THE MAPS PROGRAMME TOOK PLACE OVER SIX YEARS, FROM 2010 TO 2015.

It sought to build national scenarios to inform action towards a lower emissions future in four Latin American countries, thus helping to combat climate change while fostering development. An example of collaboration in the Global South, a team from South Africa worked with country teams in Brazil, Chile, Colombia and Peru to co-develop, with country stakeholders, an extensive body of knowledge. Mandated at government level, the results have impacted domestic and international policy in these four countries, not least it has translated into the contributions these countries will submit at the crucial UN climate meeting in Paris in December 2015.

But MAPS also had other impacts. Most significantly, it had an impact on people, and will leave a legacy of capacity and leadership that will be lasting. Stakeholders in these countries worked with the best indigenous researchers and government leaders to shape future action – and, in the process, created a new community of practice. At the heart of this was a core group of climate practitioners who built deep friendships and learnt compelling insights about the transition to prosperous low-carbon societies. These are the stories from the South, as seen from their perspective.

Exploring low carbon development pathways
Stefan Raubenheimer and the MAPS Team
STORIES FROM THE SOUTH

Exploring low carbon development pathways
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Izabella Monica Teixeira
Minister of Environment, Brazil

Support from MAPS Programme was crucial to the undertaking by the National Forum on Climate Change of IES-Brasil, an innovative exercise of GHG emissions scenario design, the first of its kind in Brazil to involve such a wide spectrum of highly qualified stakeholders. Its pioneering insights on the social and economic implications of mitigation actions in Brazil have provided a reliable technical basis for governmental consultations with business, scientific and NGO communities, supplying valuable inputs to the process of development of Brazilian INDC. The IES-Brasil outcome has highlighted a number of win-win opportunities for fostering economic activity, employment and life standards of low-income groups while curbing downwards GHG emissions in Brazil. Adopting the perspective of sustainable development, combining concerns of economic and social sustainability with the target of mitigating global climate change, IES-Brasil has made a relevant contribution to a new approach to environmental issues promoted by Brazilian government through the Ministry of Environment.

Gabriel Vallejo López
Minister of Environment and Sustainable Development, Colombia

Support from MAPS Programme was crucial for our government in its aim of building the ‘Colombian Low Carbon Development Strategy’, which has become a key pillar of the country’s green growth strategy, according to the National Development Plan 2015–2018 (Law 1753, 2015). MAPS’s comprehensive approach, including its innovative tools and technical and participatory methodologies, allowed the country to identify the main mitigation measures, many of which were later adopted by ministries through eight Sectoral Mitigation Action Plans. More recently, MAPS strengthened capacity at the Ministry of Environment and Sustainable Development, the Department of National Planning and our research teams to produce the scenarios that were used to make a decision in regards to Colombia’s INDC to be presented ahead of the Paris COP. We express our deep gratitude to the MAPS team for their invaluable collaboration to planning green growth in our country.
Pablo Badenier

*Minister of Environment, Chile*

MAPS has made a very significant contribution to the way of making public policy in the country. The original question we asked ourselves – ‘How to move forward with low carbon development options?’ – has been answered by the project with concrete results: about 100 mitigation measures, nine mitigation scenarios representing possible future pathways, and the related macroeconomic effects. I must emphasise that it is not only about relevant and rigorous results, but these have also been produced with the participation and scrutiny of numerous strategic stakeholders in the country. These results have been the main input for the design of our national contribution and, beyond the international negotiations, the governance process – Steering Committee, comprising seven ministries – has been key to establishing the Chilean mitigation policy. I want to thank, on behalf of the Government of Chile, all who have made this initiative possible and take the opportunity to extend my sincere congratulations to the entire MAPS team.

Manuel Pulgar-Vidal

*Minister of the Environment, Peru*

... we found the MAPS approach – based on country-driven collaboration between decision-makers and local researchers – a highly valuable way to co-produce a credible and relevant set of low-carbon scenarios. The knowledge base has been built along with a broad spectrum of high-level stakeholders within our society, and the results are emerging just in time as a reliable basis for the development of our INDC under the UNFCCC.

The regional platform in Latin America and the South–South collaboration with South Africa have, indeed, provided a technical and political space for exchange on our common challenges and successes, and for reflective thinking on research and processes.
ACKNOWLEDGEMENTS

This book is the product of a team effort. It is written in one voice, but by many voices. It is a book for everyone, because the issue is one that is important for all people. We hope it will appeal to a wider audience, despite some technical and complex elements.

Stefan Raubenheimer, from the MAPS team in Cape Town, took the role of lead author, stitching together the writing of a large team of contributing authors. We decided to blend the writing of these co-authors into one continuous narrative, and so although we (mostly) do not attribute text to particular authors, this book is truly the collective product of intensive work from all of them. These are all, without exception, extraordinary people, who made massive contributions to this account.

- From Brazil: Emilio Lèbre la Rovere, Charlotte Heffer, Carolina Dubeux, Barbara Oliveira, William Wills and Neilton da Silva.
- From Chile: Hernán Blanco, Paulina Calfucoy, Alexa Kleysteuber, Carlos Benavides.
- From Colombia: José Manuel Sandoval, Ángela Cadena, Katherine Ovalle, Andrea Guerrero, Mónica Espinosa and Ricardo Delgado.
- From Peru: María Elena Gutiérrez, Lupe Guinand, Rocío Aldana, David García, María Paz Cigarán, Mario Bazán and Pía Zevallos.
- From the MAPS International team in Cape Town, Santiago and Sao Paulo: Stefan Raubenheimer, Marta Torres, Andrea Rudnick, Michelle du Toit, Harald Winkler, Emily Tyler, Kim Coetzee, Ana María Rojas, Jesse Burton, Alison Hughes, Bruno Merven and Tara Caetano.

Between these authors, and others within the MAPS teams who did not directly help with this book, a remarkable research output has been achieved. Here are the numbers:

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ACKNOWLEDGEMENTS

This body of work is on our website, and its various authors added deep value to the thinking in this book. We hope we captured the spirit of their academic work.

Special mention must be made of the following contributions:

- Marta Torres, Andrea Rudnick, Kim Coetzee and Michelle du Toit, who stood close to Stefan in his lead author role and did much of the heavy lifting.
- The brilliant photographs are mostly from the camera of Hernán Blanco. We thought his photos evoke our world in a remarkable way.
- Helen Karathanassis kept us on time and handled all the production elements. Aisling de Klerk was responsible for design and infographics and all things visual, and our cover and overall book design is from the pen of Catherine Bondesio. Lorraine Dimairho played her usual brilliant support role throughout.
- Glenda Younge was our impeccable editor.

This book was funded by the Children’s Investment Fund Foundation.

Disclaimer: The views contained in this book are not the official views of the governments of Brazil, Chile, Colombia, Peru and South Africa, but the views of individual authors writing in their private capacity.
## ACRONYMS

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<tr>
<td>AFOLU</td>
<td>Agriculture, forestry and land use</td>
</tr>
<tr>
<td>AILAC</td>
<td>Association of Independent Latin American and Caribbean states</td>
</tr>
<tr>
<td>BASIC</td>
<td>Brazil, South Africa, India and China</td>
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<tr>
<td>BURs</td>
<td>Biennial Update Reports (to the UNFCCC)</td>
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<tr>
<td>BUSA</td>
<td>Business Unity South Africa</td>
</tr>
<tr>
<td>BAU</td>
<td>Business as Usual</td>
</tr>
<tr>
<td>CAIA</td>
<td>Chemical and Allied Industries Association [South Africa]</td>
</tr>
<tr>
<td>CARE</td>
<td>Ashanika Community of Rio Ene (Peru)</td>
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<tr>
<td>CDKN</td>
<td>Climate and Development Knowledge Network</td>
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<td>CDM</td>
<td>Clean Development Mechanism</td>
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<tr>
<td>CEC</td>
<td>Comité de Elaboración de Cenários (Scenario Building Team in portuguese)</td>
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<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
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<tr>
<td>CEPLAN</td>
<td>National Planning Centre (Peru)</td>
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<td>CGE</td>
<td>Computable General equilibrium</td>
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<tr>
<td>CIFF</td>
<td>Children’s Investment Fund Foundation</td>
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<tr>
<td>CIMGC</td>
<td>Inter-Ministerial Commission on Global Climate Change (Brazil)</td>
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<tr>
<td>CIRED</td>
<td>Centre International de Recherche sur l’Environnement et le Developpement</td>
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<tr>
<td>CLCDs</td>
<td>Colombian Low Carbon Development Strategy</td>
</tr>
<tr>
<td>CONPES 3700</td>
<td>Institutional Strategy for the Coordination of Policies and Actions on Climate Change in Colombia</td>
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<tr>
<td>COP</td>
<td>Conference of the Parties to the UNFCCC</td>
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<tr>
<td>COPPE</td>
<td>The Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering (Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa de Engenharia)</td>
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<tr>
<td>CPR</td>
<td>Centre for Policy Research</td>
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<tr>
<td>DAR</td>
<td>Environmental Law and Natural Resources (Peru)</td>
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<tr>
<td>DEA</td>
<td>Department of Environmental Affairs (South Africa, after May 2009)</td>
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<tr>
<td>DEAT</td>
<td>Department of Environmental Affairs and Tourism (South Africa, prior to 2009)</td>
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<tr>
<td>DEROs</td>
<td>Desired Emission Reduction Outcomes (South Africa)</td>
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<tr>
<td>DIAN</td>
<td>Directorate of National Taxes and Customs</td>
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<tr>
<td>DNP</td>
<td>Departamento Nacional de Planeación (National Planning Department)</td>
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<tr>
<td>DSGE</td>
<td>Dynamic Stochastic General Equilibrium model (Chile)</td>
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<td>EASD</td>
<td>Equitable Access to Sustainable Development</td>
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<td>EC-LEDS</td>
<td>Enhancing Capacities for Low Emission Development Strategies (USAID)</td>
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<td>ENPCC</td>
<td>National Team of Foresight for Climate Change Mitigation</td>
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<td>ERC</td>
<td>Energy Research Centre (University of Cape Town, South Africa)</td>
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<td>ERF</td>
<td>Equity Reference Framework</td>
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<td>EUETS</td>
<td>European Union Emission Trading System</td>
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<td>FARC</td>
<td>Revolutionary Armed Forces of Colombia</td>
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<tr>
<td>FBMC</td>
<td>Brazilian Forum on Climate Change</td>
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<td>GDP</td>
<td>Gross domestic product</td>
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<td>GEF</td>
<td>Global Environment Fund</td>
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<td>GHG</td>
<td>Greenhouse gas</td>
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<td>GIZ</td>
<td>German Agency for Technical Cooperation</td>
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<tr>
<td>GTC</td>
<td>Grupos Técnicos Consultivos</td>
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<td>Acronym</td>
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<tr>
<td>IADB</td>
<td>Inter-American Development Bank</td>
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<tr>
<td>IDEAM</td>
<td>Institute for Hydrology, Meteorology and Environmental Studies (Colombia)</td>
</tr>
<tr>
<td>IMCC</td>
<td>Inter-Ministerial Committee on Climate Change (Brazil)</td>
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<tr>
<td>INDCs</td>
<td>Intended Nationally Determined Contributions</td>
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<tr>
<td>INEI</td>
<td>National Institute of Statistics and Informatics (Peru)</td>
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<td>IPCC</td>
<td>Inter-governmental Panel on Climate Change</td>
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<td>LCDS</td>
<td>Low Carbon Development Strategies</td>
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<td>LCGP</td>
<td>Low Carbon Growth Pathways</td>
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<tr>
<td>LCRD</td>
<td>Low Carbon Resilient Development Programme</td>
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<tr>
<td>LECB</td>
<td>Low Emissions Capacity Building</td>
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<tr>
<td>LEDS</td>
<td>Low Emissions Development Strategy</td>
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<tr>
<td>LTMS</td>
<td>Long Term Mitigation Scenarios</td>
</tr>
<tr>
<td>LULUCF</td>
<td>Land use, land use change and forestry</td>
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<tr>
<td>MACC</td>
<td>Marginal Abatement Cost Curves</td>
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<tr>
<td>MAPS</td>
<td>Mitigation, Action Plans and Scenarios</td>
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<tr>
<td>MAVDT</td>
<td>Ministerio de Ambiente, Vivienda y Desarrollo Territorial (Ministry of Environment, Housing and Territorial Development)</td>
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<tr>
<td>MCDA</td>
<td>Multi-Criteria Decision Analysis</td>
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<tr>
<td>MINAM</td>
<td>Ministry of Environment (Peru)</td>
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<tr>
<td>MRV</td>
<td>Monitoring, Reporting and Verification</td>
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<tr>
<td>NAMAs</td>
<td>Nationally Appropriate Mitigation Actions</td>
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<tr>
<td>NCRE</td>
<td>Non-Conventional Renewable Energy</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<tr>
<td>OECD</td>
<td>Organisation of Economic Cooperation and Development</td>
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<tr>
<td>PAMA</td>
<td>Poverty-Alleviating Mitigation Actions</td>
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<td>PDD</td>
<td>Peak Plateau and Decline</td>
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<tr>
<td>PECC</td>
<td>Special Climate Change Programme (Mexico)</td>
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<td>PPT</td>
<td>Microsoft PowerPoint</td>
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<td>PRODOC</td>
<td>Project Document</td>
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<tr>
<td>RBS</td>
<td>Required by Science</td>
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<td>REIPPPP</td>
<td>Renewable Energy Independent Power Producer Procurement Programme (South Africa)</td>
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<td>SAC</td>
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<td>SBT</td>
<td>Scenario Building Team</td>
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<td>Steering Committee</td>
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<td>SDC</td>
<td>Swiss Agency for Development and Cooperation</td>
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<tr>
<td>SINA</td>
<td>National Environmental System (Colombia)</td>
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<td>SMAPS</td>
<td>Sectorial Mitigation Action Plans</td>
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<td>SSN</td>
<td>SouthSouthNorth</td>
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<td>UFRJ</td>
<td>Universidade Federal do Rio de Janeiro (Federal University of Rio de Janeiro)</td>
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<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
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<td>United Nations Development Programme</td>
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<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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<td>UPME</td>
<td>Mining and Energy Planning Unit</td>
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<td>VBT</td>
<td>Vision Building Team (MAPS Chile)</td>
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Can the world prevent catastrophic climate change while building the energy systems needed to sustain growth, create jobs and lift millions of people out of poverty? That question goes to the heart of the defining development challenges of the 21st century.

Kofi Annan –
Africa Progress Panel Report
01

Setting the stage

Los niños vagabundos

The photographs taken in Chile in the 1950s by Sergio Larraín attest to the astonishing levels of poverty at that time. Many children, though happy, appear in rags. Larraín focused on his home country but would have captured similar images in Brazil, South Africa, Colombia and Peru, had he been there. But so much has changed. To the world’s great powerhouses, we are all perhaps ‘los niños vagabundos’, starting up again from broken homes.

‘Las hijas del pescador’, 1957, Villa Horcones, Chile: Sergio Larraín, MAGNUM Photos (right of use paid to Latinstock).

1 Homeless children.
New democracies we all are, struggling with acute development challenges and often squashed between pessimism and optimism of our future destinies. South Africa struggled under apartheid until 1994; Brazil was under military rule from 1964 to 1985; Chile suffered through dictatorships from 1973 to 1990; Colombia’s history is littered with civil unrest and peacemaking processes; and Peru experienced coups in 1948 and 1968. All were under colonial rule at some time before that. All have only recently been liberated. Our misfortunes were not long ago and their legacies persist.

But our five countries are, in a sense, leaving their difficult youths behind and are bristling with new thought, fresh action and myriad clever people. Santiago’s skyscrapers are its own ‘Sanhattan’, a member of the Organisation of Economic Co-operation and Development (OECD) since 2010. Sao Paulo is certainly a megacity – you seem to fly for 30 minutes to cross it and it has the distinction of having the largest number of private helicopters in the world. You are continually reminded that everything in Brazil is big – its hydro dams, its forest basins and the number of cattle grazing its lands. Lima is exploding with small businesses and chic shops. Bogotá boasts glittering and trendy commercial districts. Johannesburg’s wealth is resplendent, and sports cars occupy many of the parking spots in its financial heartland of Sandton. Cape Town is Africa’s Monaco, its villas enjoying azure views. Our countries are on the move.

There is a darker side, however. Each of our cities has its slums, its no-go areas, its traffic and congestion and its dirt and crumbling infrastructure. We have huge numbers of poor and unemployed. Each country has worrying to frightening levels of violence and crime. Each is mired in inequality, and hope and despair are close companions. Each is part of the new world order, the free market, consumer- and commodity-driven capitalism. Each is in the making. But each of us has a long way to go before we achieve peace and prosperity.

A new threat is now added to the pile: our climates are altering. All five countries are slowly beginning to feel the impacts that climate change is bringing, and these knocks threaten the pace and scale of development. But our countries are also, to some extent, causing the global problem. We are mainly victims but also, to some degree, the perpetrators.
Our ‘stories from the South’

This book is about the problem of climate change in developing countries. It is focused on five countries: Brazil, Colombia, Chile, Peru and South Africa. It recounts the actions of these countries in response to the mitigation challenge: the reduction of greenhouse gas (GHG) emissions and their future avoidance. In this way it is about taking responsibility.

Our book is a set of stories of a learning journey by a group of people from each of these five countries as our countries confronted this new responsibility. These stories are told by a number of us who are on this journey. It is also the story of a programme known as ‘MAPS’ (formally known as the Mitigation Actions Plans and Scenarios, but affectionately referred to in abbreviated form for its sly reference to roadmaps to the future). It is, indeed, a story about trying to chart a new map to a different future.

We believe it is worth a modest publication because it is about a pair of super-wicked problems, a bunch of pioneers, some risk-takers and a whole lot of personalities. It’s about countries in flux. It is also about some really head-scratching technicalities, and about models, predictions and doubts. It is about politicians, international talks and negotiation positions. But mostly it is about trying to crack the climate change problem in a unique way in five homes.

This book is intended for all audiences – we try, in our stories, to make the technical accessible and the anecdotal pivotal. We hope that decision-makers of all types, whether linked to the climate world or not, will find some handy approaches to tough problems in this set of stories.

What binds our stories is our shared location in the south; those areas of the world where there is still much to do to ensure a safe street, a full stomach and a working toilet. It is where rich and desperately poor live close together, and where aspirations are writ large. We will veer from politics to economics, from social justice to institution-making, from human tales to children’s desires, from mathematical models to technology.

We hope that this set of stories is useful and informative and shows how far we have gone and just how far we, as humans on a planet imperilled, still need to go.
The five homes

Our five countries are powering ahead in the world economy. Between 2004 and 2013 Peru enjoyed a virtuous cycle of economic growth. Foreign investment was pouring into mining, hydrocarbons and big infrastructural projects. The commodity boom’s export income has provided tax revenues and underpinned the currency, allowing public investment to reach record levels and the domestic market for consumer products of all kinds to take flight. The result has been almost a decade of growth, averaging nearly 7 per cent a year (Vera & Wong, 2013) – faster than anywhere else in Latin America and pretty much up there by global standards. This tapered off in 2014, but the finance minister says that this is a blip and that Peru will soon be on the boil again. At the same time, protestors push up against mining and water issues: social and political turmoil pop up constantly.

Colombia and Peru trade places in the fast growth stakes: in Colombia, helped by an investment boom, the country’s economy keeps growing beyond the 4 per cent mark – this in 2014, the bad year for the rest of the region. Colombia, like Peru, is a medium-sized commodity exporter with an open-market economy. Colombia’s main exports are oil and coal, whereas Peru depends on copper and gold for half of its exports.
If we turn to Chile, the story is focused on copper and more copper! Copper has been the lifeblood of Chile: 10 years ago it provided 80 per cent of exports and currently it provides 20 per cent of gross domestic product (GDP) and 50 per cent of exports (The Economist, 2013; O’Brien, 2015). Thanks to copper and to the industrial diversification of the last decade, Chile’s economy has positive growth rates, healthy macroeconomic conditions, with controlled inflation and unemployment. It all looks good. However, as an open economy, small shifts in the copper price and other international fluctuations make the country very vulnerable. Mining copper is also energy intensive, and due to Chile’s stretched geography, distances are far and transport costs huge. Costs of energy are rising too and so are the social costs: a strong green movement opposes more hydro dams.

Brazil is the giant among the other four. The country is blessed with extraordinary natural capital: the Amazon, some of the world’s largest rivers, an astonishing coastline, mineral and (potentially) vast oil wealth. Brazil is a monster in food production: get this – the number of cattle rose from 12 million in 1978 to over 50 million in 2014. The industry provides 360 000 direct jobs (Duran, 2014). Brazil is key to world food production – the second largest meat exporter in the world. Its huge population has prospered well over the last decades:

Brazil is reaping the benefits of years of reforms that have delivered greater economic prosperity and a fairer distribution of the benefits of growth among the population. Growth and sensible policies have allowed 40 million people to join the middle class over the last decade. Now the challenge is to create the conditions that will allow further improvements to living standards and sustained reductions in income inequality in a sound macroeconomic environment.

(Gurría, 2013)

But Brazil has many longer-term challenges: the crumbling highways and buildings astonish anyone driving through Rio de Janeiro for the first time. Much still needs to be done. And right now the prospects look bad: Brazil started sliding into recession in late 2014. Talk to a Brazilian and all you hear are complaints: skyrocketing costs for second-rate hotels, shoddy infrastructure, red tape, rigid labour rules and a convoluted tax system. The presidential election in October 2014 was poised on this knife-edge. And then came the mega scandals of 2015.
South Africa has struggled of late. In late 2014, the country just missed falling into recession after a protracted set of strikes in the mining sector. The government is in serious trouble: plagued by accusations of kleptocracy and an allegedly corrupt president. The erosion of many of the gains of democracy means that the necessary focus on a coherent economic development path is lacking. South Africa worked through its revolution peacefully, but has since struggled to make sense of itself. With Brazil, it is one of the countries with the most unequal distribution of wealth in the world (World Bank, 2015), and, much like Brazil, it is extraordinarily well endowed. Agriculture, fruit production and viniculture are all well organised and are pretty successful, but land still lies mostly in white hands. When it comes to minerals, South Africa has the honour of being one of the most well-endowed countries in the world, yet it comes only halfway up the ladder as an investment destination. The inequality of resource distribution hits hard in the soft underbelly of South Africa’s aspirations, and a real lasting social compact is still far off.

All five countries face long, hard slogs up the development ladder. The multiple objectives of development – food, water, energy, health, housing, mobility and so forth – drive political directions and policy decisions. These needs, in the short term, can fizz with urgency as service delivery protests, street violence and state responses dominate the news. Development is not an easy road. Our people are restless and demanding.
Throw in a ‘super-wicked problem’

As if there was not enough to do, to manage, to plan (and often to resist!), our countries now face a new issue: what can we do about the effects of climate change? And it’s a deeply difficult question. It is indeed a ‘super-wicked problem’ encompassing not only climate change itself, and all the challenges that are a part of its universe, but also the problem of making a case for the solution to it.

A huge amount has been said about climate change over the last 15 years, great bodies of knowledge have been created, reams of negotiation text have been generated, as well as waves of political heat. But all this work and analysis on rising emissions has largely resulted in failure. One thing is for sure, we have a problem and it’s getting more and more serious. It has become a ‘super-wicked problem’ and, as such, mixes toxically with our development demands.

In the early 1970s, two design theorists proposed that all public policy and open societal problems could be characterised as ‘wicked’ (Rittel & Webber, 1973). Not wicked in the sense of deplorable or evil, but rather because they are malignant, aggressive and vicious. This is in contrast to the problems that engineers and scientists typically face – problems that can be explicitly defined and therefore solved. Rittel and Webber’s wicked problems are inherently unsolvable and have no definitive formulation. There are multiple ways of addressing these problems, and how they are explained determines the way in which they are approached.

So what transforms a wicked problem into a super-wicked problem?

Since the turn of the century, it has become clear that we are in even more difficult territory, with the rise of global environmental problems, such as climate change, prompting the introduction of the term ‘super-wicked’ problems (Levin et al., 2009). Super-wicked problems are characterised by additional features to those of wicked problems. First, we have limited time to respond to them – once a tipping point is breached (as in the climate system), the changes become irreversible, so there is no room for compromise. Nature cannot be mediated by the political system, as in the case of social problems. Second, no strong central authority exists to address these environmental problems. Third, those that seek to solve these problems are also those causing them. And finally, super-wicked problems are compounded by an irrational preference for the present over the future, a tendency known as ‘hyperbolic discounting’.
These characteristics of wicked and then super-wicked problems mean that we need to look beyond science, engineering and even political science, international relations, public policy analysis and theories of environmental politics for tools with which to respond. The world of these problems is neither linear nor predictable.

We know that we, as humans, are causing the problem of climate change. We know that we have limited time to avoid its tipping points, and we are struggling to value and protect the future appropriately for ourselves and for our children. Climate change is already happening and it is going to get much worse. But science can give us no perfect prediction of exactly how bad it will be, except to say that the trends look dire, and that certain events are more likely to happen than not. Trying to cost the impacts is not easy. Trying to imagine the catastrophe is outside our normal frame of reference, even as the latest findings from the Inter-governmental Panel on Climate Change (IPCC) characterise the warming of the climate system as ‘unequivocal’ and the concomitant observed changes (melting ice, sea level rise, and warming of the atmosphere and oceans) as ‘unprecedented over decades to millennia’ (IPCC, 2014). Climate change will amplify existing risks, as well as create new ones for humans and the natural systems (like food production) upon which we rely, disproportionately affecting disadvantaged people and communities, as they are less likely to be able to adapt to different circumstances. No single mitigation or adaptation option, however, is likely to be sufficient by itself. We require effective institutions, governance, innovation and investment at scale and across levels of governance. This level of coordination poses significant governance challenges; additionally, as climate change impacts increase, so, too, does the challenge of successfully implementing options.

Then we have the opposition: uncertainty makes rich soil for casting doubt, and denialists have had a field day doing so. But they are just a front for fossil fuel interest holders, and here lies the real rub: we all hold shares, in one way or another, in the fossil industry, and our portfolio props up the entire world economy. The vested interests in fossil fuels and related industries, in logging and agribusiness, are all so tied up in the current status quo as to fiercely resist any change to it. The interest holders in the sources of emissions, from energy companies to drivers, from loggers to gas pipeline shareholders, are spread wide and deep throughout society. Their wealth drives yet other interest holders: bankers, derivative stockbrokers and investors. Some get seriously rich off these practices, and some will actively and cynically fund climate denialism; but most of the rest us just live ordinary lives, which are utterly dependent on the very practices that will threaten our children’s lives so terribly.
The problem becomes even more wicked when we look at who is given the responsibility to tackle the challenge and how we organise ourselves.

In the international climate negotiations, instead of looking at each of us as individuals, and our emissions at the point of consumption, we look at sovereign countries and their emissions at the source at which they are produced. Here the logic is not questionable because we trade and consume goods and hence import and export emissions. This sovereign approach – looking at emissions at source – raises yet another wicked problem: the issue of equity.

Key principles underpinning the United Nations Framework Convention on Climate Change (UNFCCC) are ‘equity’ and the related ‘common but differentiated responsibilities and respective capabilities’ (United Nations, 1992: Article 3[1]). While these are repeated, as if by rote, they point to issues of responsibility and capability. The well-known political philosopher, Henry Shue, has pointed to the simple but deep roots of equity: ‘All over the world parents teach their children to clean up their own mess.’ He goes on to point out that if one learns that one cannot walk away from the mess one has created, ‘one is given a strong negative incentive against making messes in the first place’ (Shue, 2009). Climate change is a problem of the concentration of GHG emissions in the atmosphere, which is caused by the stock of cumulative emissions. Cleaning up the ‘mess’ of climate change requires both that states take responsibility for past emissions, which have
caused the problem, and that they (and others) do not repeat the mistake. Equity has a clear time dimension – it is about past and future emissions, and what we do in the present. One fair question to pose is, ‘Who caused the problem in the first place?’ Clearly it is those countries that industrialised early and became rich on a high-carbon development path. Given the accumulation of GHGs already in the atmosphere, it is increasingly clear that we cannot solve the problem without following different development paths.

Climate change is a collective action problem, and solving the problems facing the global commons requires the participation of all countries: so those developing later must take responsibility for future emissions. This is an ethical obligation as taking responsibility for the future is about stewardship of the Earth. But future emissions are projections, not certainties. And if developing countries do the morally right thing – as we should – it is crucial that it is not at the cost of our development, in the sense of providing basic needs to large populations currently still living in poverty. We also have to ensure that the poor, who are least responsible for the problem, do not pay by suffering climate impacts. So all who have the capacity to solve the problem should act to do so. This brings us back to addressing equity among countries; the subject matter of much theorising and the UNFCCC negotiations (Aslam, 2002; Kanitkar et al., 2010; CASS/DRC joint project team, 2011). But the inequalities within countries will be highly relevant. South Africa, Colombia and Brazil have the dubious distinction of having among the highest Gini coefficients\(^2\) in the world. Addressing poverty and inequality is absolutely crucial, and this is the context in which we must tackle the wicked problems of development and climate.

So this is the super-wicked problem, and the emerging crisis, of climate change. This takes us to the next dimension of the super-wicked problem: if the doctors are so clear in the diagnosis, why are we refusing the prognosis? It’s like smoking: why can’t we quit when we know it’s bad for us? Most scientists now believe we have a crisis and that catastrophe awaits unless we change, but startlingly few are acting as if this is really true. Since we started talking about the climate change problem, we have added over 60 per cent to our world emissions. It is as if we are reckless; as if our natures are, in themselves, part of the problem. We seem unable to change. Encouraging change from a life that seems so normal is perhaps the problem. Why change if the sky seems blue and the birds are still singing?

Inducing change itself is a critical challenge.

\(^2\) The Gini coefficient/ratio is a measure of income inequality within a country: zero expresses complete equality and one represents complete inequality.
Change. This becomes a keyword

The world’s current economic growth model relies on production and consumption practices that are high in carbon emissions or is reliant on the destruction of natural carbon sinks. This model takes climate stability for granted. Take these practices out of our societies today and our economies would simply collapse, resulting in even more poverty and struggle in the long term. Do nothing and climate impacts will eventually threaten socioeconomic collapse as well.

That change is needed is agreed by most. We need to rid society of poverty and inequality, and we need to reverse climate change. This implies an astonishing degree of change, necessitating both rapid change and change at a societal scale. This cannot be left to the markets or to a few disruptive technologies. This is a change we will have to implement at super-scale on one hand, and at the personal intimate level on the other.

New approaches are needed just about everywhere to meet the super-wicked challenge of climate change in a development context; this hydra bewilders and overwhelms us. In most cases, we have started with obvious solutions: by building renewable energy, avoiding deforestation and making lighting more efficient. But to achieve a resilient, zero-carbon, prosperous world is going to be a lot more complex than this – it is going to take a continuous commitment to constant change. For example, while we have some understanding of how to address poverty, we have far less understanding of the rising problem of inequality. And now we have to overlay the challenges of climate change mitigation and rid society of high-carbon activity within a limited time frame, and, at the same time, we need to invest in climate change resilience.

Finding the sequence and the pathways to achieve our development goals now becomes a constant and dynamic process of change and learning, rather than assuming that there is one sure-fire plan. We will have to take constant action. And action involves people and processes, tools and knowledge, and will and conviction.

You could say that people lie at the heart of this problem of change and that we need to start there.
MAPS

MAPS, as a programme, has always been focused on this problem of change. Within MAPS we have been impact-driven: we hope to achieve scalable change towards climate compatibility in systems (so far we have worked at country level and have focused on the mitigation of GHG emissions). Our thinking is that since change must be driven by people, people need to be influenced or moved to act. This assumes that a critical mass of decision-makers in a system starts a process of change that builds a constant impetus towards the impact sought (in this case, the eventual zero-emissions society that is climate resilient, competitive in the post-carbon economy, and which delivers prosperity and equality to all citizens).

Our theory of change presupposes that in order to start acting, decision-makers across society need to be convinced that they should act in a particular way, pushing against prevailing practices and vested interests. This conviction is constant and institutionalised, driven by internalised knowledge on the one hand, and by more ‘emotional’ or value-driven motivators on the other. This means that not only must leaders be convinced by the data, but they also need to ‘feel’ ownership for the case to defend the actions required, especially in the face of vested interests. Finally, their actions must be aimed at the longer term and be resilient to political and other changes – they must act within a strong institutional framework.

Building knowledge about mitigation and adaptation options, and exploring the way in which implementation of these options might interact with the economy and with the behaviour of people over time in society, is a complex challenge. Such knowledge is usually also contested. To have persuasive value, it has to be seen to be highly credible, preferably presented as sets of options that are constantly re-evaluated. To achieve this credibility, data should be at the frontier of science, developed by the best researchers (and tools). Our approach in MAPS is to work with the best researchers to achieve this. But research alone does not guarantee credibility: we go further and bring research into a partnership with decision-makers within government, the private sector and civil society. We facilitate a deep and long-term dialogue, in this way ensuring robust, co-created data that can be confidently used to drive implementation.

In this process, data is also focused on what is relevant to society. The decision-makers in a low emission, vulnerable country will make different decisions to those in a high emission, economically developed and stable system. Mitigation on its own is not sufficiently relevant for a country with few emissions and a serious poverty
problem; but if knowledge focuses on economic development, energy security, poverty alleviation and so on, a double benefit from mitigation actions, or actions that avoid future emissions, can be explored. Process-driven research thus ensures relevance.

Finally, for this knowledge to create the impetus for change at scale and to do so rapidly, it needs to be seen as legitimate. This is the third pillar of the MAPS ‘approach’. A full mandate for the work by the highest authority is needed, and the work from knowledge creation to action must take place within a robust institutional framework.

This combination of credibility, relevance and legitimacy is thus achieved through a managed process. MAPS has so far not focused on the eventual implementation of knowledge, but rather on its legitimate co-creation, and has constantly tried through learning to make this knowledge more compelling at all three levels.

These stories

Poverty and climate change are two defining challenges of our times. They exist hand in glove in our developing countries. The multiple objectives enshrined in national development processes and international sustainable development goals (United Nations, 2014) range across energy access, education, health, reduction of inequality and poverty, and more. In addition, we have unequivocal scientific consensus that the global economy will have to reach net zero GHG emissions some time in the early part of the second half of this century, and that along the way we will start, and continue, to experience severe impacts of climate change and will therefore need to develop sufficient levels of resilience. These impacts will threaten efforts to rid society of poverty. Hence both developmental and climate goals are non-negotiable and inextricably connected. Failure to achieve any of these goals will result in impacts we cannot adapt to or withstand, and economic and social collapse will inevitably follow. Over the 20 years of addressing the challenge head-on, poverty is on the decrease, but inequality is rising; world emissions have continued to rise, climbing over 40 per cent, and climate impacts are increasing: as people become less poor they emit more. Our systems are complex and the vested interests in these systems are real and entrenched. They change slowly, and are highly resistant to change. Those attempting to tackle the climate challenge have, in effect, failed to change the systems and the people who run them.
Our stories from Chile, Colombia, Peru, South Africa and Brazil are about change. It is too soon to say that we have, indeed, started lasting change. These stories are just about the start. We look in detail at what has been done in each country, and we reflect on the progress made so far.

We start in South Africa, in 2006.
FURTHER READING

The following papers are available on the MAPS website at www.mapsprogramme.org

- Inequalities-emissions (Rennkamp).
- Brazil–South Africa comparative (Rennkamp).
- MAPS approach and Theory of Change paper (Boulle et al).

REFERENCES


Overall, the review team believes that the LTMS is the first of its kind in developing countries with South Africa a leader in this area.

Wang, La Rovere, Yang and Fedorsky for the World Bank
From South Africa to Latin America

South Africa

The origin of the Mitigation, Action Plans and Scenarios (MAPS) programme – the idea that has driven the approach adopted in Latin America – was in South Africa. We start here.

South Africa has a particular history: it is well known that the Dutch and then the British took turns occupying the southern tip of Africa. The local population was subjugated pretty much straight after a European toe touched the sands of the Cape. It is less well known that the first white settlers found themselves surrounded by thousands of nomadic farming people, who lived with large domesticated herds and, at the same time, dealt with elephants and lions, and miraculously coped. The Cape was a wild place. The Dutch settlers built a fortification, mapped out the place, behaved like owners and bartered. They soon reigned supreme. It is also not so well known that the first *homo sapiens* (more or less like us) came from South Africa, that it was probably the epicentre of all humanity; that the oldest artwork (a scored piece of ochre) was found in a cave in the Cape. North of the Cape was the rest of Africa. Various people were settling in the regions of South Africa, having travelled south through Africa. We know that 1 000 years ago, locals in the north of South Africa (near today’s Phalaborwa) were busily mining copper and had a sophisticated metals industry. We have records of huge settlements of people who constructed circular stone walls to protect their cattle. There are no written records, but this does not mean that there was no history.
As the Dutch, and later the British settlers, migrated into the northern parts of what is now South Africa, mapping new borders as they went along, so they encountered Africans moving southward, and as one can imagine there was quite a bit of conflict along the way. Things got messy quite quickly. Many wars followed, most characterised by the typical belief of the colonialists that the place was theirs for the taking.

Much has been said about the time of the British, the colonial oppression of the people, and of apartheid. But the back story is in the economics and the astonishing mineral endowment of South Africa, discovered by the colonists about 150 years ago. In their push north from the Cape, the colonists stumbled upon wealth that was hard to imagine. Not only did they grab it with both hands, they knew who would do the back-breaking labour, so they set about making the African people do the hard work for them. Modern South Africa was born.

South Africa’s miners unearth approximately 53 different minerals. In many of these it was the world’s leading producer. In the early years, South Africa, and particularly the companies that owned the mines, rode the great wave of mineral wealth, but this was not to last forever. Today less than 10 per cent of South Africa’s gross domestic product (GDP) is attributable to mining, and the industry is plagued by power shortages, stoppages and violence. South African mining should be a success, but it is in decline. Mining has struggled for past decade, missing the global commodity boom, and some minerals are in decline. The economy in general is battling. The unemployment rate hovers at approximately 25 per cent for example – high compared to rates in Brazil (5.9 per cent), Russia (5.6 per cent), India (3.6 per cent) and China (4.6 per cent) in 2013 (World Bank, 2015a). In addition, there is also almost total dependence on social grants for those living in poverty. It was estimated that there were 15.4 million registered South African income taxpayers in 2013 – although a large percentage fall within the tax-free threshold (Bisseker, 2013) – while recipients of social grants increased from an estimated 4 million in 1994 to 16.3 million by 31 August 2014 (Ferreira, 2015). A few taxpayers support many poor people through to old age, with little that can be done to change this. South Africa’s education system is also failing the poor, and many of the unemployed have now all but given up on even looking for a job.
By mid-2015 the shortage of energy supply was shaving off percentage points from growth, and business confidence is at an all-time low. Inequality in South Africa is persistently high. Despite 20 years of democracy, a staggering 26.2 per cent of the population still lives below the international poverty line of US$2/day (World Bank, 2015b). As such, the so-called ‘quandary of growth and job creation’ lies at the centre of the policy and governance challenge in South Africa (National Planning Commission, 2012).

The challenge for South African governance lies in its bifurcated socioeconomic context. In very key aspects, South Africa is a developing country, and, much like other developing countries, it has a range of pressing developmental priorities, limited budgets, high unemployment and capacity challenges. But like many developed countries – and as an enduring legacy of the economic development model favoured by the apartheid state – South Africa has a highly emissions-intensive economy built on abundant, cheap coal.

There are yet more problems linked to mining: extracting minerals consumes huge amounts of energy. For what is today a shrinking per cent of GDP, South Africa has developed a political economy that is hard-linked to the minerals–energy complex (Fine & Rustomjee, 1997), which is briefly described in the next paragraphs. It is this connection that has become a centrepiece of the recent South African story.
The mineral that has the leading role in the cast is coal. Coal was first mined commercially in 1864, but it was only after the discovery of gold in the Witwatersrand that commercial coal mining really took off. Coal provided the energy that the Zuid-Afrikaansche Republiek (also known as the Transvaal Republic) needed in the nineteenth century to power mines and railways, driving the fast-growing gold mining industry, and later also the platinum, iron and steel, chrome and manganese sectors. Escom (Electricity Supply Commission), the national utility, which was brought into being in 1922 with the explicit purpose of providing ‘cheap and abundant electricity’ to drive industrial development, turned to coal to do so. From the 1940s onwards, coal became integral to the development of a local steel industry through Iscor, the state-owned steel company; then in the early 1950s, Sasol, the South African Coal, Oil and Gas Corporation, a state-owned petrochemical company, began to produce liquid fuels from coal.

South Africa’s installed electricity capacity grew from only 6 500 MW in 1969 to over 44 000 MW (85 per cent of which is coal-fired plant) (Davidson & Winkler, 2003). The Richard’s Bay coal terminal, now the largest single coal terminal in the world, was constructed in 1976 on the east coast of the country by the coal companies in order to facilitate exports to foreign markets (the first deal was with the Japanese), while the state-owned railways built a line from centrally located coal fields to Richard’s Bay. The electricity system came to depend on coal, and Escom (now Eskom) became (and has remained) essentially a coal utility.

This was the real story of the birth of industrial South Africa. The South African story is often thought of as a story of gold, but really coal was the enabler of everything. It provided very cheap inputs to the electricity sector, and coal-fired power still accounts for most of Eskom’s output; it enabled the development of steel for industrialisation and railways to move the minerals to port.

At the liquid fuels end, coal has also played a huge role: in the 1920s, South African scientists started researching the possibility of using coal as a source of liquid fuels (petrol, diesel, etc.) and the company Sasol was born. Commissioning of the Sasol I site for the production of synthetic fuels started in 1954. After Sasol II and III were built in 1980 and 1981, respectively, coal became integral to the South African liquid fuels supply. Sasol now provides about a third of South Africa’s petrol requirements through converting coal to liquids. It plays a huge part in South Africa’s economy, and is one of its biggest taxpayers, thus propping up a large share of the social benefits system. But there was a catch, for Sasol is a dirty industry, with high levels of local pollutants, and, in terms of $\text{CO}_2$, Sasol at Secunda operates one of the biggest single points of greenhouse gas (GHG) emissions on the planet.
Eskom emits some three times more GHG than does Sasol. These two companies dominate the climate debate. Without the low coal prices Eskom has historically enjoyed, other minerals could not have been mined so cheaply, and the beneficiation of ores and the development of other types of energy-intensive industry would not necessarily have happened. Without Sasol fuel from coal, the sanction-isolated apartheid state would have suffered huge fuel shortages. There remain real economic dependencies on coal; the industry is around the third largest export earner in the country, and South Africa is in the top five largest exporters of coal globally. Around 90,000 people are employed in the industry, and it alone contributes just over 1 per cent to GDP (CoM, 2014). But, more importantly, as the bulk of South Africa’s primary energy supply, it is the basis on which all other mining and much of South Africa’s manufacturing depends. One can say, with some confidence, that mining and burning coal built South Africa.

Meanwhile, in South African cities another reality is developing: as with most developing countries, urbanisation is happening at an astonishing rate. Apart from the many problems this brings to those who run cities, South African cities are at a major disadvantage: their inherent design is based on the malevolent intent of the architects of apartheid, resulting in special separation of the working classes from the heart of cities’ commercial and industrial areas. There is little densification in the South African urban landscape. Many of the poorest working South Africans pay a greater proportion of their earnings to get to work than most in the world.
The legacy of apartheid still pervades South African society. Most South Africans remain un- or under-educated and unskilled, living in city slums. Most live far away from potential work. Most rely on the state for help. Most remain poor, yet aware that others have incredible wealth. South Africa is one of the most unequal countries in the world. This gives rise to a brutal society on many levels: crime, rape and other social ills are rife. While South Africa managed to transition to a democracy, that democracy inherited all these fundamentals. The current government struggles with these realities and has so far failed to turn the economic corner.

There are, however, some positive legacies. One that is peculiar, and plays a part in the story going forward, is that South Africans learnt through the development transition to talk to one another, and there is a tradition of negotiation, of discussion and decision, locally expressed in the principle of ‘ubuntu’. During the democratic transition, a number of South Africans received world-class training to help with the political negotiations, to build a democracy.

**Now for the climate challenge**

South Africa ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997. It acceded to the Kyoto Protocol in 2002. Shortly afterwards, it issued an Initial National Communication on Climate Change and, in 2004, a National Climate Change Response Strategy. It became clear from domestic research in the early 2000s that South Africa was going to be heavily impacted physically by climate change. Predictions of the desertification of large regions and increasing water stress were summarised in the communication. Like most of southern Africa, water was going to be the main problem.

With some foresight, the Initial National Communication recognised that South Africa emitted a great deal of GHG for its size and population. The economy had high emissions intensity; per capita emissions were high in comparison with other similar countries. There was risk, consequently, on both the physical and economic fronts.

This brings us to the emissions profile of South Africa.
In 2004, the world produced about 49 000 Mt CO₂-eq, mainly from energy generation and deforestation. In comparison, South Africa produced about 440 Mt, or about 1.5 per cent of this global figure. The World Resources Institute’s Climate Data Explorer tool placed South Africa as the nineteenth highest emitter in the world in 2012 (World Resources Institute, 2015). South Africa’s emissions are (and were at the time) large relative to the size of its population and economy. Our coal-based energy economy has provided relatively low energy prices historically, which has favoured energy-intensive industries. We can compare South Africa to other countries as follows:

Table 2.1: Comparison of South Africa’s annual and cumulative emissions. LTMS technical reports.

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<td></td>
<td>Mt CO₂-eq</td>
<td>%</td>
</tr>
<tr>
<td>Six gases, energy &amp; LULUCF</td>
<td>As share of global total</td>
<td>CO₂ only, energy &amp; LULUCF</td>
</tr>
<tr>
<td>South Africa</td>
<td>415</td>
<td>1.0%</td>
</tr>
<tr>
<td>Brazil</td>
<td>2 213</td>
<td>5.4%</td>
</tr>
<tr>
<td>China</td>
<td>4 920</td>
<td>11.9%</td>
</tr>
<tr>
<td>India</td>
<td>1 814</td>
<td>4.4%</td>
</tr>
<tr>
<td>OECD</td>
<td>15 423</td>
<td>37.4%</td>
</tr>
<tr>
<td>World</td>
<td>41 240</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

As Figure 2.1 shows, South Africa’s emissions intensity (that is, emissions per unit of GDP) is high compared to most developed (OECD) countries and developing countries. Our emissions per capita are higher than those of China and India, which are also coal-based energy economies, and higher than Brazil’s – until we add Brazil’s emissions due to changes in land use, notably deforestation.

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1 Greenhouse gas emissions are measured by megatonnes (Mt) of CO₂-equivalent. Emissions from the other greenhouse gases (GHGs) are converted to CO₂-equivalents by Global Warming Potentials.

2 Note on Table 2.1: gases for annual emissions include CO₂ (energy), CO₂ (land use change), CH₄, N₂O, PFCs, HFCs, SF₆. Table from LTMS. Available: www.erc.uct.ac.za/Research/Publications-recent.htm [15 March 2015].

3 In climate negotiations, these sources of emissions are referred to as ‘LULUCF’ – land use, land use change and forestry.
South Africa was therefore in a difficult position in relation to some proposed climate regimes. Some countries argue – on the basis of equity – for allocation of emission allowances on a per capita basis: South Africa already exceeds the global per capita average. Other proposals for developing countries are based on emissions intensity. Again, given the country’s high relative emissions intensity, this is not likely to be a favourable approach for South Africa either. South Africa was an ‘outlier’, with a clear problem, mainly due to its huge coal endowment.

In the Initial National Communication, and the Response Strategy, the government recognised that while South Africa had no formal obligations to reduce its emissions (this was the effect of differentiation between developed and developing countries under the Kyoto Protocol), it was still willing to address the issue. As a first step, the country would inventorise its GHG emissions properly and begin to consider mitigation options. Indeed, a number of options were listed in the Initial Communication, and there was some evaluation of these, but it was clear that a real number-crunching assessment was needed. The recommendation at the end of the communication stated: ‘The preliminary investigation into potential mitigation options needs to be extended to include more specific macro-economic modelling to evaluate the impact of different measures ...’ (South African Government, 2003: 121).

The stage was set for a deeper examination. In this, South Africa was ahead of its time when compared to other developing countries. Despite its emissions handicap, it was considering its options – this then was the essence of the exercise that it was soon to embark on: the Long Term Mitigation Scenarios (LTMS).
Other things moved the process along: a number of focusing events contributed to creating a window for domestic climate change mitigation policy in South Africa. Developments in the UNFCCC process, described in the previous section, were one. Internationally a ‘perfect storm’ had developed in the years during which the LTMS was being conducted. There was the publication in 2006 of Nicolas Stern’s review of the Economics of Climate Change, Al Gore’s documentary, An Inconvenient Truth, released in the same year, and the Intergovernmental Panel on Climate Change’s (IPCC) Fourth Assessment Report in 2007. The period 2005–2008 has been described as ‘watershed years for climate science’ (Raubenheimer, 2011: 5). In South Africa, Stern’s tour of the country to promote his review heightened awareness of the issue around the time of the LTMS, particularly within National Treasury. All of this was pushing in one direction: climate change was under the spotlight.

The South African Government was in a bind, however: it could do nothing and simply point a finger at the large emitters in the north, or it could assume some degree of responsibility but risk its coal-driven economy. It opted to start by understanding its options, and commissioned a ‘knowledge project’, which became known as the Long Term Mitigation Scenarios.

The scenarios exercise, which was essentially a large assessment style process, commenced in 2006 and was completed in 2008. It was mandated by the government in an interesting way:

- South African stakeholders understand and are focused on a range of ambitious but realistic scenarios of future climate action both for themselves and for the country, based on best available information, notably long-term emissions scenarios and their cost implications.
- The South African delegation is well-prepared with clear positions for post-2012 dialogue.
- Cabinet can approve (a) a long-term climate policy and (b) positions for the dialogue under the United Nations Framework Convention on Climate Change.
- Cabinet policy based on the scenarios will assist future work to build public awareness and support for government initiatives.4

The task to lead the LTMS was passed to Harald Winkler of the Energy Research Centre, and Stefan Raubenheimer joined his team to lead the facilitation team. Together they had sought to influence the design of the LTMS along the lines of what was to become the basic theory of change behind MAPS. The central task from

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4 Published by the Department of Environment before the LTMS commenced.
government was: create knowledge that helps us understand exactly what we emit, what we are likely to emit as we develop and grow, what our options are to mitigate those emissions, and what implications such options might have to our economy. Now this knowledge could be created by an academic institution or commissioned from a consultancy. In fact, some time into the LTMS, the World Bank offered to conduct a study for South Africa, but was asked instead to review the outcomes of the LTMS process.

Central to the LTMS was research, but the design was to do research in a fundamentally different way: to include central actors in South Africa in the process of producing the knowledge; in fact, to ask them to lead the knowledge production process; in a sense to ‘commission’ the research outputs.

So the LTMS was to be driven by a broad group of stakeholders: stakeholders from industry, government, regulatory authorities, NGOs, church groups, mining houses and consultants. This broad inclusivity was unique at the time, certainly in the developing world. It was in fact an objective, as we can see above, for stakeholders to gain capacity and ‘be focused on’ a range of ‘ambitious but realistic’ scenarios. This implied a number of freedoms: given the freedom from any emissions reduction obligation, stakeholders could exercise their imagination, look beyond constraints and speculate on outcomes. It constrained them to realism, but not to any cap in action or any particular course of action. It also allowed them to argue: conflict was accepted as part of the exercise, and its resolution was part of the solution. Conflict was seen as important to stress-test assumptions, agree inputs, avoid gaming and fabrication. The role of the facilitator was hence integral to a process in which contestation was central.

This group of actors in society partnered up with a research consortium made up of the best South Africa had to offer. A number of institutions and individuals were contracted to form one group, and this group entered into conversation with the sector stakeholders to build knowledge together. The researchers would use the most advanced tools and models then on offer, but would ‘open the black box’ to the stakeholders. This was to be a completely new way to build knowledge. It was quite a risk!

The LTMS was not a policy-making exercise, but was scenario building in the true sense of the word. The other freedom was one peculiar to South Africa in the early 2000s: a government giving free reign to, and joining, a broad stakeholder group to imagine the future, and in this way help the ‘cabinet to approve long-term policy’
and to set ‘positions for dialogue’ in the international setting. Quite a risky exercise, given that in the room there were pro and anti-nuclear groups, and that other huge differences of opinion would play themselves out. The LTMS turned out to be a very contested space. It also took a while: two years may seems a long time, but this process needed to be absorbed, internalised and digested by its participants.

What actually happened in the LTMS has already been well documented (Winkler, 2010; Raubenheimer, 2011), but it was widely regarded as an important exercise. A peer review of the project by the World Bank had this to say:

Overall, the review team believes that the LTMS is the first of its kind in developing countries with South Africa a leader in this area. The team found that the combination of research-based scenarios with stakeholder consultation process was a pioneering effort to provide high-quality information for decision making on climate change response strategies in South Africa. The team is most impressed by the rigorous stakeholder consultation and consensus building process leading to LTMS, and believes this is a major achievement of the exercise. It started from an endogenous initiative in South Africa, and unfolded into the involvement of key stakeholders in the scenario building team (SBT). Different governmental agencies, representatives from the business world (see CEO list of participants), and NGOs were members of SBT, besides technical experts. The many rounds of meetings and discussions held in the process are essential to build consensus among stakeholders, as climate change mitigation involves many sectors and stakeholders across the country and has significant implications to the economic growth and development prospects. Particularly impressive is the consensus reached among the senior level decision makers for the Required by Science (RBS) scenario. The key strength of the consultation process was the consensus that stakeholders achieved at the input stage built the platform for the same consensus at the results stage; which in turn strengthened the credibility of the result at the political level. This pioneer effort was so relevant that it deserves continued support and development.

(Wang et al., 2008)
The idea behind the LTMS approach draws (in hindsight) from the theory about assessment processes (Cash & Clarke, 2001), although at the time the process design adopted by Harald and Stefan and the LTMS team was more intuitive: get the best researchers together with the best technical people from all the stakeholders, encourage contestation, and drive agreement over the inputs and assumptions that will be used to model the mitigation options; then run the models and see what comes out. Argument over what went into the models was expected and would be managed by neutral third party facilitation. The research would reveal a rich seam of data about mitigation options and their socioeconomic effects. As a country, South Africa would know what it could and could not do, what things would cost, how actions would impact the economy, and importantly, what decision-makers throughout society thought about these actions – which had broad support and which did not.

Figure 2.2 shows the final scenarios, in diagram form, as presented to the government after the LTMS process was concluded.

Figure 2.2: The final LTMS scenarios from the high-level presentations.

So the question is: did it work? Were the objectives set by the government actually achieved? Did the LTMS build capacity in stakeholders and ‘focus them on a range of ambitious but realistic scenarios’? Did it provide the ‘best available information’? Did it prepare the South African position internationally and help to build domestic policy?
Peak, plateau and decline: International reaction

South Africa’s ‘peak plateau and decline’ (PDD) GHG emissions trajectory was approved by the South African Cabinet in 2008 after the LTMS process had submitted its report. As part of the lead-up to that decision, the key findings of the LTMS team were disseminated broadly through various engagements with South African leaders. The findings were discussed with government, business, NGOs and civil society in a series of outreach events in late 2007 and the first half of 2008 (Raubenheimer, 2011). The Department of Environmental Affairs and Tourism (DEAT) took the findings through consultations in government and further engagements with stakeholders, in the lead-up to a presentation to a cabinet meeting. Having mandated the LTMS process at the outset, the cabinet considered its results in July 2008.

Then, after discussions during its July meeting, the South African Cabinet agreed on an ambitious plan, driven by the aim of limiting temperature increase to 2 °C above pre-industrial levels and doing a fair share to reduce emissions in the international context.

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Figure 2.3: The government Peak Plateau and Decline Policy, represented by the red line, overlayed on the final LTMS scenarios.

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5 A global temperature increase of 2 °C above pre-industrial levels is considered to be the threshold beyond which the risks of climate change become unacceptably high and unavoidable.
Taking a long-term view, the goal was to make a transition to a low-carbon economy, presenting this as the best option for job creation and development in a carbon-constrained future. Cabinet stated clearly that emissions need to peak (at the latest by 2020–2025), then plateau for a decade or so, and then decline. This decision was to become a very controversial one and is still contested today. The PPD range is the neat red line placed over the LTMS results, thus overlaying the study’s results with a line representing a political decision.

The strategic direction set out by Cabinet included immediate priorities, such as setting more ambitious domestic targets for emissions reductions through energy efficiency, renewables and transport changes. Cabinet acknowledged that increasingly, mandatory action would be needed. In developing formal policy, state-led regulation would need to play a key role, complemented by getting the economic incentive structure right. The South African Government (as it was then) indicated that it sought long-term change to making a major transition from an energy-intensive to a low-carbon economy. Together, the implementation of the strategic options outlined in the LTMS was designed to enable South Africa to turn climate change mitigation into a ‘pro-growth, pro-job and pro-development strategy’ for the future (Raubenheimer, 2011: Annexure 10). It was an optimistic, forward-looking position.

This Cabinet decision represented a decision by government at the highest level. However, political change was on the horizon, and shortly afterwards President Mbeki, who had led the cabinet at the time of the LTMS, was unseated by a populist movement within the ruling party and he gave way to a new president. At first it seemed that there would be policy continuity when the ruling party made a resolution on climate change at its policy conference in December 2007. That resolution resolved to ‘set a target for the reduction of greenhouse gas emissions as part of our responsibility to protect the environment and promote sustainable development, and to participate in sharing the burden with the global community under a common framework of action’ (African National Congress, 2007). This sense of continuity was confirmed in a restatement of the strategic direction at a second Climate Change Summit in March 2009, shortly prior to the April elections. ‘Government has agreed to a strategic policy framework for our emissions to peak between 2020 and 2025, and then stabilise for a decade, before declining in absolute terms towards mid-century’ (Motlanthe, 2009).
Overall, the LTMS represented a major stimulus for South Africa’s climate policy. The national Climate Change Summit in 2009 launched a process to implement the strategic direction, with policy interventions aimed at getting the right economic incentives, investment structures and the necessary legislative and regulatory frameworks (Motlanthe, 2009). But behind the scenes, the very people who were in the LTMS process were starting to pick away at the findings. Business was waking up to the full implications of a low-carbon future, and some elements did not like what they saw. NGOs were also divided. Many saw it as not enough or despised its inclusion of nuclear data. And those holding large coal interests were waking up to the fact that the PDD was foreseeing the end of coal – well before the last reserves were exhausted.

Joanne Yawitch (the Deputy Director-General in the DEAT who oversaw the LTMS) and Harald Winkler presented the LTMS outcomes internationally for the first time at a side event to COP6 14 in Poznan, December 2008. There was a largely positive reaction, including from negotiators from developed countries. Some started considering how such scenario work might be replicated in their own countries; people asked how much it had cost (it was cheap by today’s standards). The LTMS was starting to have some international visibility. It was getting airtime.

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*The top of Table Mountain at sunset, Cape Town, South Africa: Blanco.*

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6 The Conference of the Parties (COP) is the annual meeting of signatory nations to the UNFCCC.
Bali, Copenhagen and the pledge

The LTMS had, in part, been a preparation for the ‘post-2012’ negotiations; 2012 was to be the end of the first commitment period under the Kyoto Protocol. The COP in Montreal in 2005 had launched negotiations on a second commitment period; in Bali in 2007, it was agreed to also negotiate ‘long-term cooperative action’ to enhance implementation of the Convention. This was an attempt to include the United States of America (USA), and also at least some larger developing countries in some kind of ‘post-Kyoto’ regime to be agreed at COP 15 in 2009. Thus hopes were particularly high at COP 15 in Copenhagen that a new climate treaty would be agreed, which would include all the largest emitters for the first time. The hype was huge, as was the need for a deal. The science had firmed up, and the Bush years in the USA were mercifully at an end. But the desire was still for a ‘top-down’, legally binding allocation of responsibility. This meant an agreement by all nations to a dividing of the responsibility cake, and meant that a common position on equity would need to be taken.

With hindsight, we should have known that such an agreement was just simply impossible.

In the last few months of 2009, just before the conference, there was a spate of announcements. China, India, Brazil and others announced their numbers before South Africa did. We know that there had been a desperate rush to do so in Brazil. While thorough homework had been done through the LTMS process, the process of putting forward South Africa’s ‘commitment to act’ internationally had just not been done properly, and was equally rushed.

At the start of COP 15, on 6 December 2009, President Zuma announced South Africa’s mitigation action pledge, explicitly referring to the LTMS process and the PPD. This came as a surprise to many private sector actors, civil society players, and a few government officials too. Following the agreement among 29 world leaders reflected in the Copenhagen Accord, South Africa formally communicated these numbers, and the language of the PPD, to the UNFCCC in January 2010:

The commitment of South Africa to play its part to address climate change has already been reflected in President Zuma’s announcement made on the 6th of December 2009. South Africa has conducted an internationally reviewed study of its mitigation potential in the context of long-term mitigation scenarios, which has informed the nationally
appropriate mitigation action that may be taken. In accordance with the provisions of Article 12 paragraph 1(b) as well as Article 12 paragraph 4 and pursuant to the provisions of Article 4 paragraph 1 of the Convention, South Africa reiterates that it will take nationally appropriate mitigation action to enable a 34% deviation below the ‘Business As Usual’ emissions growth trajectory by 2020 and a 42% deviation below the ‘Business As Usual’ emissions growth trajectory by 2025. In accordance with Article 4.7 of the Convention, the extent to which this action will be implemented depends on the provision of financial resources, the transfer of technology and capacity building support by developed countries. Therefore, the above action requires the finalisation of an ambitious, fair, effective and binding multilateral agreement under the UNFCCC and its Kyoto Protocol at COP 16 and CMP 6 in Mexico to enable the delivery of this support. With financial, technology and capacity building support from the international community, this level of effort will enable South Africa’s greenhouse gas emissions to peak between 2020 and 2025, plateau for approximately a decade and decline in absolute terms thereafter.

(Department of Environmental Affairs, 2010)

Much has been written about Copenhagen, but we shall simply follow the South African story, rather than attempt yet another analysis of that conference. The Guardian said this at the time:

The UN climate summit reached a weak outline of a global agreement in Copenhagen tonight, falling far short of what Britain and many poor countries were seeking and leaving months of tough negotiations to come. After eight draft texts and all-day talks between 115 world leaders, it was left to Barack Obama and Wen Jiabao, the Chinese premier, to broker a political agreement. The so-called Copenhagen accord ‘recognises’ the scientific case for keeping temperature rises to no more than 2 °C but does not contain commitments to emissions reductions to achieve that goal. American officials spun the deal as a ‘meaningful agreement’, but even Obama said: ‘This progress is not enough.’
Two years after Copenhagen, and shortly before hosting COP 17 in Durban, South Africa adopted a national climate policy. PPD became the performance ‘benchmark against which the efficacy of mitigation actions will be measured’ (DEA, 2011b). It all seemed to be resolved. But many in business were furious that there had been no consultation with them before the presidential pledge in Copenhagen, and that they were now committed to numbers that, for many, were just scenarios. The numbers firmed up in the Department of Environmental Affairs (DEA, 2011), which set a ‘benchmark national GHG emissions trajectory range’. It added an upper and lower range to the PPD projections from LTMS and the Copenhagen commitment to act. Specific numbers are stated in the policy for ‘Business as Usual’ (BAU) for 2020 and 2025 (the two years specified in Copenhagen), a period during which emissions flatten out (2025–2035), and the decline from 2036 to 2050. The policy itself specified the key points that define the trajectory, with lower and upper limits for 2020 and 2025, and around a plateau from 2025 to 2035.

A definition of the trajectory with a more detailed derivation of these values was published during the consultations in the policy-making process (DEA, 2011). Then for some years nothing much happened, until once again the pressure mounted for a more comprehensive international agreement in the Paris COP of 2015.

After Copenhagen

So the LTMS had more or less become policy and an international commitment to boot, and here lay the rub for many in the fossil fuel sector: they had participated in a voluntary exploration of possible futures, only to find the government opting for the future that would hit them hardest. Given the lack of an ongoing policy process, the ambiguity of whether the LTMS was a policy prescriptive or simply policy relevant initiative was exacerbated. Prior to the Copenhagen COP, a participant described the LTMS as ‘just a study with some findings’. This neatly downplays the agreement by stakeholders at the end of the LTMS that the RBS scenario was probably the only robust one, given how the world would have to approach climate change! However, the transformation of the LTMS numbers into the Copenhagen numbers, with no process transparency, was reported as a ‘shock’ or surprise to almost all in the business sector. Business felt that, through this action, the government had reneged on its promise that the LTMS would not be policy prescriptive.
So had these interest holders really ‘bought into’ the study, as it appeared during their participation in the LTMS process? Who was betraying whom here? Had government messed up?

During 2015, concerned about the backlash against the PPD policy, MAPS commissioned Emily Tyler and Marta Torres to review the impact of the LTMS. They interviewed many of the participants in the original study.

On the one hand, some interviewees considered the consensus achieved ‘remarkable’, enabling a key group of strategic thinkers with deep sectoral knowledge to put aside their agendas to some extent and to look to what was most important for the country. Further, interviewees believed that government was capacitated and had gained confidence to follow policy trajectories; that the process had developed champions in other stakeholder institutions, and that it had developed a key group of thinkers who understood what was needed with regard to energy. On the other hand, interviewees asserted that the depth of participation and consensus achieved was perhaps not all that it had seemed initially, and recalled that there was never consensus around where South Africa (as a country) needed to go, and that there was a glossing over of this disjuncture in the final documentation in which some personal agendas were overly represented. An interviewee stated: ‘when it comes to the level of ambition this [where we need to go] requires, the costs, the actual steps, this is where we are not yet on the same page’. Government buy-in was uneven across departments, organised labour didn’t participate meaningfully, and buy-in to the results by some in civil society and the private sector decreased during the process. One interviewee reflected that, at the end, stakeholders remained fairly separate, with lack of clarity as to the next steps. Another suggested that supporting work, outside of the formal process, could have been done better to achieve conviction among those in the SBT.

OK, so the LTMS design and delivery was by no means perfect. This is clear when looking back. Today the modelling looks rather primitive. Stakeholders were dominated by certain players (the fossil industry representatives are important today, but must their views apply to 2030 and beyond?); a lot of technologies were not modelled; a lot of uncertainty was not resolved; a lot of data was not available. The work beyond 2030 was really just speculative. Many of the people who should have been there were not in the room. And finally, perhaps the overall ‘agenda’ was far too much about the climate problem and far too little about the development challenge.
The first and most apparent mistake made was not to follow up and keep going. With the participants fresh from the experience of the study, why not continue to more detailed, sectoral work? There was an expectation and a strong call from the SBT that there should be immediate work following on from the LTMS, consisting perhaps of ‘deep dives into the sectoral analysis’ and a political economy discussion. The formal recommendations called for the completion of a long-term climate policy for the country, on the basis of the parameters presented in the LTMS via a more formal policy process (Scenario Building Team, 2007). It is a pity that the government turned down this desire to go forward – now it appears to be a large opportunity lost.

Interviewees gave two main reasons for this lack of follow-up. The first was that DEAT/DEA officials were exhausted by the LTMS push, and there was a general lack of capacity within the department. There was also a change of staff and leadership, with key players involved in the LTMS moving out of the department or to different positions. The single-minded focus of the Executive, which had characterised the LTMS period, was absent. While appearing to accept the policy that developed out of the LTMS, other issues were distracting the Zuma government.

In this leadership vacuum, a pushback occurred to both the LTMS and its subsequent use in mitigation policy, led by business, predominantly Business Unity South Africa (BUSA), the Chemical and Allied Industries Association (CAIA) and Sasol (Marquard, 2013). An interviewee reflected that there was a time when one could hardly mention the LTMS, even within parts of DEA, due to lobbying by business. The pushback centred on the data issues in the LTMS analysis itself and also on the lack of updating of the LTMS, despite there being greater data availability.

With the fossil industry starting to attack a study in which it had participated, government resolve was bound to weaken. From 2008 to 2015 there has, essentially, been no implementation of climate policy, with perhaps the notable exception of the Renewable Energy Independent Power Producer Programme (REIPPPP). Interviewees suggested that a parallel and on-going policy process was required immediately after the LTMS to maintain the policy community that had been created and to move to the phase of policy formulation and, ultimately, implementation. ‘We needed to look more carefully at embedding the process, and what needed to be happening around it, there was no embedding of outcomes’, no thought given to ‘and then what?’ The ‘social capital’ built by the LTMS was not maintained, despite this needing constant replenishing; a shared vision and common agenda doesn’t last forever. That this didn’t occur ‘significantly constrained the impact/outcomes that LTMS could have had’ (Tyler & Torres-Gunfaus, 2015).
The LTMS is seen by many as environmental policy created by a small group of custodians for environment in government, and not as confronting the very politically charged broader policy focus within the departments of Trade and Industry, Mineral Resources and Energy on beneficiation, and energy intensive industry. Furthermore, ‘as the conversation has gone on we’ve lost the bigger picture. We haven’t drawn the links across government departments or even within the mitigation agenda’. Another interviewee stated that ‘the economic cluster departments are trailing behind DEA and do not buy into the mitigation agenda, feeling disempowered and helpless on the mitigation issue’. Government, indeed, seems to be all over the place on the issue of a low-carbon future. Certainly, had the LTMS been more rooted in economic policy, it could have been more politically powerful.

Political economy considerations are important in the challenge of transitioning to a low-carbon economy and society in South Africa. As one interviewee put it ‘... we still haven’t had a conversation around how difficult this [low carbon] transition will be. We have had 100 years of building up our fossil-fuel centred economy, and now we are asking to change it completely.’ The realism of this, particularly in the context of pursuing a climate mitigation agenda in a developing economy still dominated by a Minerals–Energy Complex (Tyler, 2010), is unclear. An Earthlife critique of the LTMS articulates this question succinctly: ‘The mere fact that the process took place in a political economy dominated by centralised, energy-intensive and dirty industries, is an achievement. But will decision makers on industrial and energy policy accept its implications?’ (Hallowes, 2008: 1). The outcomes of the LTMS imply significant losers in the shift from BAU trajectories to any of the mitigation trajectories, but didn’t explicitly engage with these.

Comments that related to the political economy were particularly significant. Some interviewees considered the LTMS to have had a strong ‘political component’, referring to the government and CEO ‘sherpas’ present. However, another cautioned that participation by itself was insufficient for implementation saying, ‘It is a mistake to fetishize participation without understanding power relations; where the authority lies, what can undermine implementation…. Political economy is a rather ugly thing.’ Another interviewee concurred and felt that the LTMS did not address the political economy issue head on. Interviewees gave some suggestions as to how the political economy aspect could have been approached differently. One said the outcomes of the LTMS should have impacted the incumbent powers, namely Cabinet, the ruling party, state administration and its machinery, businesses, investors and the National Treasury. Another noted that there should have been less time spent on the models and data, and more on the
political/legal and regulatory environment. Were it to have been driven out of an economic department, with champions in the political elite, would it perhaps have been easier to achieve deep buy-in? Or would the questions of who bore the costs inherent in the policy formulation and implementation stages have surfaced with the same level of intractability in any framing? Indeed, whether and how the issues of political economy are best addressed in an agenda-setting exercise, such as the LTMS, is unclear. Perhaps the LTMS was successful in enabling the progression to the next two stages of policy formulation and implementation because of how it framed the mitigation problem, particularly the way in which it clarified different stakeholders’ interests (Marquard and Godino, 2013). Or perhaps the slow progress towards implementation may have the LTMS framing as an underlying cause.

Perhaps it’s all best summed up by one of the interviewees: ‘Dreaming about beautiful plans that will be implemented can only happen in a few countries, those with mature democracies, and that are well organized and well-resourced’ (Tyler & Torres-Gunfaus, 2015).

What was the contribution of the LTMS process to South African climate mitigation policy?

A theory of change emerges

The successes and failures of the LTMS as a trigger for an ambitious low-carbon plan merits even more study. What could have been done differently to tackle the ‘super-wicked problem’ more head on? This is certainly a worthwhile question. But for now we leave the impact of the LTMS on South Africa behind in our story and consider its impact on our thinking as a team in MAPS. The LTMS experience helped us to consider how change, in the context of the two super-wicked problems we have described above, takes place, or does not take place. Even if the LTMS could have shown South Africa that a low-carbon future was possible, was not likely to cripple the economy and could lift people out of poverty, it still may have been trumped by entrenched short-term fossil-fuel interests or the deals of corrupt political players. Even as it showed that a deeply decarbonised society was yet to be understood and imagined, and even though it changed the thinking of those who participated in it, the LTMS was still just a first step. Climate mitigation has been on the country’s agenda ever since.
Into the water, Durban, South Africa: Blanco.

So we ask the question: what does it take to get a country, or any other ‘system’ (city, state or company), to truly embrace a rapid, scalable commitment to build a low-carbon economy? What does it take for decision-makers to lock tight a course of action that is robust against the lobbying of interest holders and ever-changing political realities? How can that course of action deliver on other pressing needs – poverty eradication, energy, education, housing and growth? Since the LTMS there have been many studies into low-carbon, green growth, or any number of names for the same thing. But global emissions continue to rise. So what does it really take? Is there some theory of change for this overly sticky problem?

When the LTMS was done and dusted, Harald Winkler became a professor at the University of Cape Town. Stefan Raubenheimer continued to do some work at SouthSouthNorth, combining climate change and process facilitation in a number of projects. Both now had grey hair and had learnt a lot from running a gruelling project. For them, a theory of change was gradually emerging, but was still annoyingly distant. A strong and continuous mandate from government at all levels was the first key. The second was to face up fully to the holders of interests in both the fossil-fuel sectors and the low-carbon economy. This would require facilitating a robust process of contestation. Finally data generated and used in this process should be rooted in the development realities of the country. Much, much more knowledge was needed,
particularly about where the money lay: knowledge about how the fossil resources could play a constructive role in the transition; knowledge on how to beat poverty and inequality while stripping carbon out of the economy; knowledge about how one could actually get to the zero carbon future, and when that would be remotely possible.

Ultimately, there seemed at least to be three elements that needed to be welded together: a constant mandate, which in effect institutionalised the effort in a constant iteration between understanding and action; the participation of the right people in the political economy; and constant learning and knowledge production. The challenge of achieving full climate-compatible development is constant, and no-one, not one country, not one enterprise, has actually got this fully sorted. And so it is with ‘super-wicked’ problems: they are just never sorted.

Some time after the LTMS dust had settled and careers were on new pathways, a group of us were in conversation with Kuben Naidoo, who worked on the National Planning Commission in South Africa. He said: ‘You climate people have still failed to make the case for change. You have not been able to find the combination where both problems are solved as one: poverty and climate mitigation. Until you successfully make the case for that, you will not move decision makers.’

Poverty and climate change are indeed the two defining challenges of our times. Kuben is right. He sets a huge challenge, though: the multiple objectives enshrined in national development processes and international Sustainable Development Goals range across energy access, education, health, reduction of inequality and poverty, and more. Poverty isn’t a simple nut to crack. On top of this, we now have unequivocal scientific consensus that the global economy will have to reach net zero GHG emissions some time in the early part of the second half of this century (Rogelj, Schaeffer & Hare, 2015). The coal players who dominated the LTMS will have to be just a memory by then. They will have to have moved on to other, better, cleaner industries, and their precious coal will have to be left in the ground.
An idea

In October 2010, after some two years of cooling off from the LTMS effort, Stefan Raubenheimer and Harald Winkler had lunch with Kate Hampton, who had recently been appointed as head of the Climate Desk with the Children’s Investment Fund Foundation (CIFF), based in London. Kate was tasked with identifying some good projects for CIFF, and she had an interest in what had happened in South Africa.

CIFF is an interesting philanthropic institution with the following mission statement:

We work with a wide range of partners seeking to transform the lives of poor and vulnerable children in developing countries. This involves supporting bold ideas to seemingly intractable challenges for children. We know that the returns on smart investments in children’s early development are very high. So we aim to play a catalytic role as a funder and influencer to deliver urgent and lasting change at scale.... We place significant emphasis on quality data and evidence. For most of our grants, we work with partners to measure and evaluate progress to achieve large scale and sustainable impact. We are committed to sharing as much information as possible about what our partners and we are learning. Contributing to the global knowledge bank will help all of us speed up the transformational change required so that every child survives and thrives.

(Children’s Investment Fund Foundation, 2015)
Their view on climate change is as follows:

Climate change poses the single biggest threat to the future health and livelihood of today’s children. Children living in poverty in developing countries are particularly vulnerable to the impacts of climate change, such as increased incidences of vector borne diseases, droughts, floods and food insecurity. To protect and secure a healthy and sustainable future for children, we support the urgent global transition to a low carbon economy. Providing a climate-safe future promises multiple benefits today such as cleaner air, energy security and better jobs, along with smart stewardship of the planet’s resources for future generations. The best science tells us that climate security requires zero net greenhouse gas emissions by 2050. Consequently, we are not targeting incremental improvements but transformational change at a systems level in energy, urban design and land use. We use a sound evidence base to show that ambitious climate action is economically and politically feasible and desirable. We have a high appetite for risk in our grant-making where there is an opportunity for transformational change.

(Children’s Investment Fund Foundation, 2015)

Kate suggested that CIFF would be interested in extending the ideas of the LTMS to other countries. The idea was to share the LTMS experience with other developing countries. What was clear was that all three of us thought that this was a good idea, and Kate indicated that CIFF would fund a feasibility study and interactions with a number of countries to ascertain whether there was appetite to conduct processes inspired by the LTMS, and also to do so in a collaborative approach.

Stefan and Harald mulled over a strategy to do this. It needed to be a new initiative, not just a replication of LTMS. This was no time for ‘cookie-cutter’ thinking.

A new initiative needed a new name. ‘Mitigation’ and ‘Scenarios’ were clearly part of the idea. In a post-Copenhagen world, where the developing countries were acting on climate change and not sitting back waiting for the North to act, the word ‘action’ seemed appropriate. And our thinking was that the work had to be impact driven, so the objective was to result in plans, or Action Plans. So the nickname MAPS was born. We liked it. We all like maps, and they are, after all, especially useful!
Reconnaissance

The scoping phase of MAPS lasted just under a year and, in that time, Harald and Stefan with support from Michelle du Toit, reached out to some 20 countries. The idea was to approach contacts (gained through years of involvement in the international climate negotiations) and ask for their help and intercession to approach their governments and see if there was enthusiasm to conduct a project to develop mitigation scenarios.

In the East, MAPS approached China and India. Both countries formed part of the BASIC group (Brazil, China, India and South Africa), which played an influential role in the Copenhagen summit in 2009. From the perspective of emissions mitigation, there was a great deal of interest in these two countries. Absolute annual emissions in China were already rising rapidly, and this was before it became the largest cumulative emitter. Even though both countries have large populations, it also remained clear that they both had low emissions per capita in comparison to industrialised countries – India in particular. India showed some sensitivity to being lumped with China, due to significant differences, but even India’s emissions were growing larger every year. Both countries had started late with their industrialisation, compared to developed countries. China’s massive growth, with annual GDP growth rates around 10 per cent, made it the ‘factory of the world’ – also raising issues of the calculation of emissions associated with consumption, as distinct from emissions from production. India’s growth was slightly lower, but also rapid. Prior to Copenhagen, both countries announced mitigation actions framed as reductions in the carbon intensity of GDP – lowering intensity by 20–25 per cent from 2005 levels by 2020 in the case of India, and 40–45 per cent for China. Given that the (in)famous Box 13.7 in the IPCC’s AR4 implicitly required 15–30 per cent relative reductions from developing countries (in addition to drastic cuts by developed countries), these numbers seemed a good start (Gupta et al., 2007; Den Elzen & Höhne, 2008). China had included energy intensity goals in its eleventh five-year plan (2006–2010), which after Copenhagen were expressed in carbon intensity in the twelfth five-year plan guidelines. China’s communication to the UNFCCC in January 2010 – in accordance with the political agreement in Copenhagen – also included an increase in the share of non-fossil fuels in primary energy consumption to around 15 per cent by 2020 and increased forest coverage by 40 million hectares. India announced a National Action Plan on Climate Change, including eight ‘missions’. For example, the solar mission aims at 20 000 MW by 2020, and 100 000 MW by 2030 (Prime Minister’s Council on Climate Change, 2009).
As it turned out, a new initiative like MAPS was of no direct interest to China, which already had a substantial internal team working on mitigation efforts. In India, there was a lot of interest from some players, but the politics in India at that time was complex, and a loose agreement to collaborate was all that could be achieved. That collaboration has remained strong throughout subsequent years. Indonesia, Malaysia, the Philippines and Nepal did not respond to the approach by MAPS, although later there was interest in a process-driven approach in Nepal and some interest from Indonesia around forestry-related issues. In Africa, there was strong interest in MAPS from Botswana, Zambia, Nigeria, Ghana and others, but the time it took to get the issues in front of ministers was too great, and as it turned out, others were quicker to come forward.

So it was that in Latin America, the ministers of Environment of Brazil, Chile, Peru and Colombia all issued letters of commitment and support for the idea of developing mitigation scenarios. Their responses were put to the board at CIFF, and a decision followed to abandon further approaches to other countries and focus instead on the Latin American region, particularly on these four key countries.

Stefan and Harald did not know it at the time, but they were to fly ‘across the pond’, as the pilots of South African Airways are fond of referring to the Atlantic, more than they could ever have imagined and were destined to make scores of presentations, help build remarkable country teams, develop deep friendships and get to know cities they had never visited before.

The second phase of learning for the MAPS project was just starting.

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Superpowers and other outsiders have fought over us for centuries in ways that have nothing to do with our problems. In reality we are all alone.

Gabriel García Márquez
So why was it that Brazil, Chile, Colombia and Peru took up the idea to conduct Mitigation, Action Plans and Scenarios (MAPS) processes in their countries? Why had climate change become important for them?

To understand this, it is worth taking a moment to look at some of the characteristics of each of these countries, taking a snapshot of the countries as they were in 2010. We ask: what is notable about the political economy and the history of these countries? What forces might influence their attitude and approach to the climate and development problem? Our chapter is just a brushstroke or two, roughly painting the many complexities of each of these fascinating countries, but we hope it gives some impression of what was real and present for them, back in 2010, when the MAPS idea was hatched.
Brazil in 2010: A new world player

Brazil, Brazil. We think of its gorgeous beaches, its famous sugarloaf, those chilled sucos and the warm water. Football and Carnival. Of course, we know Brazilians are the world’s best party animals, but Brazil is not all beauty, fun and games. It is a complicated social, economic and political giant. Brazil is also a vast and mega-biodiverse country. It has a multiracial melting pot population of 190+ million inhabitants, concentrated mostly in cities by the coast, especially in the south-east. Its economy is based mainly in agribusiness commodities, oil products and mineral exports, steel and automotive industries, and production of consumer goods for the internal market, therefore ranking among the 10 biggest economies in the world. Brazil is a giant in many ways.

Beyond all this greatness, the country has its share of regional inequalities on socioeconomic development, besides the disparities between the urban and rural population, black and white citizens, and slums and structured city areas. Consequentially, public administration faces great challenges on the implementation of projects to develop the country and provide public services with the necessary standards, on overcoming the so-called ‘Brazil Cost’ and the impunity of corruption and organised crime. Not all is fun in Brazil.

Despite the difficulties, Brazil’s trajectory is undeniably positive since the monetary stabilisation in the beginning of the 1990s. There was a notable enhancement on the quality of life of the population, especially from lower income classes, due to the increase of minimum wages and income transfer programmes, allowing for an economic stimulus of internal demand. Political advances, such as the creation of the Transparency Law demanding the publication of public spending, a dramatic reduction on deforestation and the collaborative writing of the Internet Civil Act, are only a few examples of the country prevailing over its problems as a young democracy. Impressive things have happened in Brazil.

Until the beginning of the twentieth century, the Brazilian economy was characterised by a succession of economic cycles, each of them based on the exploitation of a single export commodity. First of these was based on timber; sugarcane became the mainstay in the sixteenth and seventeenth centuries; precious metals and gems in the eighteenth century; and finally, coffee in the nineteenth century. A large number of slaves were shipped in from Africa to provide the labour used for production. This would continue until late into the nineteenth century. As the
country developed, small-scale agriculture and cattle raising were the mainstays for local consumption (Embassy of Brazil in Wellington, n.d.).

Brazil experienced a long cycle of import substitution after World War II, growing to become a true world economy, and one of the biggest. Its economy was built on steel, oil, hydropower and motor vehicle manufacture, and finally on capital goods.

Following World War II, Brazil experienced high growth rates averaging 7.4 per cent until the mid-1970s (Embassy of Brazil in Wellington, n.d.). During the 1970s, huge capital inflows were directed to infrastructure investments and large state enterprises were formed. Brazil was becoming an economic giant. Brazil’s Gross Domestic Product (GDP) increased rapidly through to 1980, despite the impact of the 1970’s world oil crisis. Per capita income rose fourfold during the decade, reaching US$2,200 in 1980 (Embassy of Brazil in Wellington, n.d.). Early in the 1980s, however, substantial increases in interest rates around the world forced Brazil (and other Latin American countries) to implement strict economic adjustments that led to negative growth rates. Capital flows slowed, stringent monetary measures were implemented and price freezes followed. There was hyperinflation. For a while Brazil was in trouble. This difficult period was finally ended in 1994 with the Real Plan, after which was to follow a long, virtuous cycle of growth and redistribution. On the one hand, while the 1980s crisis signalled the exhaustion of Brazil’s ‘import substitution’ model, it also contributed to the opening up of the country’s economy. Brazil was now emerging into the globalised world (Embassy of Brazil in Wellington, n.d.).

The Luiz Inácio Lula da Silva presidency brought a celebrated improvement in the social picture, with the implementation of a minimum wage above the inflation rate and social transfers to the poor through the so-called Bolsa Familia project (Watts, 2013). Brazil became a leader in redistribution. As poverty reduced, increased domestic consumption powered growth forward. This occurred within a favourable international context of high demand in China for Brazilian outputs, all this constantly adding to the growth cycle. A new middle-class was emerging, and was increasing the domestic market. This was, in fact, the central rationale behind the Lula’s Workers Party. Its political manifesto was to create a massive domestic market and it pretty much achieved this objective. In the period 2003–2013, some 26 million people were lifted out of poverty.
But by the end of the first decade of the century, external and internal difficulties started to arise. First there was the 2008 financial crisis, and second, the slowing of demand from China. With the fall of commodity prices, Brazil started to exhaust the possibility of going on the same trajectory of economic growth and consumption. By 2010 the cracks were there; by 2015 growth had slowed down to a trickle. After the surge of internal consumption, investment in infrastructure and the improvement of public services was now badly needed. Brazil was, in fact, the symmetrical opposite of China in 2010: China was fostering savings and increasing investment on the supply side. Brazil, in contrast, now had a huge infrastructure deficit, and so at this point the challenge became anchoring the cycle of economic growth on investment, both from foreign and domestic sources.

The challenge of course is to make this investment low carbon, and since a significant portion will be in energy production, the energy challenge becomes central.

Meanwhile, the problem of Brazil’s emissions was being taken seriously. Until the end of the 1990s, Brazil’s forest police had been struggling to enforce laws and regulations that forbade deforestation of more than 20 per cent of total surface of privately owned land in the Amazon. Government efforts towards this goal had limited effectiveness due to powerful driving forces of the deforestation process in the Amazon. Greenhouse gas (GHG) emissions from land use had been the main source of emissions in Brazil.

If we look a bit closer at the overall split of Brazil’s emissions, we see what makes Brazil different:

Figure 3.1: Brazilian emissions by source, 1990–2010. Source: MCTI, 2015.
The main source of GHG emissions in Brazil has been deforestation caused by the expansion of agricultural frontiers, mainly in the Amazon region; but this is dropping as Brazil slowly wins the battle against deforestation. Good estimates of deforested land surface are available from satellite image recovery, and management of the problem is now world-class.

Agriculture and husbandry are key sectors of the Brazilian economy, which explains why they rank second as one of the main GHG emission sources. Because of the country’s vast agricultural and grazing lands, it is one of the largest agricultural producers in the world and ranks second in soybean production, accounting for 18 per cent of the global total. It also has the second largest bovine herd in the world, with 12 per cent of the global total, a staggering 186 million cows (FAO, 2005). In this sector, methane emissions are dominant, as a result of the phenomenon of enteric fermentation of ruminant herbivores, which includes this huge cattle herd.

The energy sector comes in the third position as a GHG emitter, thanks to the role played by hydropower and renewable biomass (ethanol from sugar cane, wood and charcoal from forest plantations and biodiesel from vegetable oils cultivation) allowing for a 45 per cent share of renewables in the country’s total energy supply. Contrast this with South Africa, where the overwhelming portion of the emissions comes from coal-fired electricity.

Brazil is already a relatively low-carbon society, especially if one takes the Amazon out of the mix, but on top of this, it has already been making a lot of effort to limit its GHG emissions. This includes important investments in renewables. The main contribution to curb the country’s GHG emissions will still come from the efforts to reduce deforestation in the Amazon, following the successful record of recent years (Union of Concerned Scientists, 2011).

For its Copenhagen voluntary goals, a reduction in between 36.1 and 38.9 per cent of the country’s GHG emissions, projected to 2020, was pledged (UNFCCC, 2011). On 9 December 2010, during the COP 16, the Brazilian Government published a decree (Federal Decree 7390) regulating the articles of Law 12187 regarding the final figures of the voluntary goals for the amount of reduced GHG emissions in 2020 (Presidência da República do Brasil, 2010).
The goal set for the agricultural sector was very ambitious, considering the recent growth of the country’s grains and meat exports. However, economically feasible mitigation alternatives already existed and had great potential: recovery of degraded pasture land, agroforestry schemes, more intensive cattle-raising activities, biological nitrogen fixation and low-tillage techniques, covering more than 20 million hectares in the country, and rapidly spreading.

The case of the energy sector deserves special attention. The emissions due to the use of fossil energy have been increasing significantly in the country in the form of oil products, natural gas and coal. These fuels play a basic role in running the modern part of the Brazilian economy, such as industry and transports, as well as agribusiness and the residential, commercial and service sectors. Its share in power generation has also been increasing, starting from a low departure level, to complement the use of the huge Brazilian hydropower potential, which is by far the dominant energy source for generating electricity in the country. Thus, the emission of GHG due to the use of energy, especially the carbon dioxide (CO₂) resulting from burning fossil fuels, showed a high growth rate in the period between 1990 and 2005, reaching in 2005 a level 68 per cent higher than in 1990. Indeed, economic growth, the rising urbanisation and the dominance of road transportation in the country were the driving forces behind increasing fossil energy consumption and the associated CO₂ emissions. As the Amazon problem was being solved, so the fossil-energy problem was growing. The need to reverse this fossil growth will be even more acute in the future, as fossil fuels will become the most important source of GHG emissions in Brazil, as seen elsewhere in the industrialised world. After 2020, Brazil will be in a situation more similar to other industrialised countries, faced with a new challenge of economic development with low GHG, energy-related emissions. If no additional mitigation policies and measures are implemented, GHG emissions will start to increase again in the period 2020–2030, due to population and economic growth, which will drive energy demand, supply and GHG emissions. In order to avoid this, the portfolio of additional mitigation actions would have to be substantially extended.

So, in 2010, Brazil was still moving forward, but not with the same energy as before: the economy was slowing as the supercycle in commodities slowed. Since 2010, the clouds just seem to get darker: deforestation is increasing again; the worst drought on record threatens energy and water supplies; and more recently, the huge scandal in Petrobras has brought millions of people to the streets. The oil price dropped and rattled the economy further. Dilma Rousseff won a second term in 2014, but not without difficulty. And her second-term challenges just keep getting bigger. Climate change is edging lower on a long list of problems going bad.
In fact, as we shall see in Chapter 4, this decline in fortunes and the preoccupation with development challenges has made it especially difficult to bring the problem of mitigation to the fore again. In the months before Copenhagen, Brazil rose to the challenge, but in the period 2010–2015, the Rousseff government was looking toward other, more immediate, distractions. What MAPS was proposing came at a bad time for Brazil.

Chile in 2010: Heading for developed status

We turn now to Chile, the ‘land where the earth ends’. The uniquely long, thin country fills a narrow 4,506 kilometre (2,880 mile) strip between the Andes and the Pacific Ocean. The towering ranges of the Andes cover one-third of Chile. In the north is the driest place on Earth, the Atacama Desert, and in the centre is a 1,127-kilometre-long (700 mile long), densely populated valley containing most of Chile’s arable land. At the southern tip of Chile’s mainland is Punta Arenas, the southern-most city in the world, and beyond this lies the Strait of Magellan and Tierra del Fuego, an island divided between Chile and Argentina. The country is astonishingly diverse and hauntingly beautiful. It is surrounded on three sides by virtually impassable barriers and remained largely unknown to the outside world until the middle of the fifteenth century, when the Incas succeeded in crossing the 965 kilometre long string of salt basins that are the Atacama Desert, moving across a desert that is so dry that some parts have never been rained upon. Once over the desert, the Incas encountered the Mapuche, one of the three Araucanian people who occupied the region.

The Mapuches were a tough lot and stopped the advance of the Incas after a while. The Incas established a stable presence in the territory they had gained, but they did not see fit to pursue the Mapuche any further. It was peaceful, relatively speaking, until the Spanish arrived.

In 1541, a Spaniard named Pedro de Valdivia crossed into the central valley, and founded Santiago, and soon afterward crossed into Mapuche domains and established strongholds there. He didn’t last long: in 1553, with brutality matching Spanish attitudes to indigenous people, the Mapuche tied him to a tree and beheaded him. Santiago was burnt, almost to the ground, but the Spanish hung on.
For the next 400 years, the Spanish maintained a massive defensive presence in the central valley. Gradually, a Chilean creole class emerged, which sowed the first seeds of the fight for independence from Spain. On 18 September 1810, at a town meeting in Santiago, Chile took a tentative step towards independence when a group of locally elected leaders replaced the governor appointed by the Spanish.

Thus ended Chile’s colonial period. The next 100 years was an up and down affair for the country as it struggled through various economic crises. World War II came as a godsend to a flailing economy as the demand for copper blossomed, and Chile certainly had some of the mineral to offer. But Chile was divided, fragile and fractious. And soon things were to get worse.

In 1970, a Marxist government, under Dr Salvador Allende, came to power, having responded to the perceived failure of the established liberal party and demands from the electorate. Allende’s attempts to radically change the structure and direction of the country brought about a second political crisis: in 1973, a right-wing dictatorship, under General Augusto Pinochet, seized power with the assistance of the United States Central Intelligence Agency. Recent investigations confirm that Allende committed suicide in the coup, and this loss helped Pinochet’s dictatorship to maintain power for the next decade-and-a-half – frequently resorting to terror in order to stifle discontent. Chile had entered its darkest hours.

In 1990, having failed in his bid to gain popular ratification for his rule, Pinochet handed over the presidency to the rightfully elected Patricio Aylwin. Chile’s political climate has since remained stable. Over the next two decades, the centre-left managed to win four consecutive terms at the polls. Two important political events took place in these 20 years. In 2005, Chile carried out constitutional reforms, and in 2006, Socialist Party leader Michelle Bachelet, a Concertación nominee, won the presidential elections to become Chile’s first woman president. Bachelet governed until early 2010, when the centre-right Coalition for Change’s Sebastián Piñera, a well-known businessman, was elected president.

One of the important legacies of the Pinochet era was its pro-market agenda. The dictator started reforming the economy and gradually pushed Chile toward a free-market system. The four democratically elected presidents of the Concertación coalition kept this approach alive and continued privatisation: Chile is now remarkably privatised compared to other developing economies. The country is now ranked among the 40 most developed countries, its economy is robust, healthcare has improved, life expectancy is up and poverty has been halved. Tensions remain,
and inequality is its main problem, but Chile is on its way to becoming a fully developed country.

In the last two decades, the Chilean economy has seen solid progress, thanks to strong institutions and a stable democracy. Poverty has declined continuously and the quality of life has improved. The proportion of the population considered poor fell from 23 per cent in 2000 to 9.9 per cent in 2011. In addition, between 2003 and 2011, the average of the poorest 40 per cent income grew by 4.3 per cent, considerably higher than the average growth of the total population (2.5 per cent) (World Bank, 2015).

Currently, the global crisis has affected the rapid growth in Chile and, since 2013, a gradual slowdown in economic activity is observed. GDP growth fell to 2.2 per cent in the first half of 2014, affected by a decline in the mining sector due to the end of the investment cycle and falling copper prices. Unemployment rose from 5.7 per cent in November 2013 to 6.5 per cent in June 2014. The tax reform approved in September 2014 aimed to increase tax revenue by 3 per cent of GDP to finance spending on additional education, and to reduce the tax gap. In this context, it was expected that economic growth would recover in 2015 (World Bank, 2015).
However, there are still challenges for Chile to continue its development process in a more equitable and inclusive manner. The per capita income (US$21,990 in 2012) still ranks well below the Organisation of Economic Cooperation and Development (OECD) average (US$30,036 in 2012) and the main challenge is productivity. Chile must also improve access to and quality of social services (OECD, 2015). Finally, the energy challenge and dependence on copper exports remain a source of concern.

New opportunities lurk in the wings: Bolivia, Chile and Argentina are the only potential sources that can feed the fast-growing global market for lithium. Bolivia has the largest lithium reserves, with estimates of more than half of the global total, but the country produces very little of the metal (Achtenberg, 2014).

Another interesting factor is how private-sector players drive Chile and, hence, how influential the elites are, and this affects its approach to decision-making. From its birth as an independent country – back in the early 1800s – Chile has been quite a vertical society, with elite groups dominating decision-making.

This vertical characteristic and lack of wide civil society participation was counteracted by a long tradition of democratic governments, which by the late 1960s and early 1970s had given the country an apparent plural tradition of active civil society participation and open policy dialogue and discussion. This increasing trend was, however, dramatically interrupted by Pinochet’s military coup. The 17-year military dictatorship had a number of implications on civil society and on the way public issues are addressed. It is probably fair to say that after the Allende’s socialist government, and then with the dictatorship among other effects, a kind of ‘trauma’ was installed in the general public against the possibility of (central) planning. The mantra that started to operate in the late 1970s and early 1980s was to leave almost all public issues (economic, social and environmental) to the ‘invisible hand’ of the market. The room for public participation under this context was, beyond doubt, almost non-existent.

An avenue to public participation opened up in the late 1980s and early 1990s by the return to democracy (1990) and the emergence of environmental issues. To some extent, this movement was driven by international companies bringing in their home standards. For example, mining companies were the first to submit environmental impact studies to the Ministry of Mining at a time where the country did not have environmental regulations (CIPMA, IDRI & MPRI, 2002). International organisations, such as the World Bank (IFC), and international standard initiatives (such as the Equator Principles) also contributed to installing environmental and social issues in the national agenda.
At a domestic level, there are some relevant tipping points. The massive die-off of black-necked swans in Chile’s south in the mid-1990s, due to the operation of a pulp mill project, initiated Chile’s first significant environmental conflict, which witnessed massive involvement from civil society. By then it was clear that early, informed and organised avenues for public participation were an imperative for the country, in order to prevent and resolve conflicts.

Eventually, in the early 1990s, an environmental framework law – including explicit instances for public participation – was debated and then enacted. As a result of the enactment of the law (1994), public participation was formalised, at least for the environmental impact assessment of new development projects. Although the implementation of the law represented a significant improvement compared to the previous situation, a number of weaknesses, particularly in terms of public participation, were soon identified (Sepúlveda, Sabatini & Blanco, 2000). These pitfalls in the law have to do with issues such as the very scope of participation, timing, procedures and methodologies. As argued by Sepúlveda, most of the environmental conflicts of the 1990s (and indeed up to now) have to do with the prevalent citizen perception that development projects are defined according to technical and economic criteria, without proper consideration of social and environmental issues. Related to this, there is a lack of long-term participatory planning on strategic issues such as water, energy and transportation, which makes things worse.
In the late 2000s and early 2010s, some initiatives that look into the longer term, through a sustainability perspective, started to occur (examples include ‘Escenarios Energéticos’, funded by AVINA). For the first time these initiatives – mostly led by non-governmental organisations (NGOs) – involved organised (sometimes facilitated), multi-stakeholder, participatory processes.

Facilitation, and particularly professional facilitation of multi-stakeholder processes, is hence something quite new in the country. Indeed, there is hardly any formal training programme on participatory processes design and professional facilitation in Chile. These realities were going to have a large impact on the MAPS idea.

But these issues of verticality and elites in Chile are made more difficult by the country’s dependency on one particular resource: copper. Chile’s position as the world’s top producer of copper (over 35 per cent) is not under threat, but the country faces the challenge of transforming its copper mining industry into social capital for the long term, and addressing high-energy costs, which have grown hugely over the last decade. Copper accounts for more than 45 per cent of the country’s exports (Instituto Nacional de Estadística e Informática [INEI], 2015) and provides one-third of government revenue. So it is pretty crucial to the economy. Chile’s copper reserves should last another 80 more years, but the deposits are slowly being exhausted. There are plans to inject billions of dollars into the industry in the period 2013–2020, mainly to increase production and improve copper grades. North of the Chilean border, the world’s second largest producer, Peru, is planning to double its 2012 production by 2016. So competition is on the rise. But the real challenge is internal: copper is an energy-intensive business, so energy is a key issue. So is water. And hence, so is climate change.

Chile’s contribution to global emissions is minuscule: the country emits less than 0.2 per cent of world emissions. In 2010, the balance of GHG emissions\(^1\) and removals in Chile amounted to 41 698 Gg CO\(_2\)-eq, while total GHG emissions\(^2\) in the country amounted to 91 575 Gg CO\(_2\)-eq, the latter representing an increase of 83.5 per cent between 1990 and 2010. The key drivers of this trend were the energy and the land use, land use change and forestry sectors (Ministry of Environment of Chile, 2014). But these GHG emissions increased massively over the 20 years to 2010, bringing

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1 The term ‘balance of GHG emissions’ refers to the sum of emissions and removals. This balance includes the forestry sector, known as land use, land use change and forestry (LULUCF).
2 The term ‘total GHG emissions’ refers only to the sum of emissions, and excludes the forestry sector.
emissions and growth into lockstep: the transport sector (30 per cent), industrial and mining (18 per cent) and electricity sector (40 per cent) accounted for 90 per cent of emissions due to fuel consumption in the country. The industrial and mining sectors have increased their consumption by 1.5 times, transport by 2.2 times and the electricity sector by 2.7 times since 1990 (Ministry of Environment of Chile, 2014). Development was coming at a cost to the environment, however small in global terms. We will return to these figures later in this book.

Figure 3.2: Chile’s NGHGI: GHG emissions and removals trend by sector, 1990–2010.
Colombia in 2010: Fast growth

When one mentions Colombia, most people think of conflict, or drugs and of that country’s tempestuous and difficult history. There was the Spanish era, and Colombia’s famous liberation from the Spanish in 1819 by Simón Bolívar, the country’s national hero. And yes, in more modern times, a newer, darker conflict has dominated Colombia. The origins of the conflict go back to the 1940s, when the relationship between the growing peasantry and labour movement and the two official parties, the Liberals and Conservatives, erupted into violence. A leader, Jorge Gaitán, who ran for the presidency, was assassinated just prior to the 1950 election. His killing sparked off a decade of bloodshed, known as ‘La Violencia’: some 200 000 deaths are recorded in this bloody chapter. ‘La Violencia’ gradually came to an end in the early 1960s, but the peasant movement was seen as an ongoing threat to the elites of the country. In May 1964, ‘Marquetalia’, one of the largest and most successful of these communities, was attacked by tens of thousands of Colombian soldiers, backed by US military advisers, in an effort to destroy it. Their leader, Manuel Marulanda, resisted the attack and so became the hero of what was to become the Revolutionary Armed Forces of Colombia (FARC), which announced itself as the liberator of Colombia. To this day the FARC still operates, and talks for peace are ongoing. In fact, our MAPS team had a brief discussion with Colombians in Lima at the COP in 2014, considering whether there was any way to build a green economy while, at the same time, positively adding to the peace process.

For nearly five decades there has been conflict between government forces and anti-government insurgent groups, principally the FARC, which was heavily funded by the drug trade. The conflict escalated during the 1990s. However, since 2002, when Álvaro Uribe won the presidential election, the government has managed a string of successes against the left-wing rebels, regaining control of much of the rebel-held territory and raising hopes that the conflict may be drawing to a close. On 28 May 2006, President Uribe was re-elected with 62 per cent of the vote. Economic growth and a reduction in paramilitary violence were believed to be responsible for his landslide re-election. More than 31 000 former paramilitaries demobilised by the end of 2006 and the United Self Defense Forces of Colombia ceased to function as a formal organisation.
However, the FARC devoted its efforts to making windfall profits from the trade in illegal drugs and it maintained territorial control in its traditional, mostly rural, areas of operation, which constitute at least 30 per cent of the national territory. The FARC is said to have used its huge revenues from drug trafficking to purchase a guerrilla arsenal. Colombia is still the world’s leading coca cultivator and supplier of refined cocaine.

On 7 August 2010, Juan Manuel Santos was sworn in as President of the Republic after two four-year periods under Álvaro Uribe. It seemed that Colombia was getting a grip on its problems. Its cities were now much safer, and its economy, well, it was roaring ahead.

Modern Colombia is way more than just the story of its conflicts. It’s a fascinating and elegant country, with extraordinary achievements. The country is the size of France, Germany and the UK combined and has a population of 47 million people. So it really has space! And that space is beautifully outlined: Colombia is the only country in South America to have coasts on both the Pacific and Atlantic oceans and it also reaches, in the extreme southeast of the country, the Amazon River. The Andes Mountains run north to south through the centre/west of the country, while the eastern half of the nation is split between flat plains and tropical jungle.
Colombia is remarkably rich in natural resources and exports fossils in the form of petroleum and coal. If you are looking for emeralds, over half of the world’s emeralds are Colombian; nickel, gold, copper, iron ore and natural gas are also present. This extensive endowment is an issue when we get to the question of emissions. Agriculture, in which over 25 per cent of the workforce is employed, is also crucial to the country’s economy. Agriculture and livestock/cattle ranching, of course, play a role in deforestation. Forests cover more than half of the territory. Conversion of forested pasture for livestock grazing continues to be one of the five primary drivers of deforestation, although the rate has fallen over the last decade. As we have seen already with Chile and Brazil, economic development and emissions issues walk hand in hand.

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Figure 3.3: Colombian growth stands out when compared to other countries in South America. Source: ANDI.

Over half of all exports have traditionally gone to the United States, which explains the huge role the US has played in Colombia’s history. China has recently replaced Venezuela as Colombia’s number two trading partner. Colombia has overtaken Peru as the fastest-growing of the larger Latin American economies (The Economist,
Colombia is now the third largest economy in Latin America, behind Brazil and Mexico. It is, indeed, a player.

As drugs and violence start to fade as dominant drivers, the tourist encouragement – ‘Colombia: the only risk is wanting to stay’ – had by 2010 become the new mantra for Colombia. The middle-class was on the rise, and Bogotá had become tres chic as a result.

The poverty rate keeps falling. There is an entrepreneurial spirit in Colombia today. It has a well-educated labour force and a strong business class, which is becoming more and more visible. Colombian growth stands out in South America: it has a relatively small but buoyant economy. GDP increased by 4.3 per cent per annum between 2000 and 2012, faster than in the OECD or the Latin American and Caribbean countries (OECD/ECLAC, 2014). But all this good news must not mask the fact that there is still poverty: the per capita income is less than one-third of the OECD average, mainly due to low labour productivity. While stagflation has left prices rising at between 6 and 7 per cent a year in Brazil, and hyperinflation of almost 70 per cent in neighbouring Venezuela has caused the cost of living to skyrocket, Colombia’s central bank has kept inflation – which currently stands at 3.8 per cent – close to its target of 3 per cent for more than half a decade (OECD/ECLAC, 2014).

Growing urbanisation poses major economic social and environmental challenges. The population is projected to grow at a relatively high but decreasing rate to 2020. It is a comparatively young population: half were under 26 years of age in 2010. The unemployment rate declined steadily to 11 per cent in 2012. On the side of inequality, Colombia is one of the world’s most unequal countries. The Gini coefficient in Colombia stands at 0.55, which is still high (World Bank, 2015).

On the political side, President Santos has pushed a foreign policy that is much more aligned with international and multilateral causes, with a very different perspective on bilateral relations, in particular with Venezuela, Ecuador and Brazil. He is close to world affairs and this includes climate change and other environmental challenges. Santos has set Colombia the goal of accessing the OECD, with a huge impact and target setting in the environmental and climate change area. For this purpose, President Santos reformulated the Ministry of Environment to include Sustainable Development. This ministry included, for the first time, a Climate Change Directorate (at the same level of other issues such as Water Resources, Forests and Biodiversity, Sectoral and Urban Affairs). Santos’s
National Development Plan (2010–2014) included, for the first time, a Climate Change Chapter with key policy guidelines, including the mandate to formulate a low-carbon development element. We will return to this in Chapter 4.

Colombia is considered to be the second most biodiverse country in the world and has a long tradition of developing policies and laws to protect its natural heritage. However, this heritage and the well-being of its people are under growing threats from extractive industries, livestock grazing, urbanisation and motorisation. Colombia’s vulnerability to environmental changes and the need to strengthen its environmental policies and institutions was underlined by floods and landslides related to the La Niña event in 2010–2011. Over four million people were affected, and the damage to infrastructure and agriculture caused losses of over US$7.8 billion (Hoyos et al., 2013). Colombia is vulnerable as climate change intensifies weather patterns. It is projected that its Caribbean region and part of the Andean region will shift from a semi-humid to semi-arid climate over the course of the century and impact on glaciers in the high Andean region will affect water supply.

So let’s now turn to emissions: according to the data of the first biennial update report (IDEAM, PNUD, MADS, DNP, CANCILLERÍA, 2015), which contains the most recent GHG inventory for Colombia, the country emitted about 224 Mt CO$_2$-eq in 2010. These emissions account for approximately 0.46 per cent of global emissions.

![Figure 3.4: Colombia’s projected GHG emissions per sector of the economy, 2010–2040 (excluding LULUCF sector). Source: MAPS reports.](image-url)
Annual emissions from deforestation were estimated at more than one-quarter of the total GHG emissions. Emissions intensity was slightly higher than the OECD average, mainly due to a high level of methane emissions from enteric fermentation and nitrous oxide emissions from the use of fertilisers. Agriculture accounted for 19 per cent of total emissions, which is very high compared to an average of 7 per cent in the OECD. In fact, agriculture was to become one of the difficult challenges for MAPS in Colombia (IDEAM, PNUD, MADS, DNP, CANCILLERÍA, 2015). Energy-related CO₂ emission intensities per capita and per unit of GDP were, in 2010, respectively, 86 per cent and 50 per cent – 2 per cent below the OECD average, reflecting the difference in income, as well as Colombia’s heavy reliance on hydropower (IDEAM, PNUD, MADS, DNP, CANCILLERÍA, 2015).

CO₂ emissions rose by 13 per cent between 2000 and 2011, driven by growing transport, oil and gas activities, as well as higher energy demand linked to the economic recovery. The national production of energy uses a lot of fossil fuels; however, Colombia exports almost the total production of coal and oil. Oil remains dominant in the energy mix at 41 per cent, with natural gas growing from a low base to 24 per cent in 2011. On average, Colombia has a relatively low-carbon electricity mix. Hydropower accounts for more than three-quarters of renewables-based electricity but remains under threat from water patterns, particularly related to the El Niño phenomenon (OECD/ECLAC, 2014).
As we can see from Figures 3.4 and 3.5, emissions are set to rise, in fact to nearly double by 2040. GHG emissions are in step with a fast-growing economy: this picture is of a growing peace and prosperity in Colombia, a deepening incorporation into the world economy, rapid growth and modernisation, but rising pressure on ecological resources, rising emissions and increasing climate vulnerability. Facing climate change had become central to Colombia in 2010.

Peru in 2010: Growing to new heights

Peru is one of the most biodiverse countries in the world with about 40 000 to 50 000 species of flora alone. It has the second most extensive Amazonian forest after Brazil (Ministerio del Ambiente del Perú, 2001), the highest tropical mountain range, 84 of the 104 life zones identified on the planet and 27 of the 32 climates in the world. Of the four most important food crops in the world, Peru has the highest genetic diversity of maize and potatoes. Peru is extraordinary. It is imbued with ancient history, but a look around modern Lima belies the cliché that Peru is all about crafts and high-mountain wonders. Peru is being noticed; it has stepped forward.

The first Peruvian people are believed to have settled in the area around 9000 BC. A long history followed of various indigenous and conquering people, and culminated in the fifteenth century with the emergence of the Incas. In the span of a century, the Inca civilisation formed the largest empire in pre-Columbian America, with their capital in Cusco. It is remarkable to realise that the Incas of Cusco controlled upwards of a third of South America, with a population of over 10 million under their rule. Peru was an empire.

All went well for the Inca until between 1524 and 1526 when the Incan ruler, his family and heir were all killed by smallpox introduced from Panama by the Spaniards. This resulted in the collapse of the Incan political structure. In 1532, a party of Spanish conquistadors, led by the notorious Francisco Pizarro, took advantage of this situation, staged a coup d’état and took over. For the Spanish, this battle with the Incas was the most important of their campaigns in Latin America, and culminated in a final series of conquests in the late sixteenth century. Thereafter Spain was in charge, and the indigenous population dramatically collapsed due to bloody repression, exploitation, economic change and disease. The Spaniards proceeded to exploit locals to extract gold and other resources, later adding African slaves to their labour pool. And they were brutal, by all accounts – the Inca Museum
in Cusco illustrates the horrors of this time. Christianity spread to South America with most people forcibly converted to Catholicism, and churches were built almost everywhere. Religion was just one ingredient in a toxic concoction of beheadings, exploitation and what must have been racism at its worst.

In the early nineteenth century, most of South America was being liberated by independence movements, some with wars attached. Spain was losing power in Europe, and the War of Independence in North America was influencing things down south. The time of the Spanish colonisation of Latin America was coming to an end. Peru was one of the last bastions for the Spanish royalty. Chile was liberated in 1810, and Peru followed some 10 years later.
Peru did quite well at first as an independent country, making good money from guano exports, of all things. This wasn’t such a renewable resource and, by the turn of the century, Peru was once again broke. Later it was also at war, this time with Colombia, Chile and Bolivia. Peace was declared between Peru and Chile only in 1883, and in 1929 there was an agreement over the territory occupied by Chile. So the early twentieth century was a troublesome time for Peru, stuck between marginal economic viability and constant spats with its neighbours, and things did not get easier.

The period after World War II was an equally up-and-down mix of complex politics and economic mismanagement. By the 1980s the economy had collapsed and Peru spiralled into chronic inflation; its GDP had dropped 20 per cent and social tensions were on the rise. This period saw the rebel movements take root, notably the infamous Shining Path – they began to cause havoc in the country. It was in this tough climate that Alberto Fujimori became president in 1990. The medicine he administered for Peru was bitter and most vulnerable people suffered under the attack of austerity. Cholera broke out all over the country. Fujimori’s remedy may have pulled up the economy but at huge social cost. The man himself became more authoritarian as time went by and, by the end of his term, human rights abuses were commonplace. In 2000 he went into self-imposed exile. His rule had been dark and strange.

Peru thankfully then entered a period of relative political stability, economic growth and poverty reduction. The governments of Valentín Paniagua (who governed for less than a year on an interim basis) and Alejandro Toledo brought Peru to a reformed, stable state by 2006. Alan García launched a political comeback and won the presidential race in 2006. By 2010 the economy was at last booming and poverty was almost half of what it had been in 2000. But behind this new sheen, the poor of Peru remained unhappy and social unrest was erupting constantly. Ollanta Humala, a left-wing leader, went on to win the presidency in 2011, but he had to forge alliances to gain his majority and so had to moderate his politics. The question of development approaches now drives deep social divisions in Peru. The left wing, making up Humala’s original support base, push for the nationalisation of strategic industries. But on the right wing, Peruvian business and a conservative, wealthy elite want a different future. On the part of labour and the poor, social unrest continues, especially over exploitation of natural resources in mining and threatened water resources. The practice of conflict resolution is slowly growing in Peru and now has government backing. Conflict is popular in Peru.
In 2002, during the process of transition and the consolidation of democracy, representatives of political forces in congress, civil society and the government entered into a dialogue known as ‘The National Agreement’ with the aim of creating a shared vision for the country and the politics of the state. The National Agreement stipulated the need for government to focus on goals and strategic planning, a national perspective and transparent procedures, optimising resources and reaching national goals of development, growth and adequate integration into the global economy. The policy concerning sustainable development and environmental management stipulates that the state should drive the application of tools for environmental management. Government should stimulate investment in the environment and in the transfer of cleaner and more competitive technologies for industry, mining, transport, sanitation and energy production, as well as the sustainable use of forestry resources, among others, and comply with international treaties on environmental management.

Moreover, the country has a National Planning Centre (CEPLAN) responsible for long-term and coordinated planning. Currently, CEPLAN heads the debate concerning the Strategic Plan for National Development for 2021.

At the same time, the country is in the process of decentralisation and reassigning responsibilities to sub-national/local governments. It is simultaneously modernising and improving the regulatory functions of central government. The aim of decentralisation is to achieve integrated and sustainable development by means of separating duties and responsibilities, and equalised exercise of power throughout the three tiers of government. In short, there is much reorganisation afoot in Peru.

What all this tells us is that the political history of ‘modern’ Peru is exceedingly short, perhaps only a few years of stable democracy, a relatively peaceful society and sustained economic stability. One can expect only fragility in so new and yet so old a country.

Since 2001, Peru’s economy has been strong with its growth due mostly to the export of natural resources. Mining is critical, and royalties have been used to generate wealth for distribution in social programmes. Still, 30.8 per cent of Peruvians are poor and struggling (INEI, 2015). Humala has promised to maintain free-market policies, while also working to narrow inequality. His declared goal is to cut Peru’s poverty by half by the end of his term in 2016. So far he has done well.

The economy of Peru is classified as upper-middle income by the World Bank.
and it is the 39th largest economy in the world. The GDP is made up of services, manufacturing and extractive industries. Peru’s main exports are copper, gold, zinc, textiles and fish products. Between 2001 and 2008, the growth rate was astonishing at about 8 per cent on average. This slowed as a result of the global financial crisis in 2008, but Peru maintained a positive outlook. US President Barack Obama called Peru an ‘extraordinary economic success story’. However, the problem in Peru remains one of inequality: the top 20 per cent of the population holds over half of the nation’s income, while the lowest 20 per cent earns less than 5 per cent (INEI, 2015). Social unrest has followed this disparity and the current government is rising to the challenge. Disputes between mines and locals are the most direct evidence of this disparity and have dominated much of the news in Peru in the last five years, sometimes tragically. A recent example is the unrest around the US-owned Newmont mine in northern Peru; this particular dispute became violent and lives were lost.

Peru has come a long way in the last 10 years. However, it still faces structural challenges in a complex reality that goes beyond the economic space. Peru is extremely rich in biodiversity, and its people are highly entrepreneurial, but it remains a fragmented and distrustful society. In one month (June 2015), the Ombudsman’s Office identified 141 socio-environmental conflicts, of which 114 (80 per cent) were related to the mining and hydrocarbon sectors and directly impacted the quality of life in rural areas of the country (Defensoría Del Pueblo, 2015). There is much still to be done.

Peru is an extraordinarily beautiful country with everything from deserts to jungles to high mountains. The combination of tropical latitude, high mountain ranges, ocean currents and jungle make for a diverse ecology and, of course, an increased vulnerability to the forces of climate change. Peru also has a huge wealth of glaciers (3 044) of utmost importance for human water consumption, agriculture, the generation of electricity and mining. A staggering 22 per cent of these glaciers have been lost in the last 35 years (Ministerio del Ambiente del Perú, 2011). Glacial retreat increases the problem of water distribution to the population: most need is on the Pacific side, where only 2 per cent of the country’s water resources are found. About 60 per cent of energy in Peru is generated hydroelectrically, but when the demand is above production or there is a deficit of hydroelectric energy due to climatic changes, energy is provided by thermal/kinetic sources.
Peru has a rich marine biodiversity, and is one of the major exporters of fishmeal and fish oil, due mostly to an abundance of anchovy in the cold Humboldt current. However, the presence of El Niño warms these waters making this a highly vulnerable industry.

Peru has huge forestry resources. It contains 13 per cent of the Amazonian tropical forests and 70 million hectares of forestland, containing huge varieties of species. The rate of national deforestation from 2000–2005 was −0.136 per cent, putting Peru among the countries with the lowest rate of deforestation in the region. However, between 1985 and 2000, the rate of deforestation was registered as constant. The current and medium-term prospect of strong economic growth represents a dilemma for forest conservation (Ministerio del Ambiente del Perú, 2011).

Peru is a party to the UNFCCC and has submitted two national GHG inventories (1994 and 2000). The first was a rudimentary effort using simple tools. For the second, a greater effort followed, building the inventory over two years. According to the national inventory of GHG emissions in 2000, total emissions were 120.023 Gg CO₂-eq (Ministerio del Ambiente del Perú, 2014). The main source of GHG emissions was the conversion of forests and pastures, attributed to deforestation of the Amazon, to change land use for agricultural purposes. The second category was energy, the principal source being transport.

Peru’s recent political dimension has been characterised by the presence of democratic governments that have allowed, to an extent, continuity in overall decisions and are sensitive to social and environmental dynamics in the country. The successive governments of the last 10 years dictated public policies on international trade and reforms in education and social inclusion, among others. However, political scandals, corruption and social conflicts have generated distrust of political parties, which has resulted in low rates of acceptance of these governments.

Peru is a new success story, a wonderful country, a glowing people. Not many countries can show a reduction of 57 per cent of the national poverty rate in the period of 10 years (World Bank, 2015), while the Inequality-adjusted Human Development Index in 2014 reached 0.562 (UNDP, 2015), denoting high human development. Peru is on the mend. The country has gone a long way in the last 10 years, but still faces structural challenges in a complex reality that exceeds the economic arena. In 2010, climate change was just coming onto the radar.
REFERENCES


Change is the law of life and those who look only to the past or present are certain to miss the future.

John F. Kennedy
Making the case: To whom?

In 2010, Harald Winkler and Stefan Raubenheimer, supported by a feasibility funding input of the Children’s Investment Fund Foundation (CIFF), approached some ‘people they knew well, some not so well’ in about 20 different countries. The World Bank review of the South African Long Term Mitigation Scenarios (LTMS) had encouraged the team to replicate the process in other developing countries. Kate Hampton from CIFF had provided the backing. The plan was to make approaches in Asia, Africa and Latin America and see who would be keen. But which countries to approach? Would one just consider the larger emitters, or also look at smaller, faster growing countries? Would one look at more progressive countries that wanted to show leadership on the climate issue, regardless of size? For which countries would mitigation of greenhouse gas (GHG) emissions actually be important?

If one looked at the contributions of developing countries to the GHG problem, the following could be seen: The top 15 emitters were led by China, and hence all 15 were placed on the initial list.
StorieS from the South

Figure 4.1: The top 15 GHG emitters, led by China.

Then we see the countries in the next 15, led by Argentina.

Figure 4.2: The second 15 highest GHG emitters, led by Argentina.
Table 4.1: The initial list of developing countries to approach for participation in the MAPS project.

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<thead>
<tr>
<th>Argentina</th>
<th>Egypt</th>
<th>Mexico</th>
<th>Peru</th>
<th>Taiwan</th>
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<td>Bolivia</td>
<td>India</td>
<td>Myanmar</td>
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<td>Thailand</td>
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<td>Brazil</td>
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<td>Saudi Arabia</td>
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<td>China</td>
<td>Iran</td>
<td>Nigeria</td>
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<td>Colombia</td>
<td>Kazakhstan</td>
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<td>South Korea</td>
<td>Venezuela</td>
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<tr>
<td>Congo, DR</td>
<td>Malaysia</td>
<td>Papua New Guinea</td>
<td>Sudan</td>
<td>Zambia</td>
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The project team then conducted a matrix analysis, in which several criteria were used, including:

- Mitigation potential (absolute annual emissions);
- Emissions intensity \(\text{CO}_2\text{-eq/US$ of gross domestic product [GDP]}\), to also reflect those countries which do not have high absolute emissions, but would grow rapidly with economic growth due to high \(\text{CO}_2\) per unit of GDP;
- Fast growing with the opportunity for leap frog – reflecting countries that might develop more rapidly;
- Government interest in LTMS-like process – a deal-breaker;
- Stakeholder processes experience;
- Presence of champions;
- Security and accessible, safe working conditions.

A weighting approach was taken, and finally, it was decided to approach the countries listed in Table 4.2.

Table 4.2: Final list of countries to approach for the MAPS project.

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<thead>
<tr>
<th>Latin America</th>
<th>Africa</th>
<th>Asia</th>
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<tr>
<td>Argentina</td>
<td>Egypt</td>
<td>China</td>
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<td>Bolivia</td>
<td>Ghana</td>
<td>India</td>
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<tr>
<td>Brazil</td>
<td>Kenya</td>
<td>Indonesia</td>
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<tr>
<td>Chile (added at this point)</td>
<td>Nigeria</td>
<td>Thailand</td>
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<tr>
<td>Mexico</td>
<td>Tanzania</td>
<td>Malaysia</td>
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<tr>
<td>Peru</td>
<td>Uganda</td>
<td>Vietnam</td>
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The idea was to find ‘champions’ in each country who would assist the Mitigation, Action Plans and Scenarios (MAPS) team in making an approach to the focal points on climate change, and then widening a mandate to all key ministries. The task of finding and approaching champions began in November 2009. This meant a lot of talking – and some travel. In Asia the responses crossed the spectrum of interest. China did not traditionally collaborate with other countries on matters such as this, but champions wanted to stay engaged. India was just too large and complex politically, but there was strong interest, again from the champions. Indonesia showed some interest in collaborating with Brazil and other forestry countries. The MAPS team failed to find champions with the right profile to make successful political approaches in Thailand, Malaysia and Vietnam, but a strong response in favour of the idea came from Nepal, where officials had heard of the idea, although the country was not on the list.

In Africa, the responses were more encouraging. Nigeria, Ghana and Uganda showed some interest, as did Zambia, which was also off the list. But clearly, taking matters forward would take a lot more time in Africa, and the mitigation problem was very low on the list for these countries where emissions were very low. Africa would need a different proposition.

In Latin America, there was stronger uptake, and by agreement, the list was extended to include Colombia. The response was rapid. Encouraged by this, the CIFF Board decided to focus on that continent, and so did the MAPS team. A regional approach was expected to deliver greater benefits from collaboration.

The hard slog towards full mandates had begun.

The focus now centred on Colombia, Peru, Argentina, Brazil and Chile (Mexico was excluded, see below). The South African team, led by Harald and Stefan, readied themselves for the trans-Atlantic flight. There was some anticipation: would they be welcome? Would there be any interest in two South Africans and their story? Neither could even speak Spanish or Portugese! They would soon find out.

This chapter deals with the leadership shown by our four Latin American countries. As we saw in the previous chapter, all four were facing their own peculiar challenges in early 2010. Each had already done a great deal of work on climate change, but in none was it central to their development pathway, nor central to political decision-making. In all of these countries, there was limited awareness among stakeholders.
What really strikes one in this unfolding story is the role of leadership. When do leaders take the plunge, respond to an idea, agree to open their doors, collaborate openly and embrace new ideas? This requires some embracing of risk, some dilution of authority, after all. And when do they do so for something not apparently of direct interest to their political agendas or economic development? How do leaders react to ideas from far afield?

Stefan and Harald thought a great deal about their first approach, about the proposition they would deliver. The idea was not to propose a crude replication of the LTMS but to say, ‘Look, we did something back here at home; we learnt a lot; are you interested in sharing this experience?’ They also knew that the LTMS was not exactly turning the South African economy around, and so did not want to say ‘this is easy, just do it this way’. MAPS was not a fly-in-and-do-the-job project. It was quintessentially about South–South collaboration and learning around a complex challenge. So this was central to their proposition. Here the fact that the approach came from another southern country was powerful – approaches from the North, and from country donors in the developed world, are often seen as giving help rather than learning together. MAPS did not come with any solutions, nor tools or guidelines. It was, simply, an invitation to struggle together.
Having said this, some elements of the ideas behind MAPS were presented more strongly: there was a ‘methodological approach’ (not quite a ‘method’) that was being suggested: to generate credible, legitimate and relevant knowledge in the form of scenarios through a combination of mandating, research and process. Each country had, at minimum, to agree to this broad approach. In extended form, this was what we were hoping for:

In MAPS we are looking to achieve lasting transformational impact, country ownership, long-term understanding with deep stakeholder engagement and world-class modelling. MAPS is a species of planning, and is a form of ‘super cooperation’ in the political economy. Long-term decision-making is absent in the economic and political spheres. The MAPS programme, and the MAPS projects in each country, strives to create a lasting narrative, a lasting roadmap that is supported by all players in that country. We hope this roadmap can outlast individual governments and corporate interests, creating a common purpose, a common sense of direction. A common language and a set of tools they can refer to.

(Kate Hampton, CIFF)
First approaches

In Peru, the MAPS initiative started with a joke. Stefan learnt from Harald that a good person to talk to in Peru was María Paz Cigarán, whom he knew from the climate negotiations, and was reputed to have her hand on the pulse of all that was Peruvian and climate. Stefan set up a Skype meeting across the Atlantic. He learnt that MP (as she is affectionately known) would be joined by Pía Zevallos. He expected two senior players and prepared for a serious conversation. Nothing could have prepared him for what happened. MP and Pia are members of the young professionals who seem to play such a major part in the ‘new Peru’. They were the new generation. But the Skype conversation started oddly – Stefan was confronted by two faces on the screen, with a pirate overlay complete with crudely drawn eyepatches and treasure chests, bobbing and floating over the screen. Appearing to be living in an aquarium, these two women couldn’t disable an app, which was resident on their laptop (apparently the work of a naughty younger brother), and so the first conversation about MAPS in Peru was conducted between two giggling pirate girls and a South African guy barely able to contain his laughter. This is how friends are made and things start out sometimes. Perhaps all meetings need to have a pirate app to help them on.

MP and Pía took the idea of doing something around climate mitigation in Peru, similar to the South African experience, to their government. They came back with a tentative ‘yes’ answer. Come and visit and tell us what you did in South Africa. The doors are open for you.

The climate circuit, that rotunda of gatherings known as COPs, SBSTAs, Carbon Expos and the endless acronyms that go with them, certainly intimidates the outsider. But the same core of faithful climate practitioners goes each year. One such persona is the grizzly Chilean, Eduardo Sanhueza, whose weathered face belies a deep knowledge of his game. Stefan met him in Barcelona and liked his smoking, red-wine drinking, expansive personality. It was only natural for Stefan to ask Eduardo, who lived in a modest apartment in leafy, downtown Santiago, if there was a chance for a MAPS-like process in Chile. Eduardo knew his locals and opened the doors. Again Stefan encountered another two powerful women in the game: Andrea Rudnick and Alexa Kleysteuber, both in the Ministry of Environment, and they gave the same signal as the Peruvians: come and talk to us and tell us what you have done.
Whereas there was a (more or less) clean slate in Chile and Peru in planning for the future low-carbon world, Colombia already had a process. Uribe was president at the time and he was focused on two things in particular: an economy taking off and a huge security challenge. At that point his government’s approach to climate change was to focus on the carbon markets and promote an influx of carbon finance. The World Bank was financing carbon projects in Colombia, and this helped to create a support team in the Ministry of Environment. After the COPs in both Copenhagen and Cancun, Colombia could see, however, that a broader climate strategy was needed, one in which a domestic effort to reduce emissions was present, as long as the economy remained competitive. The ECBDC, Colombia’s Low Carbon Development Plan, was set in motion, driven by the Ministry of Environment and the National Planning Department. The planning process for this strategy was in its early stages and did not include some of the elements of the MAPS approach, especially the participation of stakeholders. Stefan and Harald called at just the right moment, starting with an approach to Claudia Martinez, who had been the Minister of Environment in Colombia. She was persuaded by the MAPS ideas and was extraordinarily helpful, opening doors to officials in the current department. A meeting in Bogotá was swiftly arranged.

On his second visit, Stefan was again struck by how chic Bogotá was on one end and how derelict it was on the other. The airport was in a poor condition (there is a sparkling new one now) as was the approach road, which rather ominously, passed through a dark, dangerous part of town. This echoed what seemed to be the case in all developing countries: where the way into town from the airport is all you need to picture the problems of the country. Stefan waited outside the hotel for his pick up for meeting number one: Andrea Garcia (now Guerrero) was Director of Climate Change in the Ministry of Environment. Her car zipped out of the traffic, pulled over and she said ‘get in!’ And so started the Colombian MAPS project.

Brazil, it is said, is ‘not for beginners’. By 2010, Brazil had already done a great deal of work on mitigation, especially in avoiding deforestation. However, in October 2009, Branca Americano, then working for the Ministry of Environment, met with Harald at an international meeting and they discussed an LTMS-like process for Brazil. She was particularly interested in South–South collaboration. Since 1999, Stefan had also worked with Professor Emilio la Rovere of the Federal University of Rio de Janeiro. They had, in fact, established SouthSouthNorth (the organisation that was to team up with the Energy Research Centre to run the MAPS Programme) back at the COP 5 in Bonn in that year. Emilio took up Branca’s initiative and spoke to Carlos Mink, the then Minister of Environment and a close friend. There was enthusiasm for the idea. MAPS in Brazil started with quiet conversations.
In January 2010, the centre in which Emilio worked in the university in Rio was awarded, by the Ministry of Environment, a United Nations Development Programme (UNDP) contract to do a first set of mitigation scenarios for Brazil, and it was decided that this study would be the cornerstone for a future MAPS process and would be conducted within the collaboration programme. This was just a desktop study commissioned under the guidance of one minister, but it would help to eventually present the advantages of the project. Instead of simply presenting the South African experience, some Brazilian results would also be presented, thus making the case for a further, larger mandate. This seemed a clear strategy, but getting a full government mandate in Brazil turned out to be a hugely complex task in the end.

In Argentina, Stefan and Harald worked with two remarkable champions, Atilio Savino and Hernán Carlino, to see whether the third largest emitter in Latin America would come to the party. After a year of approaches and meetings, the idea was abandoned. Argentina was politically allied (at least as far as views on climate mitigation were concerned) with a group of Latin-American countries known as the ALBA, the so-called Bolivarian alliance. At that time, these countries took the
strong view that the larger emitters should first show drastic cuts in GHG emissions before they would look at their own emissions. Argentina was, in 2010, politically against a MAPS approach for this and other reasons. Although the two champions were dead keen, the project eventually had to be abandoned.

The other large emitter in Latin America is, of course, Mexico. This country is an example of another type of leadership on climate change: a comprehensive, strong and decisive mover from the top, from the president himself. In a recent assessment of best practice in low-emissions planning, the Green Growth Best Practice report (Green Growth Best Practice initiative, 2014) analyses the Mexican experience from a leadership perspective. President Felipe Calderón played a ‘key role in driving the process of creating a national plan of action and legislation on climate change’. Calderon and Lee of South Korea ‘have made climate change and green growth their “legacy issue” investing considerable personal and political commitment to drive progress both domestically and internationally’. Calderon’s leadership was so powerful on this issue that it is unique internationally. It translated directly into action and tremendous climate ambition: in 2009, the Government of Mexico published the Special Climate Change Programme (PECC), which set out a broad programme to achieve a long-term climate change agenda of reducing emission by 50 per cent by 2050, compared to the 2000 level, and medium-term and sectoral goals for adaptation and mitigation. Mexico had done its work and so it was decided that it did not need to be part of MAPS, at least not in this phase.

AILAC and the BASIC

At this juncture, it is important to point out that our five countries, Brazil, Chile, Colombia, Peru and South Africa, also have allegiances and memberships of blocs, each developing positions relevant to the international climate negotiations.

Chile, Colombia and Peru all became part of a negotiating group called AILAC (Association of Independent Latin American and Caribbean states). Joined by Costa Rica, Panama and Guatemala, these countries started a big shake-up in the climate game after their formation at the Doha COP in 2012 (the group had been talking together from much earlier, though), coming just after the MAPS processes started in 2010. They started what some called a revolution ‘from the middle’ [Friedman, 2012], straddled as they were by the large northern emitters on one side and the developing countries on the other. For a long time the North and the South had been separated by distrust: broadly speaking, the developing South countries wanted to
see concrete and ambitious action on emissions mitigation from the North before they would act. The discourse between their negotiators could get emotional, and it is not hard to imagine thoughts along these lines: ‘why should we curtail our development just as it is beginning, if you, who have developed fully using fossil-fuel energy (and some colonisation, just for good measure) refuse to reduce your own emissions?’ But the problem was that, from a planetary perspective, even if the developed countries did slash emissions, inaction on the part of the large developing countries would still push the planet into the danger zone.

AILAC took the position that everyone had to act together without delay. The AILAC negotiators avoided the toxic ‘North–South’ disputes. They pushed for countries – all countries – to step up their commitments to rapid decarbonisation. This was a real shake-up. ‘We do see ourselves as a group that is bridging the North–South divide,’ said Isabel Cavelier, adviser in Colombia’s Ministry of Foreign Affairs. ‘We think we can show the world that we are developing countries, we have a lot of problems at home, but we are ready to act. If we can show that we can take the lead, and we’re not waiting for the rest of the world, then we can [set] an example’ [Friedman, 2012].

AILAC punched above its weight a few times at the United Nations (UN) talks. At the 2009 COP in Cancun, when Bolivia tried to break up the final agreement, it was Colombia that pushed for the agreement. A year later, the AILAC joined the vulnerable islands group and the least-developed countries group to form an alliance with Europe. That alliance, in turn, forced the United States (US), China and India to agree to a legally binding-for-all agreement in 2015. AILAC had a role to play in getting Paris COP on the agenda.

Brazil, in contrast, is less of a leader in its own region and more of a lone ranger, attaching itself geographically to the other large, developing countries. China and India were key members of this group. These two giants had slowly been floating closer to each other in the climate talks after 2000, overcoming old rivalries. After all, they had the same problem: a lot of people, all of whom had to be lifted out of poverty. That would carry a massive energy bill, which in turn would mean an emissions problem. If every Chinese and Indian person lived like an American, however, the world climate system would collapse. Northern countries knew this and were pressurising the two countries to participate in climate talks, for example, at the Major Economies Forum in the run-up to the Copenhagen COP [Obama, 2009]. China and India were becoming key players.
As Copenhagen approached, there were rumours that the European Union (EU) and the US would propose a deal for the COP and thus drive the agenda. China and India could not afford that, and neither could Brazil nor South Africa. The four countries were part of the G77 bloc, the full group of developing countries, and did not wish to break away from this group, but from an emissions perspective, the G77 was hugely diverse. The history of the G77 is complex, but the following is a useful summary:

The G77 is a product of the political economy of the North–South divide in the 1950s and 1960s. At this time, many countries in the Global South were gradually coming loose from their colonial associations and looking optimistically towards a future of rapid social and economic development. However, the politically charged atmosphere of the Cold War was not particularly sensitive to developing country concerns, and many Southern countries found themselves facing structural disadvantages that contributed to a worsening of the terms of trade. A campaign to establishing an International Trade Organisation as part of the Bretton Woods structure was unsuccessful, leaving poorer nations dependent on trading primary products without a regulatory body.
to represent their interests. It was against this backdrop of Southern disquiet that developing countries pushed for the establishment of the United Nations Conference on Trade and Development (UNCTAD) in 1964. At UNCTAD, a new solidarity bloc within the Third World contingent was formed with 77 founding members under the name of Group of 77. Over the years, membership of the group has grown to accommodate over 130 members, and its concerns and activities have widened far beyond UNCTAD, in which the group no longer plays any role.

(Hallding et al., 2011)

Many in the group, notably India, prioritised economic development over environmental concerns. And when it came to emissions, the question of equity popped to the surface right away. Equity was really about fairness: what would a fair outcome look like in the management of the emissions problem? After all, would it not be fair to say that every person on the planet had an equal right to emit? This was not only a thorny issue for the flow emissions (the emissions put into the atmosphere daily by all of us), but also the stock emissions (emissions have a ‘resident’ effect on the climate, in the case of CO₂ for around 100 years), where the developed countries have a historical responsibility, having developed to a position of wealth for most of the twentieth century. These positions on fairness united the G77 and shaped its negotiation positions.

The United Nations Framework Convention on Climate Change (UNFCCC), and eventually the Kyoto Protocol, enshrined this division by concretising a principle of ‘common but differentiated responsibility’, setting up a firewall between the developed and developing nations. The North would go first, the South would follow later. The division was just a delusion, really, as wealthy Gulf states were lumped in with struggling least-developed nations in the G77. But the poorer countries now had clout.

The G77 countries pulled together as a group in the climate talks, but it was a group that could not last forever and divisions multiplied as the talks wore on. By Copenhagen, the group was openly in disagreement on various elements of a deal. This helped to bring China, India, Brazil and South Africa together. They were new, large economies in their own right, and they could not allow a struggling G77 to be overwhelmed by a deal that was not in their interests. Their association became known as the BASIC (Brazil, South Africa, India and China).
The four BASIC countries represent roughly 40% of the world’s population, and each is indisputably a regional power. South Africa contributes around 31% of sub-Saharan Africa’s GDP, and Brazil 38% of GDP in Latin America and the Caribbean. India, home to around 17% of the world’s population, accounts for 80% of GDP in South Asia, and China, with a population about 200 million more than India’s, for 35% per of GDP in the East Asia and the Pacific region. China is the world’s largest GHG emitter (in total annual tonnes), has a permanent seat on the UN Security Council and is a developing country superpower. The four together accounted for 12% of global GDP in 2009.... Since the early 1990s, the BASIC countries have all enjoyed higher than world average rates of economic growth, and higher growth rates than the US or the EU, led by China and India with average annual GDP growth since 2000 of 10.2% and 7%, respectively.

(Hallding et al., 2011)
The MAPS initiative became involved in the BASIC group on climate change through its Expert Group on Climate Change, and we shall revert to its work on equity at a later stage. At the third meeting of this BASIC group in Rio, the statement issued by the group supported work on adaptation and ‘mitigation plans and scenarios’, a reference to the work being proposed by MAPS.

For now, on the issue of mandating, events at the BASIC were important in order to understand how Brazil was preparing for the post-Copenhagen period.

*Members of the BASIC expert group, Rio, July 2010, with fond memories of the late Girish Sant, who passed away in February 2012 (fourth from left): MAPS Archive.*
Brazil

Almost half of Brazil’s energy mix comes from renewable sources, so it is very different from South Africa, Chile, India and China, for example. The Brazilian economy has a relatively low carbon profile as a result. Per capita emissions also fell as Brazil started winning its fight with deforestation. But Brazil is a big economy and, with deforestation of the Amazon, its emissions are around 5 per cent of the global figure. So it’s a significant player, sitting at the presidential table with China, the US and Europe.

The issues of climate change, forestry and ecology in general leapt to the forefront as early as 1990 for Brazil. During the preparatory process for the Earth Summit in 1992 in Rio, a delegation of representatives from the Brazilian scientific community, led by COPPE-UFJR, called the attention of the Minister of Science and Technology to the need for an appropriate institutional setting within the Brazilian Government to deal with climate change issues. In response to this demand, the minister established a Climate Change Unit within the ministry. Brazil was the first country to sign the UNFCCC during the Earth Summit in 1992. It was a world leader on the climate issue and was to remain an innovator in this field.

Rio de Janeiro, Brazil: MAPS Archive.
The responsibility for coordinating the implementation of commitments under the UNFCCC was given to the Ministry of Science and Technology in August 1994. Brazil was at the forefront of thinking around the issue of mitigation in the developing country context. In fact, Brazil has been a leader on climate change since 1992. The government started the preparation of its First National Communication in accordance with the commitments assumed under the UNFCCC. The elaboration of National Communications is a multidisciplinary effort involving around 150 institutions and 600 experts from all regions of the country – it’s a big deal effort. The First National Communication was delivered during the COP 10 in Buenos Aires (2004), and the Second National Communication during the COP 15 in Copenhagen (2010).

The prospect of the Clean Development Mechanism (CDM), which grew out of the Brazilian proposals in Kyoto, highlighted the importance of formalising institutional arrangements within the Brazilian Government, and so the Inter-Ministerial Commission on Global Climate Change (CIMGC) was created on 7 July 1999 for the purpose of coordinating government actions in this area. Given the need to expand the debate on climate change issues and increase the participation of the various country stakeholders, the Brazilian Climate Change Forum (FBMC) was created in 2000, through a decision made by President Fernando Henrique Cardoso, after environmentalist non-governmental organisations (NGOs) had questioned him about the lack of civil society representation in the CIMGC.

This forum, which is headed by the President of the Republic, gathers all stakeholders in the climate change issue, including government institutions, the private sector, the scientific community and NGOs. The FBMC members are:

- the president of the country;
- an executive secretary;¹
- all 11 ministries belonging to CIMGC;
- the governors of the 27 states;
- the mayors of the 27 capital cities of the country’s states;
- representatives of several business sector organisations;
- representatives of the scientific community involved in the climate change field;
- representatives of environmental NGOs.

¹ Initially Fabio Feldmann, a parliamentarian of the Green Party from the state of São Paulo during Cardoso’s two terms, who was later replaced by Professor Luiz Pinguelli Rosa, Director of COPPE-UFJR during Lula’s two terms.
The FBMC has no decision-making powers but provides good opportunities for representatives of civil society to meet with the president and the ministers and brief them on their viewpoints on climate change issues. The FBMC typically meets once or twice per year, but has several technical chambers that can meet more regularly upon demand. For example, a ‘Poverty and Climate Change’ group, established within the FBMC, has produced a number of proposals for the National Climate Change Plan. Although not invested with decision-making powers, the FBMC played a key role in the run up to Copenhagen; it provided the setting for a series of meetings that helped to build the consensus on the country’s voluntary pledges presented at the COP 15. It was also to play a key role in our MAPS effort in Brazil.

In December 2000, the Ministry of Environment decided to broaden its participation in the area of climate change in order to increase the national debate on the issue. The ministry supported the creation of CentroClima (Centre for Integrated Studies on Climate Change and the Environment) within COPPE-UFJR based at the Federal University of Rio de Janeiro. MAPS, in fact, teamed up with this centre for the project in Brazil, thus tying up with the Ministry of Environment. This was to be a significant choice, as it turns out.

Brazil, due to its relevance as an economy on the world stage and the scale of its emissions, was a special case for MAPS. The MAPS team approached Brazil knowing that there had been many studies there and many competing institutions and approaches, to say nothing of the acute differences between ministries. To say the least, the MAPS task in Brazil was politically delicate.

The first task was to help with the consolidation of existing studies. A proposal for a Phase I of MAPS included this element and was mandated by the Ministry of Environment. Phase I also included a study of the sectoral significance of the Copenhagen pledges made by Brazil. Brazil’s pledge (unlike those of other BASIC countries) was disaggregated, with detailed actions specified – most notably the 80 per cent reduction in deforestation rates but also mitigation action in the grasslands and on the energy sector (The Embassy of the Federative Republic of Brazil, 2010). This first phase of MAPS was not stakeholder-driven, as it really focused on the top-down nature of the pledges and their significance for the sectors. This work, concluded in August/September 2011, consolidated the various baseline studies and then keyed in directly to the sectoral carbon plans, which were required by decree to be delivered in December 2011. Sectoral ministries were able to (and did) refer to the study for help in the formulation of the sectoral emission
plans. Phase I was well received in government and helped MAPS to present the next objective: the long-term challenge for emissions reduction in Brazil. CentroClima team leader, Emilio La Rovere, and the MAPS South African team met a number of times with the Minister of Environment and the lead official in the Ministry of Science and Technology to outline this longer-term challenge: some time after 2025, Brazil’s emissions challenge would move from sustained avoided deforestation to a new energy/industrial economy. With hydroelectricity reaching its limits, the energy matrix, and particularly the power sector, may become more rather than less emissions-intensive. In a sense, Brazil ‘grows up’ around this time, as our research leader Professor Emilio La Rovere described it. As efforts in avoiding deforestation flatlined, the energy ‘Business as Usual’ (BAU) scenario showed a rapid increase, as did the overall economy.

![Figure 4.3: After 2025, Brazil’s emissions challenge would move from sustained avoided deforestation to a new energy/industrial economy.](image)

*Sources: 1990–2010 historical record (national inventory, MCTI 2015); 2010–2020 Copenhagen/Cancún pledges (NAMAs); 2020–2030 estimates based on the extension of governmental plans with no additional mitigation measures (GPS scenario, IES-Brasil, 2015).*
In early 2011, the MAPS team started to look beyond this first, consolidating phase at the possibility of a stakeholder-driven assessment. It was always known that the broad mandate granted to MAPS by the Brazilian Government would be subject to change once the Lula Government came to an end. In the October 2010 elections, after a second vote, Dilma Rousseff won the presidency. In response to this, it was planned to engage with the new government between March and June. MAPS concluded the engagement by the end of July 2011.

Under the dispensation, some coordination was needed between the Minister of Environment and the Minister of Science and Technology, with the Minister of Science and Technology officially in charge of climate change. The new government addressed this need to align matters. Officials and ministers were still settling in and the approach from Emilio and his South African colleagues would take some time to figure out. Also, at the time, much heated debate surrounded proposed changes to the Brazil Forest Code, which would lower the amount of ‘legal reserve land’ on farms and settlements in the Amazon down from 80 per cent. It was thought that this had led to the sudden increase in deforestation of 27 per cent between August 2010 and April 2011 in perverse anticipation of new legislation. This increase would put Brazil’s Copenhagen pledges in jeopardy. For most of the middle period of 2011, this battle of the Amazon was fought in the Brazil Congress and dominated the headlines. This was a tough time for the new Minister of Environment, Izabela Teixeira, and this was not a time to make MAPS proposals. Fortunately, time is what MAPS needed. The Brazilian team was readying a new tool with which it hoped to model the MAPS results in Brazil – and it needed all the time it could get to conclude the complex task of calibrating this model, named IMACLIM. There will be more on this effort in Chapter 5.

Finally, when the heat was off the forest issue, MAPS and the Brazil COPPE team put a draft concept note to Minister Teixeira. It was decided that the stakeholder group would be selected through the FBMC, and unlike the other countries, this represented a fast-track to the process – in fact, the plan was that MAPS Brazil would take place within the FBMC.

The concept note gave an indication of the direction of the proposed process, by proposing the questions for the assessment:

- What is the projected BAU or ‘growth without constraints’ GHG emissions scenario for Brazil between 2020 and 2050? What are the likely ranges in this scenario, given different internal scenarios driven by, for example, different oil price realities?
• What are the economic, social and other implications of these unconstrained scenarios?
• What are the likely constraints on this scenario, both international and regional, and what are the likely impacts of these constraints?
• Given these constraints, what low-carbon economic and social pathways are available to Brazil, and what are the economy-wide and social (job creation and poverty impacts) implications of these various choices?
• How do these options compare to a scenario that is driven purely by scientific requirements to keep to a 2 °C world?

The later months of 2011 were spent presenting this new path, and our proposed process to understand it and present options to the relevant and key ministry officials. This was a long slog to gain understanding and approval. Finally (with full support) the proposed study was presented to the Inter-Ministerial Committee on Climate Change (IMCCC). At the same time, the results of the Phase I study were presented to the Ministry of Environment on 23 August 2011 and to the Executive Task Group of the the IMCCC on 29 August. It was here that the prospect of a second peak in emissions after 2020 was introduced.

Due to the fact that the different ministries were drafting sectoral plans on how to reduce emissions by 2020, it was decided that it would be premature to launch the FBMC project just yet. Frustratingly for all, the Brazil Forest Code had already passed through the Assembly, but the Senate vote on changes to the Forest Code, set for May 2011, was rescheduled for December 2011 by a political agreement. The South African leaders in MAPS were learning a lesson in Brazilian complexity, and 2011 sped by.

It took up to September 2012 to gain an audience with the Minister of Environment and complete all preparations for the second-phase mandate. The mandate letter is addressed to Pinguelli Rosa of the FBMC, instructing him to initiate the process. The letter noted that the Durban Platform for Enhanced Action, approved at the last Conference of the Parties, held on December 2011 (COP 17), required that Brazil and the emerging economies play an important role in international negotiations up to 2015 about the future goals of GHG emission limitation after 2020. This was one priority: helping Brazil to prepare for Paris. A second priority was to understand the wider macroeconomic (GDP growth, inflation and public debt) and social (employment generation and income distribution) implications of mitigation scenarios. These needed to be assessed to inform the discussion on national goals for GHG emission reduction and/or limitation up to 2030 and 2050.
It seemed clear what needed to be done and preparations started in earnest to initiate the process. But in yet another twist, news came later in 2012 that the Ministry of Science and Technology had also designed a process to assess mitigation options under the auspices of the Global Environment Fund (GEF), and that this would, indeed, be the ‘official’ process of developing knowledge on mitigation options. Middle-level officials within the executive committee structures of the IMCCC became concerned about the mandate to the FBMC. Officials were concerned that there was a large overlap between ‘MAPS Brazil’ and the GEF project. The officials were also concerned that for MAPS to do well in Brazil, it needed the support from other ministries (within the IMCCC), which had not yet been fully secured. MAPS and the GEF project teams met to ensure that there was synergy, alignment and no duplication between the projects. The GEF project was not stakeholder based, so MAPS would be different. And a further difference would be that MAPS would not duplicate the emissions work of the GEF project, but would focus on the economic and social implications of mitigation options. Finally, after much discussion, it seemed that all were keen to ‘make it work’, but one huge problem now emerged just to frustrate things further: the Brazilian Government could not lend financial support to a second process. MAPS and the FBMC would have to find their own money.

Achieving a consolidated single mandate to develop knowledge scenarios on mitigation had proved to be tough in Brazil. It’s a big country, with high levels of complexity. It has taken a cautious approach to the climate issue – there is much to lose – but in the end the FBMC process would, for the first time, see key players in Brazil grappling with the issues of mitigation and its impacts on the economy and on human development. Leaders in the FBMC, under the able management of Neilton Fidelis da Silva, would finally gather and start working.

Chile

Chile, as we have seen, is not a big emitter, and mitigation of emissions was not high on the agenda in 2010 when the first approaches were made through Eduardo Sanhueza. But the two officials in the Ministry of Environment, Andrea Rudnick and Alexa Kleysteuber, saw the potential in the idea.

From the early years of the UNFCCC and its Kyoto Protocol, Chile had participated consistently and proactively. Specifically, Chile was part of the early wave to ratify both the UNFCCC (1994) and its Kyoto Protocol (2002) and was one of the first
countries in the world to sell emissions reductions using the CDM, through the World Bank’s Prototype Carbon Fund. Chile had also demonstrated its dedication to implementing its commitments under the Convention through the timely and thorough preparation of both its Initial National Communication (2000) and Second National Communication (2011). The preparation of both reports was supported with national resources and given significant national attention, with the country’s president attending the publication and submittal of the Second National Communication. With the presentation of that report, Chile can currently claim the longest running GHG inventory data of any developing country. Hence there was early leadership, and leadership right at the top.

With an active participant in the CDM and a national team responsible for preparing the National Communications, it was not surprising that the Chilean delegation arrived in Copenhagen with over 40 delegates from the public and private sectors for COP 15. Headed by the Minister of Environment at the time, Ana Lya Uriarte, the political approach at the time was for Chile to serve as a bridge between developed and developing countries by demonstrating serious political will to pursue mitigation measures using the country’s own resources. Internal discussions focused mainly on maintaining the country’s role as a first-mover on climate within the developing world and national interests in taking advantage of the potential benefits from the new agreement (markets). It was also clear that Chile’s imminent accession to the Organisation of Economic Cooperation and Development (OECD) imbued the government with an increased sense of responsibility and fuelled discussions on developing targets for voluntary emissions reductions that could be met with national resources.

As an expression of the government’s political will to participate proactively in the new agreement, the Minister of Environment announced, in her address during the high-level segment of the COP, Chile’s voluntary commitment to achieve a 20 per cent deviation from below the country’s BAU scenario by 2020 (base year for projection 2007), mostly with national resources, but also conditional on international support. The final decision to announce a numerical voluntary commitment was taken during the final days leading up to the high-level segment, and was driven by President Bachelet and negotiated between the Minister of Environment and the Minister of Energy and Agriculture, with technical support only from their closest advisers.
The delegation returned to Santiago with the task of preparing and formally submitting its nationally appropriate mitigation actions (NAMAs) to the Secretariat by 31 January 2010, with the guidance of only a basic table appended to the Copenhagen Accord. At this point, the National Environmental Commission (the precursor to the Ministry of Environment) began an unprecedented effort to initiate interministerial coordination on climate change, through the establishment of a high-level Ministerial Committee, with the objective of reaching consensus on the language of the country’s voluntary commitment. This committee included ministers from the most relevant sectors of the economy with the highest responsibility for the country’s emissions, specifically the ministries of Energy, Transportation, Agriculture and Mining, as well as the Ministry of Foreign Affairs and the Ministry of Finance. Almost immediately, a technical subcommittee was put to work to prepare a proposal for the ministers to approve.

On 23 August 2010, the country submitted a letter expressing its willingness to ‘associate itself’ with the Copenhagen Accord and for its NAMA to be included in its Appendix II (Ministerio de Relaciones Exteriores, 2010). Chile’s association with the Copenhagen Accord and the submission of the country’s first ever voluntary, national commitment to mitigate was an unprecedented step forward in the country assuming responsibility to act on climate change and low-carbon development.
Ministerial Committee discussions made it clear, however, that there were actors within the government who were concerned about committing the country to a specific level of avoided emissions, and the implications this might have at the national and/or sectorial levels.

By the second half of 2010, even with a number of ministries making the case for the need to define a BAU projection from 2007 to 2020, using existing information to move discussions quickly and effectively to sectorial assignation of efforts and sectorial action, there were others (primarily the Ministry of Energy) who advocated a more conservative approach, insisting that more information and analysis was needed before such a decision to define the baseline could even be considered. Unfortunately, the government at that time was clearly lacking the collective political will to clearly define the country’s abatement efforts in a quantifiable manner so that progress towards the pledge could be evaluated robustly and transparently. At this point, the Ministry of Environment was forced to move forward with a bottom-up process to develop specific NAMAs with the most relevant (highest emitting) and most cooperative sectors.

The process of interpreting the Minister of Environment’s Copenhagen address into the country’s official NAMA took approximately six months. On a positive note, this committee had, for the first time ever, managed to bring high-level public officials together to discuss the country’s global contribution to climate change mitigation. Furthermore, they were able to agree on a numerical pledge that would send a real signal on the need for low-carbon development in Chile.
Nevertheless, the political challenges are easily detectable in the submission: most notably, the shift from the minister’s rhetoric in Copenhagen on setting a voluntary commitment to be met mostly with national resources, to the document’s glaring omission of national resources and, instead, a reference to the need for a ‘relevant level of international support’. Additionally, the Committee was unable to specify what the 20 per cent deviation would imply in terms of GHG emissions reductions in 2020. Indeed, with the political decision taken, the process and the wording of the pledge itself raised many more questions, including: what did the 20 per cent deviation actually mean?

So there was work to be done, at first just to understand the 2020 project, but everyone knew that looking further ahead to 2030 would be necessary too.

The COP 16 held in Cancun, Mexico, was an important political instance to confirm the national pledges made by countries during 2010 and to capture them in a Decision of the Parties. The decision captured these pledges in an information document and also made an important invitation to countries (developed and developing) to provide more information that would help others understand the implications of their pledges, particularly in relation to expected GHG reductions. Again, the Ministry of Environment was highly involved in these negotiations in Cancun and it tried to use this decision as the impetus, on a national level, for the country to define a level of BAU emissions up to 2020. This was discussed intensely by the Inter-Ministerial Committee during the first few months of 2011 – again to no avail, due to intense political pushback from other ministries.

It was in parallel to these stymied efforts that, during 2011, the Ministry of Foreign Affairs received a letter from Stefan Raubenheimer at SouthSouthNorth, inviting Chile to develop a project to replicate, in a manner tailored to national circumstances, the success of a stakeholder process carried out in South Africa to define that country’s national pledge in the run up to Copenhagen in 2009. This invitation was internally lauded by the professionals at the Ministry of Environment, who saw it as a possible solution to the inter-ministerial stalemate that was holding back the process of further quantifying the national pledge and submitting it to the UNFCCC. The project offered a two-pronged approach of stakeholder engagement and robust technical analysis, including emissions projections, analysis of mitigation potential and cost-effective options, as well as an analysis of economic and social implications of these options.
The professionals within the Ministry of Environment (led by Andrea Rudnick) saw this process as a comprehensive and irrefutable answer to calls from some ministries to carry out more methodical and inclusive analysis before further defining the national pledge. In order to gain a wide national buy-in for participating in the project, these professionals decided that they would also place a high emphasis on the need for this project to help the country to define any future obligations (post 2020) that might arise as part of future decisions or legal agreements. They also knew that an emphasis on the effects of emissions reductions on employment, GDP and competitiveness would be critical for the project to gain national support.

In considering the response to this letter, the Ministry of Environment and the Ministry of Foreign Affairs of Chile worked very closely with each other and with MAPS to better understand the project, to tailor the project to national circumstances, to seek support from other ministries and non-state actors for the project to go forward in Chile, and, of course, to develop the administrative arrangements if the project were to go forward, including national and international sources for funding.

After a number of meetings with the IMCCC, the Chilean Government decided to move forward with the MAPS Chile project, to be led by the Ministry of Environment, with participation by the other relevant ministries (Agriculture, Energy, Foreign Affairs, Finance and Transportation – Mining was included later). Immediately, the first significant tasks for the project were to hire a professional facilitator to organise the progress and carry it forward, and to prepare a project document (PRODOC) to structure the project (objectives, expected results, timeline, budget, responsibilities) and raise the funding necessary to implement it.

Together, the Ministry of Environment and the Ministry of Foreign Affairs used any and all opportunities to raise the necessary funds. In particular, Alexa Kleysteuber (one of Chile’s negotiators in the UNFCCC process and a Mitigation Officer in the Ministry) was involved in a number of meetings at the Ministry of Foreign Affairs with José Luis Balmaceda and Waldemar Coutts, where she and Andrea Rudnick tried to ‘sell’ the project to the governments of a number of countries. They targeted the EU and Switzerland, but they also spoke to the US, Germany, New Zealand and the Netherlands about supporting the initiative. They leveraged Chile’s past participation in the negotiations and the country’s proactive stance on developing an ambitious, transparent, legally-binding, multilateral, rules-based regime to attract support for carrying out the project in Chile. They also emphasised the possibility of using this project as a case study for carrying out this type of initiative in other Latin American countries or other places in the world.
The Ministry of Environment and the Ministry of Foreign Affairs continued to pursue every avenue to secure funding. A dinner at the home of the Ambassador of Switzerland and a presentation of the project at a meeting of the Low Emissions Development Strategies (LEDs) Global Partnership in March 2012 were both important instances to describe the objectives and structure of the project, and to emphasise the work being done by the ministries of Environment and Foreign Affairs to secure high-level political buy-in from the Chilean Government to carry out the project and deliver useful results for the UNFCCC negotiations. During all of these interactions, the South African experience with LTMS and outreach from MAPS was put forward as the impetus and ‘successful case study’ to illustrate how this project could and should work in Chile – specifically, the combination of high-level political buy-in, robust technical analysis and, perhaps most importantly, a neutral and professionally trained third-party mediator to connect all the dots and guide a successful multistakeholder process that could ensure national engagement across many varied interests and positions.

The introductory mandate for MAPS in Chile was signed by Waldemar Coutts on behalf of the IMCCC in August 2010 and a governmental Steering Committee comprising the ministries of Environment, Energy, Agriculture, Foreign Affairs, Transport and the Treasury was constituted. At the request of the president, the
Minister of Environment, María Ignacia Benítez, together with Andrea Rudnick, Head of Climate Change at the Ministry of Environment, presented MAPS to the Economic Development Ministers Committee. In general, there was a positive response to the presentation. The main concerns raised came from the Minister of Agriculture, who wanted to know how binding the exercise was (a problem that had constantly plagued the LTMS and was to come up in every MAPS process, except Brazil), and the Minister of Finance, whose concern was the necessity of including civil society in the MAPS process. All the ministries noted the creeping up of emissions in their sectors.

All these meetings have served to raise the profile of MAPS within senior levels of the ministries. The Minister of Environment sent out an email to all 11 ministries, requesting a personal commitment to MAPS in Chile. All 11 replied in the affirmative. A formal mandate, signed individually by six ministers, soon followed. Later on, a seventh ministry was to be included in the Steering Committee – Mining. MAPS was taking off in Chile.

The key questions for the MAPS Chile process were set out in the mandate:
1. What options (possible scenarios) does the country have, in the short term, to meet the commitments of the Copenhagen Accord, which were noted in the Cancun agreement?
   a. How do we meet a 20 per cent deviation from the baseline effectively at the lowest possible cost?
   b. How do we assign sectoral responsibilities? What sub-objectives could be set to help guide our commitment?
   c. What NAMAs should be prioritised and how can they be financed?
2. As a country, how can we avoid future emissions beyond 2020? How can we decouple economic growth with the growth of GHG emissions? How do we move to a low-carbon economy?
3. What are the economic impacts of the following options: poverty, employment, GDP, finances, inflation, income distribution, competitiveness in export, others?

The process now had the legitimacy of a broad-based mandate across all the relevant ministries, with knowledge and approval from the president. It was now a matter of getting a research consortium together, finalising the process design, getting the stakeholders into the room and starting the project. Chile had been textbook stuff.
Colombia

Colombia has come a significant way in the creation and consolidation of environmental institutions and a legal framework since the 1970s. In fact, Colombia was one of the first countries in Latin America to issue environmental and natural resources regulation in a comprehensive manner. The Code of Renewable Natural Resources and Protection of the Environment (Decree-Law 2811 of 1974) initiates the development of national norms on air quality. Since then, important decrees and resolutions have been issued by the government covering the different sources of pollution.

The 1991 Political Constitution and Law 99 of 1993 are key milestones in the consolidation of national and regional environmental institutions. Law 99 created, for the first time, a Ministry of Environment and set up 33 regional authorities (known as Regional Autonomous Corporations) to cover all of the country, as well as urban environmental authorities for the most populated cities. The Ministry of Environment was tasked to coordinate the National Environmental System (SINA), which is defined as the set of guidelines, rules, activities, resources, programmes and institutions that allow the implementation of general environmental principles contained in the Political Constitution of 1991, Law 99 of 1993 and the 1974 Code. SINA is composed of the Ministry of Environment and Sustainable Development, the Regional Autonomous Corporations, territorial entities and affiliated and linked research institutes of the Ministry of Environment, notably the Institute for Hydrology, Meteorology and Environmental Studies (IDEAM).

Under such framework, the air quality policy has had important developments, and during 2005–2010 the ministry led a process of policy formulation, regulation update and capacity-building activities all around the country.

Climate change concerns followed. The ratification of the UNFCCC in 1996 and the Kyoto Protocol in 2001 set the pathway for the involvement of the ministry in climate change issues. Although Colombia is a Non-Annex 1 Party to the Kyoto Protocol, in 2004 the Climate Change Mitigation Unit was created to act as the Designated National Authority and to deal with the CDM projects.
Since then, climate change policy has enhanced its importance and has broadened its scope, both in mitigation and adaptation. For the first time, climate change strategies and goals were included in the National Development Plan (2010–2014) and a Climate Change Directorate was created within the Ministry of Environment and Sustainable Development to lead these activities. The Institutional Strategy for the Coordination of Policies and Actions on Climate Change in Colombia (CONPES 3700) was issued in 2011. It was to be central to this regulatory approach.

Colombia is considered to be a country with low-carbon intensity. In 2010, Colombia’s participation in total world emissions was 0.35 per cent (excluding LULUCF, otherwise 0.46 per cent all sectors) (World Resources Institute, 2015). In 2010, two inventories were published, the first one for the years 1990 and 1994 and the second one for the years 2000 and 2004.
The composition of the emissions in Colombia reflects the high participation of the agricultural and land use, land use change and forestry (LULUCF) sectors in the national inventory, explained by the high number of cattle and deforestation. Electricity is based mainly on hydroelectric generation and therefore this sector has a significantly lower contribution than the countries that base their electric generation on thermoelectric sources. In the 2004 inventory, energy and agriculture formed 75 per cent of total emissions. The main emissions within Colombia are divided roughly equally between energy supply and use (38 per cent), and agriculture and other land uses (37 per cent) (República De Colombia, 2010). From 1994 to 2004, the emissions of these two sectors grew 24.6 per cent and 23.7 per cent, respectively. The LULUCF and waste sectors grew more than 100 per cent, but according to the National Forest Development Plan (2001), there was no trustworthy information on deforestation rates.

As we saw in Chile in the section above, there was already a strong response to the climate challenge in Colombia. CONPES 3700 (a form of policy in Colombia) of 14 July 2011 was the culmination of the policy process, and contained the following statements:

_Estrategia Institucional Para La Articulación De Políticas Y Acciones En Materia De Cambio Climático En Colombia:

The impacts of climate change have become evident in the world.... The growing risk of facing serious impacts from this phenomenon requires the urgent development of appropriate strategies in Colombia to prepare for the challenges that climate change imposes and that will join international efforts to reduce greenhouse gas emissions. However, in Colombia climate change has not been understood as an issue of economic and social development, and therefore Colombia has not integrated this problem within the processes of planning and investment in the productive sectors and territories. This results in economic and competitiveness losses and increased vulnerability and low capacity to respond to extreme weather events.... Moreover, the country must be prepared to mitigate the causes and adapt to the effects of climate change, taking advantage of opportunities arising from the international will. While it is true that difficulty in the negotiations has not resulted in an obligation to reduce emissions in developing countries, there is a willingness from developed countries to devote resources to finance adaptation and mitigation projects in developing countries.... The Colombian Strategy for Low Carbon Development is a
long-term planning initiative that will allow the country to identify the potential for greenhouse gas mitigation and appropriate measures and projects to be carried out without a negative impact on the long-term growth of the Colombian economy. This strategy seeks to capitalize on opportunities for international finance, promote technology transfer, strengthen co-benefits, prepare economic sectors from possible trade barriers imposed by the carbon-intensity of production processes and promote the country’s image as one that is carbon progressive and efficient. To build a successful strategy based on realistic growth sector, it is necessary to have the active and coordinated participation of all economic sectors. Similarly an inter-sectoral approach to address issues such as energy efficiency, housing and construction, biofuels or electric vehicle fleet, which are the responsibility of various sectors is necessary.

(Conpes, 2010)

The CONPES pointed out that the most important challenge for this vision was knowledge. Colombia desperately needed reliable knowledge on climate mitigation. The MAPS approach to Andrea Guerrero came at a good time, and soon thereafter, on 28 June 2010, Claudia Mora, the Vice-Minister of Environment, wrote a letter to CIFF. In the letter, Minister Mora pointed out that Colombia was going through a critical moment in the definition of its development route and the impact that it would have on its natural resources and on the planet. She pointed out that Colombia was a carbon-efficient economy, which meant that their challenge, as with that of many other developing countries, was not to so much to mitigate GHG emissions, but to achieve projected levels of development without increasing them significantly and diminishing the country’s carbon efficiency. The first step, she stated, was to develop information. This information would be used at the sectoral level to identify nationally appropriate mitigation actions, creating the necessary capacity within each sector for their implementation. She welcomed the support of CIFF and added that the MAPS programme was highly suitable to the country’s priorities in developing a low-carbon development strategy, as MAPS emphasised key shared principles: country leadership, local capacity-building, stakeholder engagement and sharing experiences with other developed and developing countries.

With this, the mandate for MAPS to be included into the Colombian Low Carbon Development Strategy (CLCDS) was complete. The process for mandating could not have been simpler. Stakeholders had found a space within the CLCDS.
Work could begin. First, a more detailed set of questions were worked up to ensure a high degree of relevance to the country:

1. Will the country continue to be considered a low-carbon economy in the future with the expected growth of the strategic economic sectors?
2. Can the country deviate from its BAU emissions without damaging its economic growth?
3. What strategies could a country, with its economy based in the exports of fossil fuels, implement to respond to a low-carbon global economy?

The main objective of the programme was to ‘identify actions that reduce greenhouse emissions while delivering the same economic development’. It is hoped that the following results will be generated from the process:

- A set of measures, policies, programmes, regulatory frameworks and incentives that could reduce national GHG emissions within sectors with a stakeholder collective, and quantitative analysis regarding its economic and social impacts.
- Stakeholder guidance to the government for the CLCDS.
- Build capacity regarding the impact of climate change mitigation strategies to a group of people from stakeholders (private sector and civil society).

It was a pretty easy fit for both the government and for MAPS and we sat down to plan process. We had one difference of approach though: the Colombian Government wanted to split the work, sector by sector, and did not want to build a consolidated national knowledge set. They wanted the fastest route to sectoral implementation. We will explore this difference later. Hence we agreed:

MAPS would focus on five sectors: agriculture, industry, mining and energy, transport, and waste. LULUCF would be dealt with in a parallel process falling under the CLCDS but outside MAPS. The architecture of the Colombian MAPS process differs from the other countries and the South African LTMS experience in that six sector-specific, scenario-building processes were planned and would eventually meet for plenary sessions. Each of these sector Scenario Building Teams (SBTs) would have a sector expert from the Ministry of Environment and another from within the research team within the overall team. The sector expert would work closely with a lead facilitator (which we still needed to find and train) to guide and provide input to the process.
The process would commence with a single plenary session of all the sector SBTs to outline the consolidated intention. Each SBT would then commence its own work, generating data and mitigation actions for its particular sector. These would, from time to time, be sent up to a high-level committee consisting of private sector players, government sectoral ministries (at director and vice-minister level), as well as the Office of the Presidency, who would act in a screening function. The committee, after receiving inputs from the SBTs, would review and make recommendations on those best placed to be implemented in government policy and for use in NAMAs. The kick-off process meeting was set for July 2011, with the process ending in June 2012 to be in line with CLCDS goals. This was the plan.

No sooner had the basic plan been hatched when a reshuffle at political level stopped things moving forward. MAPS reported to CIFF: ‘MAPS progress has been delayed by the postponement in the split of the Ministry of Environment, Housing and Territorial Development into the Ministry of Environment and Sustainable Development and the Ministry of Housing, Cities and Territorial Development.’ This split was due to occur on 7 August but was delayed until 27 September 2011, when it was made official by Decree 3570. The delay in the separation of the ministry had a knock-on effect on the appointment of the Minister of Environment.

The new Minister of Environment, Frank Pearl, was an economist with a master’s degree in Business Administration. His professional background had been in the private sector. In the previous government of Alvaro Uribe he was the High Commissioner for the Peace. The transition process with the new minister meant a complete new update process. Pearl was already examining the CLCDS process, including MAPS. He had misgivings about such a participatory process, at first. Some consultation later and the process was pushed forward.
Peru

As we saw in Chile, mandating processes of this nature is not an easy or rapid business. Peru was to take the MAPS champions and the MAPS International team on a political roller coaster before a final mandate was issued for what became known as PlanCC.

Soon after first approaches to Peru via María Paz Cigarán and Pía Zevallos (who worked at a climate consultancy called ‘Libélula’, which means dragonfly), the Government of Peru responded by appointing a six-person Steering Group, in October 2010. Ambassador Luzmilla and Minister Alberto Hart of Foreign Affairs, Eduardo Durand and Rafael Millán of Environment and Javier Roca and Natalia Salas from Economy and Finance would lead this team. They would take on the task of finalising the full mandate in Peru and would build the project design.

The MAPS study in each country had to be contextually relevant and be driven by a set of questions relevant to the entire society, reflecting priorities within each respective country. These questions would also have to attract stakeholders to the MAPS process: ‘they should want to see those questions answered’ and realise
that it is in their interest to be part of the answers. The Steering Group started by considering which questions would be most relevant. They listed the challenges for Peru as:

- How to develop policies and accomplish the NAMA commitments submitted to the UNFCCC. The importance of taking into account complementary projects within Peru, such as the Third Communication, NAMA design by several cooperation agencies was highlighted by the Steering Group;
- How to build a national carbon market and regional sustainability between Chile, Colombia and Peru;
- Modelling the implications of the trade integration process within Panama, Colombia, Chile, Peru and Mexico;
- The relationship between transport, forestry and agriculture;
- The feasibility of developing a NAMA in the field of sanitation and housing;
- The nature and quantity of investments that could attract a low-carbon economy;
- Providing a model of a ‘Climate Macroeconomic Framework’.

Libélula strongly promoted a ‘development-first’ approach to mitigation, with reductions as the co-benefit of sustainable development. Suggested entry points may thus be:

- What are the impacts of climate change?
- What is needed to avoid these impacts?
- How does Peru stay competitive and resilient?
- What are the opportunities of a green economy?
- What is Peru’s part in playing a progressive role on emissions? What is Peru able to commit to? This is particularly pertinent as Peru is very vulnerable to the effects of climate change and needs an aggressive negotiating position.

These early discussions were key to shaping the project in Peru, but from the wide ambit one can see that the climate project was just starting in that country. The focus on mitigation and development helped to define a project that would be effective. The project, at this stage just in concept form, also needed a name. CCPlan was first decided upon but later this was changed to PlanCC.

In April 2011, these exploratory discussions were cut short by a presidential election. President Ollanta Humala won the vote and was sworn in on 28 July 2011. MAPS could do only preparatory work as the team waited to see what would happen in Peruvian politics. In the meantime, the questions for the PlanCC study were firming up:
1. What are the implications of ‘decoupling’ current economic growth with GHG emissions? How, using specific measures, could a turning-point be achieved?

2. Where, in terms of efficiency and effectiveness, is the greatest opportunity for mitigation in Peru? What will these mitigation actions cost?

3. What will be the impact of mitigation measures in reducing emissions, GDP, employment, productivity, competitiveness and poverty reduction?

4. What are the positive and negative effects of emissions reductions on GDP, employment, productivity, competitiveness and poverty reduction?

5. What other impacts and/or co-economic and social benefits can each mitigation action bring?

6. In terms of the three NAMAs submitted to the UNFCCC, what policies, programmes and projects must be developed to meet our commitments?

7. Which other NAMAs should be developed and in which sectors?

By September, President Humala had appointed his ministers and for the Ministry of Environment it was Ricardo Giesecke. Stefan and the Peruvian PlanCC team met with Minister Giesecke to outline the ideas behind MAPS. The new minister expressed interest in the project and stressed the importance of engaging the National Planning Centre (CEPLAN) in its execution. In this regard, the Ministry of Environment undertook to engage in initial contact with CEPLAN to relay some preliminary information on the MAPS process. CEPLAN, it was announced, would be included in the Steering Group.
The Vice-Minister of Strategic Development of Natural Resources (MINAM), Hugo Cabieses, opened the MAPS Lab in Lima (more about this later) and again expressed his support for the MAPS process. However, the main focus of the new government was elsewhere. He made the point that the global economic crisis was leaving climate and food security issues behind. The new government was deeply concerned with the economy, poverty alleviation and, increasingly, environment-driven conflict. He announced that the new government had decided to implement a ‘social market economy’ to promote the interests of the poor. Climate action had to support this endeavour to be at all interesting to this new political direction.

Just when things appeared to be settling politically, Peru went into a fresh crisis at the end of 2011. In December the Prime Minister of Peru, Salomón Lerner, resigned in the wake of violent protests against a large mining project in the north of Peru. The entire cabinet had to step down in terms of Peruvian law. In the new cabinet, which had to be constituted, President Humala replaced 10 out of 19 ministers. Once again momentous political events put work on PlanCC on the back burner for some months, but the time could be spent putting together a ‘dream team’ for the project, once it kicked off. Both the Minister and Vice-Minister of Environment were replaced. Manuel Pulgar Vidal, an environmental lawyer and professor, was appointed Minister of Environment with new Vice-Ministers Mariano Castro and Gabriel Quijandría. Eduardo Durand resumed his position as Climate Change Director.

All these new personnel now needed to be briefed. The team officially presented MAPS (still called CCPlan at that point) to the two new Vice-Ministers and the new Minister of Environment in January 2012, and, with relief, found that all were very excited by the project. All were committed to strengthening the mandate. This project could help with the mining crisis as well: they reported that due to the recent social conflicts surrounding mining and other activities in Peru, the prime minister had launched a Multisectoral Commission that would develop a ‘new environmental and social vision for investment in Peru’. The Ministry of Environment would then use this commission to launch the CCPlan project. They would also present the project in the Vice-Ministerial Environmental Committee.

Finally the process was ready to go. PlanCC was about to become something of a Peruvian institution.
The job description

The mandates were all contained in comprehensive Project Documents, which set out the questions for the assessments, as well as project timeframes, stakeholder lists and research consortia. Getting country leaders to sign off these full mandates, especially across so many ministries, took time, and many might say that MAPS was a laborious process at this end. But this would pay off, granting the processes the legitimacy they would need to produce results that were relevant and powerful drivers of change. Each country mandate was somewhat different, and these differences were interesting in themselves. But either way, they set a clear job description for each project, which now became known as PlanCC in Peru, IES-Brasil in Brazil, MAPS Chile in Chile and the CLCDS in Colombia.

Champions

Many people acted as country champions and overcame huge barriers to get to the point where the mandates were secure. In Chile: Eduardo Sanhueza, Rodrigo Palma, Hernán Blanco, Andrea Rudnick, Alexa Kleysteuber, Waldemar Coutts, Andrés Pirazzoli, Minister Benítez, Fernando Farías and Tatiana Molina played important early roles. In Peru: María Paz Cigarán, Pía Zevallos, María Elena Gutiérrez, Lupe Guinand, Eduardo Durand, Vice-Minister Gabriel Quijandría, Minister Luis Miguel Castilla and Javier Roca were crucial early players. In Colombia, the early champions were Claudia Martínez, Andrea Guerrero, José Manuel Sandoval, Javier Blanco, Angela Cadena, Sandra Garavito and Ana María Loboguerrero. Finally, in Brazil the project was presented and championed by Emilio la Rovere, Neilton da Silva, William Wills, Carolina Dubeux, Charlotte Heffer, Minister Izabela Teixeira, Luiz Pinguelli Rosa, Carlos Nobre and Andre Largo. Of course there were many others, and these early names were joined by new team members as the projects progressed. In fact, the community involved in the MAPS endeavour now numbers in the hundreds. These early leaders set the agenda, and it is to their credit that five years later, as the all important COP in Paris looms closer, their countries have a large body of knowledge on which to rely.
The issue of leadership

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‘I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity.’

Oliver Wendell Holmes Jr
In Chapter 6, we shall explore the processes in each of the four Latin American countries in detail. Before we do so, however, we pause to consider some of the main intellectual challenges that processes of this nature pose to practitioners, researchers and, of course, to participants and decision-makers.

Processes of this nature are challenging and tough. You age doing them. They are marathons. The best way to approach them is to innovate. It’s easy to write a research paper, or run some models and hand them over to a country leader. It is far harder to engage with leaders within the system, working within its contradictions.

Here are a few examples of this type of innovation, dissected and analysed.

How to make systems change – and really complex things

In Chapter 1, we explored complex problems and change. Change, as we know from much literature, happens for many reasons both rational and irrational, both thought-driven and event-driven. Leadership is often irrational in this way: it takes good (or bad) judgement calls and ‘goes for it’. Knowledge is just one driver of change.
In Mitigation, Action Plans and Scenarios (MAPS), we focused on this one element of change: building knowledge. We followed the basic theory of change that says change can be helped along when people co-produce knowledge that they trust and start to feel compelled to act upon, even if their own interests have pushed against this. In this way, change is about action that ‘emerges’ from a knowledge process. Our focus has been on trying to use knowledge to drive change, and trying as we go, to do better at achieving a result. Our thinking has been that since people drive change in a system, so people need to be influenced, or moved, to act. This assumes that a critical mass of actors in a system start a process of change that builds a constant impetus towards the impact sought (in this case a poverty-free and low-carbon society that is climate resilient and competitive).

Within MAPS, we believe in using co-production of knowledge as a way to intervene in individual behaviour at decision-making level (what we mean is that individuals are empowered to make their own bold commitment instead of having to be convinced to act). Psychological, social and cultural insights can make significant contributions to solving the climate change problem. MAPS professional facilitators know this – but the way we go about this, mainly, is to ensure that the processes are driven locally. For us, the processes have to be indigenous: yes, outside help is useful, but local skill and participation has to drive everything.
In the study drawn up by Cash *et al.* (2003), three mainspring elements are presented to mobilise science to drive more sustainable public policies. They conclude that scientific information mostly influences political responses to environmental issues when they were credible, legitimate and useful. So, if the basic theory is knowledge + people = action, then the knowledge (although limited through models and by system actors themselves) must, at the least, be credible, legitimate and relevant/useful.

By the term credible, we understand the use of the best models and tools available at the time and fit for the purpose. We add openness and transparency (black boxes are opened; copyright does not apply). The concept involves the scientific approval and peer review of technical evidence and topics. Thus, government, as the theory goes, will have the confidence to use the study results when making decisions, safe in the knowledge that the best research practices and the best professionals were involved. Furthermore, companies, non-governmental organisations (NGOs) and scientific communities will have access to information relating to the possible economic and social implications of the different scenarios constructed.

Even if this theory of change enables a workable simplification of the challenge ahead, the complexity is in the detail. How to build the ‘evidence base’, and how to ensure it is ‘credible, legitimate and relevant’, and, more importantly, how to ensure people (and which people) remain engaged throughout the process, and continue striving for change upon the completion of the evidence, remain huge challenges.

Knowledge about systems will always be limited and, in the presence of factual uncertainty, competent leadership is imperative. Leadership, as we pointed out earlier, acts both on the knowledge and when the knowledge is not there. It acknowledges the inherent complexity of the system and ensures progress amidst this uncertainty. So our knowledge-making process needs to make the knowledge available but also to show where the knowledge is lacking or uncertain, and it must be close to leaders so that they can act.

The actions of actors must be aimed at the longer term and go beyond their term of office. The change must be resilient to political and other upheavals. This raises another dimension: the institutionalisation of the entire knowledge making and leadership process. A strong institutional framework is crucial to create some guarantees for the change process.
The high-level government mandate supporting MAPS processes translates into greater ownership of the processes by stakeholders and affected parties. This in turn ensures the transfer and use of the evidence base for timely policy-making. It also starts a process of institutionalisation. It ensures that people come to the party, convinced of the importance of the process and their own contribution to it. We worked for over a year on the mandates, not just to get a stamp of approval, but also to affect major changes in the way in which society will create knowledge on climate change and participate in change to the systems they inhabit. It was a long, somewhat risky, but necessary step.

OK, this sounds pretty thought through, but in reality it’s a lot more messy. Ministers don’t want NGOs in the room; new presidents get caught up in scandals; models don’t work; and oil prices drastically change course. In fact, the sky is full of black swans. As a participant or designer of these processes, you have to constantly invent. The willingness to reflect on action has been a constant within MAPS. We are fans of Schumpeter: there’s nothing like a good dose of creative destruction! In fact, several theories and intellectuals have been inspiring us, and they have helped us to adjust our practice. Complexity theory and systems thinking have been the main domains, as have facilitation and conflict theories, and the construction of models.

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1 Joseph Schumpeter was an Austrian economist and political scientist credited with coining the phrase ‘creative destruction’.
We are aware that there are counter-positions, and that there should be no simple assumption that co-produced knowledge equals action for change; also that co-production itself is not simple. Emily Tyler in the MAPS team has examined this problem closely: climate change mitigation is highly contested as a policy issue and its advocates have had to defend themselves against the long-standing, well-resourced and active opposition of the fossil-fuel economic incumbents, who stand to lose their position under a low-carbon future. This is not a beginner’s game. Special interest comes into opposition with knowledge or brings its own counteractive knowledge. This opposition has largely focused on issues of scientific certainty under the traditional view of science as being epistemologically exceptional (Leyshon, 2014). To defend against this sustained attack has, therefore, required the marshalling of evidence, rationality and a reliance on numbers. It becomes a competition of knowledge, and knowledge is ‘weaponised’ in this way. We see in these processes all three types of conflict: data conflicts, of course, but also value conflicts (for example, we are ‘against nuclear energy’ or ‘we don’t believe in climate change’) and conflicts of interest (for example, ‘do that and our power plants become economically unviable’). Our MAPS facilitators need vigilance to identify these conflicts and design processes of resolution.

At the same time, our years of practice within the climate change community can count against us. Emily Tyler writes:

The natural sciences have traditionally been governed by a positivist and materialist worldview (Sheldrake, 2012), approaching the world as something independent from those that study it, and ultimately knowable with sufficient rational enquiry. Within a natural scientific paradigm, quantification is viewed as superior to qualitative ways of knowing, with accuracy, neutrality and objectivity all highly valued. This applied science paradigm determines what the climate mitigation community of practice has chosen to value and study: Discrete mitigation actions, physical technologies, financing, quantification and inventorying of GHGs, linear policy scenarios and policy instruments feature highly in the international climate negotiations, academic literature, mitigation projects and programmes, and conference topics.

In MAPS, what we tried to do is to get the parties with these opposing interests to try to develop knowledge ‘in the middle’, to co-produce something, and in the process of doing so, to understand each other’s interest positions and to embrace some notion of change.
At the same time, data, information and a resulting body of scientific knowledge remain critical. In MAPS we worked with a huge amount of data, and we followed a route where an evidence base for change was key. In some instances we followed conventional processes in putting this data together: our tools originate from the rational choice theory branch of public policy, which is strongly influenced by an applied science paradigm and relies on assumptions such as rationality, exogenous and known values, single actors, economic efficiency as the goal of optimisation, and there being no interlinkages with other policy issues (Morgan Granger et al., 1999). We produced much of our knowledge by combining co-produced inputs with outputs from computer models, and we tried to predict how a system might operate into the future under certain conditions. Our scenarios were not generalised stories of the future, and we rejected simplified ‘so what’ results.

Perhaps there is some failure in not following a social science-centred approach. Emily echoes Leyshon’s position that ‘the social sciences, including policy studies, need to be repositioned as “an indispensable part of reframing and understanding climate change as a social phenomenon” (Leyshon, 2014). Social change is central to what the social sciences study (Shove, 2010), and nowhere is this more relevant than in a development context’ (Tyler, 2015). So, for example, ‘Hallowes notes that whilst the Inter-governmental Panel on Climate Change (IPCC) is very convincing on the environmental impacts of climate change, it is far less so when it comes to the social and economic systems “because it cannot address power relations or talk about capitalism. It sees patterns of inequality but cannot take account of the interests that create, and are sustained by, inequality” (Hallowes, 2008, p. 15)’ (Tyler, 2015). Towards the end of this phase of MAPS processes, we found ourselves thinking hard about how we could incorporate and combine these two ‘knowledge systems’.

When we focus on developing knowledge, and particularly with computer modelling tools, we take very seriously the point Cilliers (2002) makes that we have to be humble about the limits of this knowledge. We need to approach it with scepticism and care. We know that content is not everything, and so we can also focus on process, on what happens to the humans connecting with the content they are creating or interpreting. More about this later!
This also raises the issue of leadership, or choice. Cilliers again:

Complexity science raises some ethical concerns that refer to the inevitability of choices that cannot be backed up scientifically or objectively (Cilliers, 2000). Why associate these concerns with ethics? First, because the nature of the system or organization in question is determined by the collection of choices made in it.... In a way, the history ... is nothing else but the collection of all these decisions. Secondly, since there appears to be no final objective or calculable ground for our decisions, we cannot shift the responsibility for the decision on to something else.

In other words, where knowledge falls short, or terminates in value, so responsible leadership needs to take over, and in comes ethics.

So although we need to and must work with knowledge, we understand that it has limits and that it needs constant extension to new fields of approach: climate mitigation requires fundamental socioeconomic transformation within an interconnected and highly complex world, and so too will the knowledge have to be interconnected and complex.

We also learn that knowledge often pushes levers of change that are low in the hierarchies of systems. So knowledge may help us to understand and formulate
a carbon tax: but the tax itself may (and often does) have very little impact on the decarbonisation of the system overall. Our knowledge needs to ‘climb this hierarchy of change in the system’. Helpful to our understanding (but not yet to our practice in MAPS – we are just beginners) is the work of Donella Meadows, who looks at the levers of change in society (Meadows, 1999) and stacks them in a hierarchy, in reverse order of impact (that is, the ones at the bottom of the list will tend to cause the greater changes in the system):

9. Constants, parameters, numbers (subsidies, taxes, standards);
8. Regulating negative feedback loops;
7. Driving positive feedback loops;
6. Material flows and nodes of material intersection;
5. Information flows;
4. The rules of the system (incentives, punishments, constraints);
3. The distribution of power over the rules of the system;
2. The goals of the system;
1. The mindset or paradigm out of which the system – its goals, power structure, rules, its culture – arises.

It is interesting in MAPS that whenever we tried to set a goal for the knowledge, like, for example let’s be carbon neutral by such-and-such a date, there was instant resistance. This is because such a goal is a big lever. If we start to look at the relationship between inequality and the low-carbon society, we are also in big lever territory. In MAPS processes, we were constantly forced up to the areas of levers 6 to 9, and forced to stay there, both by our interest holder participants (stakeholders), but also by researchers and managers of the process, careful not to stray too close to an examination of the deeper structures within society.

In grappling with our approach to change, we faced down some thought challenges ‘within’ the primary objective. Here are some – and we will start with process.

How to design a table and chairs: ‘process design’

One of the ways of taking up this challenge is to redraw the way processes are designed. By design we mean, which people are at the table and how do they co-produce knowledge and ask and answer questions relevant to the system that concerns them? What is the shape of their conversation? How do we make it effective?
In MAPS, independent facilitators were given the task to design the MAPS processes (with accountability to the governments who give the process its legitimacy). Lessons were certainly learnt, and here we isolate a few.

# Scenarios

Firstly, central to MAPS are scenarios. Much has been written about scenario theory, and there are many different types of scenarios. In MAPS processes, scenarios were sometimes normative, where a desired end point is chosen and a scenario is structured around that. We shall see (in Chapter 6) how this applied in ‘Required by Science and Equity’ scenarios. Some were projections, using models to shape trajectories into the future, in a combination of human inputs and computation. Here, for example, is the scenario framework for the MAPS process in Chile:

![Figure 5.1: The scenario structure adopted by MAPS Chile. Source: MAPS Chile.](image-url)
The upper scenario, which is a reference case scenario, is a projection-type scenario where a model projects how a system might behave with certain constants and assumptions present. The scenario-building stakeholders would agree these entries. It would ultimately represent a scenario with current policies, including current mitigation plans and policies. The lower scenario (the blue one) is a normative scenario, which takes an agreed end point and simply draws a trajectory to that point. These types of scenarios were the most ‘risky’ to stakeholders, but, when used, create a healthy tension between what the system is likely to do (how much it will emit, grow, etc.) and what it ‘should be aiming for’. The middle scenarios are exploratory: they postulate that if we change the reference case story, by, for example, introducing mitigation actions or a carbon tax, we will change the trajectory. These are modelled.

Scenarios could look very different. Figure 5.2, for example, is an early design for the IES-Brasil process in Brazil.

![Figure 5.2: Early scenario structure design for IES-Brasil (not adopted). Source: MAPS report.](image)

We shall not pause too long on scenarios here, as this is a large topic well covered in many studies. In MAPS, our scenarios helped to present a number of options, so that decision-makers could assess and select, rather than feel manipulated by a single knowledge set. This is a well-known advantage in using scenarios. However, in all the countries there was a degree of ‘scenario betrayal’, where scenario builders feel betrayed once the knowledge they have created becomes part of a policy that constrains their interests.
Who is in the room?

A second part of the design was to select the right people to help build the scenarios. Again there is much written about stakeholder selection, and indeed, each country followed its own approach to this challenge. The legitimacy of the process was key to bringing stakeholders to the table. Stakeholders were senior players in society and needed to be hooked in, and large government mandates helped to do this: they wanted to be chefs in the kitchen and not on the menu!

Selection of stakeholders was a complex mix of criteria and screens for selection, and expert and government appointments. Selection itself had to be legitimate. All four countries developed bespoke methodologies for selection, but common was that stakeholders came from across government, from business and from civil society. Common also, was that stakeholders were appointed as scenarists. They were not seen as representatives of sectors or of companies, but operated as strategic thinkers from their sectors, participating in an individual capacity.

Creating the conversation

The job of the facilitators, once the stakeholders were in the room, was to manage the co-creation of knowledge. This would be a mixture of processes, from conflict mediation to conversation facilitation. The choice of these facilitators was a real challenge for MAPS, given that there is no real profession of this kind in most of Latin America. MAPS, in fact, helped to train a group of facilitators for this type of work. In the end, the key importance of these people was recognised and they partnered with the Research Leads to effectively design and run the processes. In Brazil, Barbara Oliveira took this role; for Chile, it was Hernán Blanco; in Peru, César Guzmán-Barron Sobrevilla, followed by Zorobabel Cancino; and in Colombia, Javier Blanco, followed by Ivan Darío Lobo. The forerunner of their role was Stefan Raubenheimer in South Africa.

In Brazil, our facilitator Barbara Oliveira designed the process around four main tools: Chaordic Steps, Consensus Building, the Divergent–Convergent Model and Leadership Dialogue. We use this as an illustration of process design.
Brazil used the Chaordic Steps process: a model created by Dee Hock, founder and first CEO of Visa, and widely used by the facilitators’ network called Art of Hosting. The word Chaordic is derived from the combination of ‘chaos’ and ‘order’ and, according to the definition furnished by Hock, refers to the ‘behaviour of any organism, organisation or self-organised and self-governed system that harmoniously combines the characteristics of chaos and order (loose translation). Neither chaos (one extreme) nor order (the other extreme) can exist in a creative space, where one is too free and the other is too regimented. In the Chaordic approach, the process aligns the aim of the work to be done and various visions, and different interests can come together to form a common and legitimate result set. In addition to a way of understanding systems and organisations, the Chaordic Steps are a way of practising leadership.

The Chaordic Steps were used to draw up a process for each of the five scenario meetings that took place between April 2014 and March 2015 in Brazil.

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3 Ibid., p. 13.
### Table 5.1: Using the Chaordic Steps to draw up a process in Brazil.

<table>
<thead>
<tr>
<th>Chaordic Steps</th>
<th>What it entails</th>
<th>In the IES-Brasil project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Need</strong></td>
<td>Need is the reason that drives the process. The first step in drawing up a process is identifying the ‘reason’, which generates the demand.</td>
<td>Understand the importance of extending public space when constructing public policies relating to climate changes in Brazil, and the role that science plays in aiding this construction so that such policies are less polarised, more consistent and more win-win.</td>
</tr>
<tr>
<td><strong>2. Aim</strong></td>
<td>The aim derives from the need and should consist of a clear phrase that will guide the process. It is the ‘what for?’</td>
<td>The IES-Brasil project exists to create a constant set of results through the construction of mitigation scenarios and verification of their economic and social implications.</td>
</tr>
<tr>
<td><strong>3. Principles</strong></td>
<td>The principles must be clearly drawn up and should guide the collective work towards achieving the aim.</td>
<td>Additional principles were incorporated into the IES-Brasil process: confidentiality, respect for individual contributions, and participation in the personal capacity.</td>
</tr>
<tr>
<td><strong>4. People (stakeholders)</strong></td>
<td>The design develops a map of people who need to be included in the process.</td>
<td>The people involved in the Comitê de Elaboração de Cenários (CEC) were invited on the basis of various objective criteria.</td>
</tr>
<tr>
<td><strong>5. Concept</strong></td>
<td>Taking the aim, principles and people involved into consideration, the general concept of the participatory process must be drawn up – ‘what it is?’</td>
<td>The CEC was a safe environment in which to exchange knowledge, build connections and develop collective results.</td>
</tr>
<tr>
<td><strong>6. Limitation beliefs</strong></td>
<td>When creating innovative processes, it is common to come up against obstacles and barriers, both internally and externally.</td>
<td>The lack of trust between the members, the feeling of not being included, the belief that this would be an exercise without impact or a disbelief in a possible convergence relating to scenarios are limitation beliefs that could bring the process to a temporary halt, but which, in step 8, are overcome.</td>
</tr>
<tr>
<td><strong>7. Structure</strong></td>
<td>The actual structure of the process – technical, human, social, financial.</td>
<td>The IES-Brasil process is a flexible dialogue structure with summit meetings, sectorial tables and work groups, using consensus decision-making processes, with both a physical and virtual presence.</td>
</tr>
</tbody>
</table>
| **8. Practical** | The practical comprises carrying out work within the structure created, according to the aim and principles that have been established, thus providing ongoing learning and process adaptation. | During each meeting, the following were used:  
• Material used during preparation (PowerPoint presentations with results and/or preliminary report with discussion)  
• Preparation webinar  
• Invite for the meeting  
• Preliminary agenda for the meeting  
• Presentation sessions; templates for guided discussion  
• Guidelines for the facilitators at the tables  
• Minutes of the results from the face-to-face meetings  
• Webinar with absentees  
• Interviews with CEC members. |
 Situation Assessment and Consensus Construction methodologies

The Situation Assessment and Consensus Construction methodologies proposed by the Consensus Building Institute were used, in particular, to map the stakeholders/specialists that would be involved in the IES-Brasil project. Even though IES-Brasil was not an agreement-building exercise per se, every component entered into the study would be agreed. Hence, every ‘decision’ in the study was agreed. For example, decisions with regard to the aim of a public policy, the year of its implementation and rate at which it comes into force, were all subject to discussion and a search for convergence between the specialists involved in the project.

So that it was possible to work using consensus decisions, it was necessary to adopt segmentation techniques and construct decision pipelines with an open preview of the preliminary results, thus paving the way for collective discussions relating to visions, perspectives and individual conditions without preconditions. This segmentation is very important in MAPS. Bob Scholes, a member of the South African Long Term Mitigation Scenarios (LTMS), referred to this as the separate ‘magisteriums’ of each element of the resulting scenarios. In this way, nobody knows where the results may lead, and so cannot bend an unwanted result.

During the construction process, the interests of the different individuals and groups forming the CEC were considered, as well as the convergence and divergence points and areas of possible agreement. This resulted in a mapping of the areas of possible conflict. In order to ensure the evolution of the discussions and decisions when working against the clock, the method established the following assumptions: (1) linear evolution, involving no backtracking on commitment, or rather, it was only possible to amend the consensus if a new consensus was provided. In the event a new consensus could not be provided, the previous would stand; and (2) non-disposal, a guarantee of productively moving forward in the event of non-consensus, which would generate alternative practices with regard to subjects and decisions where there was no consensus.

During the process, work groups were created to drive and resolve technical differences, carry out sensitivity analyses and test hypotheses. These groups supported the plenary consensus processes by solving difficult problems behind the scenes.
During the process, close contact between the CEC members and the research, coordination and facilitation teams working on the IES-Brasil was established, both in order to be able to exchange technical information and to accompany the expectations of the members and obtain contributions relating to improvements in the participatory process.

*Team art, Chile: Blanco.*
The Divergent–Convergent approach, which was used in Brazil, treats moments of deadlock as moments of creativity. Divergence would normally take place at the start of a discussion (either at the start of a meeting or the start of the process, which would then be drawn out across a number of meetings), when participants would share their ideas and freely debate, looking for different points of view, without judgement and without making a definitive selection with regard to options. Knowledge ‘diverges’ in this phase. This is what is known as the exploratory phase. At a later stage, it was necessary that, together, the participants look for common pathways – either through group work, which helps in the consensus, or through decision-making rules, such as voting or acceptance via consensus. This is what we call convergent thought, which is a phase during which ideas are organised into categories, main points are summarised and the participants aim, without judgement, to reach an agreement.\(^5\)

The dynamic decision-making described by Sam Kaner\(^6\) inspired the entire scenario construction process carried out by the CEC. It is worth highlighting that the rule under which the CEC worked during 2014 was that the consensus would not go backwards, which made it possible to allow a large number of specialists to take part – more than 60.

Figure 5.3 illustrates the dynamics of decision-making and the moments of convergent and divergent thoughts during the process.

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5 Ibid., p.6.
Leadership dialogue

The entire IES-Brasil process rested on the conversational leadership concept. According to the definition given by the educator Carolyn Baldwin, conversational leadership is ‘the intentional use a leader makes of a conversation as a key process to cultivate the collective intelligence necessary to create a value both in business and in the social environment.’

By recognising the importance of dialogue to reach solutions, it is possible to strategically plan the development of conversations. Figure 5.4, drawn up in the context of World Café methodology to facilitate significant conversations, shows the elements that must be considered by a leader to create a strategic participatory process.

Innovative Leadership and Training Development


Dialogue is seen as an instrument to generate new knowledge, stemming from an aim and strategic intention shared by the group involved in the said dialogue. In IES-Brasil, the final result – a set of reports with additional mitigation scenarios – suggested a path that would allow this end goal to be reached. The three ‘domains’ suggest the three pillars of the process: hence ‘questions and critical issues are set in the mandate and confer relevance and legitimacy; stakeholders lend legitimacy and credibility; and, finally, the collaboration with research provides rigour and credibility to the results. Central to this is conversation: it is the gear that moves the process to its aim.

The scenarios emerge

In the end, each country’s scenarios, or knowledge sets, emerged differently as a result of differences in the mandate, differences in process design, and so forth. Chile and Peru were most similar to LTMS. Colombia’s original focus at sector level resulted in Marginal Abatement Cost Curves (MACC), which are not really scenario-building stuff, but in a second phase, the options emerging from the MACCs were strategically combined into mitigation scenarios and plans. Brazil skipped the ‘lower end’, the normative scenarios Required by Science and Equity.

Extensive discussions and considerations surrounded the definition of the reference case scenarios. Elaborating on the Peru example: we conceptually discussed the idea to turn the traditional Business as Usual (BAU) scenario into a scenario set, where a set of development goals was achieved, with no environmental-related constraints. This would have been a radical design departure from the LTMS, where, to put it plainly, development is simplified to gross domestic product (GDP) growth. The next steps would have been to examine the impact of a number of constraints into these scenarios, derived, for example, from water scarcity, environmental conflicts and greenhouse gas (GHG) emissions caps. Resulting scenarios would be assessed against social and economic implications. The rationale of this approach was the need to realise the implications of the current growth model in Peru and interrogate its sustainability. In drawing the mitigation scenarios, one would have been able to understand what mitigation opportunities have to offer in terms of development.

A major challenge that this concept runs into is the complexity of defining and modelling development paths. In spite of the efforts in embedding mitigation within development practice, the current practice continues to be the modelling of mitigation interventions. In other words, and to put it in black or white, we derive a number of mitigation scenarios from a single development path rather than generating several development paths and deriving the mitigation impacts from these. The idea was abandoned in Peru simply because of time, budget and methodological constraints.

The work on understanding mitigation activity had started early on. The researchers in each MAPS country were initially asked to review mitigation actions developed thus far in a case study. Harald Winkler was quick to realise that very few case studies of mitigation actions or nationally appropriate mitigation actions (NAMAs) were assessed in the Inter-governmental Panel on Climate Change’s (IPCC’s) Fifth Assessment Report (AR5), even though its Chapter 15 was focused on the national level (IPCC, 2014). Of the limited literature, very little was written by authors from developing countries, even though NAMAs were actions to strengthen participation from the South. MAPS
country case studies were published in a Special Issue of *Climate and Development* in 2014, thus filling a gap in the literature – at least partially, in Latin America and South Africa – enabling assessment in AR6. This on its own has international significance and contributes to long-term sustainability of this academic work. Analytically, important contributions were made by the five in-depth case studies: (Delgado *et al.*, 2014, for Colombia; E. L. La Rovere *et al.*, 2014, for Brazil; Sanhueza & Ladron de Guevara, 2014, for Chile; Tyler *et al.*, 2014, for South Africa; and Zevallos *et al.*, 2014, for Peru). Further contributions were: the international policy context (Coetzee & Winkler, 2014) and the comparative analysis – exploring similarities that can support more general lessons, while remaining sensitive to important differences specific to each context (Garibaldi *et al.*, 2014). Learning needs to continue; further deepening and broadening is still required, for example, reflecting on the role of the concepts of mitigation actions, NAMAs and low carbon development strategies (LCDS) for advancing mitigation policies in the Global South, such as the work of Tyler *et al.* (2013). Winkler, (2014) describes some emerging lessons based on all the work above.

In the period following the finalisation of the case studies and now with the support from the stakeholders, a total of more than 320 interventions had been identified, discussed and analysed. The challenge became then packing them up to understand systemic changes.

*Table 5.2: A summary of the scenarios generated in each MAPS country. Source: MAPS Final Results Paper (Rojas, et al.)*

<table>
<thead>
<tr>
<th>Reference Scenarios</th>
<th>Brazil</th>
<th>Chile</th>
<th>Colombia</th>
<th>Peru</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Scenario (Government Scenario) – based on Copenhagen Pledges</td>
<td>BAU 2007</td>
<td>BAU 2013</td>
<td>Reference and Inertial Scenarios</td>
<td>Reference Scenario</td>
</tr>
<tr>
<td>Number of actions</td>
<td>51</td>
<td>96</td>
<td>97</td>
<td>77</td>
</tr>
<tr>
<td>Additional mitigation 1 (mitigation actions costing 20US$ or less)</td>
<td>Base effort</td>
<td>Grey</td>
<td>Cost-Saving</td>
<td></td>
</tr>
<tr>
<td>Additional mitigation 2 (mitigation actions costing 100US$ or less)</td>
<td>Middle effort</td>
<td>Realistic</td>
<td>Sustainable</td>
<td></td>
</tr>
<tr>
<td>Additional mitigation 1 + Carbon tax (20US$ tax)</td>
<td>High effort</td>
<td>Green</td>
<td>Fast</td>
<td></td>
</tr>
<tr>
<td>Additional mitigation 2 + Carbon tax (100US$ tax)</td>
<td>Energy efficiency</td>
<td>Sustainable + Carbon tax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required by Science (RBS)</td>
<td>RBS (range)</td>
<td>RBS simple, per capita, combined</td>
<td>RBS</td>
<td></td>
</tr>
</tbody>
</table>
The crucial part of the work became defining the narratives of the mitigation scenarios, or the criteria to pack mitigation actions into scenarios; and, the interesting part, comparing the emerging scenarios to the narratives in the other scenarios, such as the reference case and the normative RBS and Equity ones.

All the countries used criteria that would relate to the level of effort to pack the different mitigation scenarios. In Brazil, this was directly interpreted as a relative mitigation abatement cost threshold. Effort levels were defined in Chile as a combination of abatement costs, potential and feasibility (technical, economic and institutional). Feasibility was the main determinant. For Colombia and Peru, it was a combination of relative abatement costs and some aspects of feasibility. There was an additional scenario in Peru, ‘the ideal one’, which was called Sustainable Scenario by the stakeholders. In addition to this, Chile used a different criteria set to generate six further scenarios, as requested by the Scenario Building Team (SBT). They called them ‘thematic’ scenarios, and the approach was about grouping certain type of technologies and/or measures together. In Chapter 7, we shall go into detail on each of these scenarios.

A new way to do research

Inherent to the MAPS approach is a facilitated collaboration between researchers and stakeholders. This collaboration fundamentally transforms how knowledge is produced and disseminated. This collaboration gives place to the known concept of ‘co-production of knowledge’, which is at the heart of the MAPS theory of change, as explained earlier.

Why combine process and research? There are a number of reasons. With hindsight, and using the assessment conducted by Paulina Calfucoy for MAPS Chile as an example, two categories of positive impacts have been identified. The first one relates to the improvement of the quality of scientific research and enrichment of contextual information for public decision-making. The second category is about the improvement of public decision-making, enriching understanding of the causes, dynamics and implications of problems. From a more pragmatic perspective, the combination of process and results is convenient when research budgets are limited, and therefore the capacity to compile (not generally available) robust and local data and to model is limited too. In this context, expert opinion and judgements become critical.
MAPS brings information based on research into the process, so stakeholders have the opportunity to (1) commission the research teams and approve their methods; (2) examine input assumptions and data; (3) look at initial results and ask for reruns. This is very different to the usual approach of presenting the final study results for comment and then having a kick-off meeting. A recent analysis of MAPS Chile, conducted through a number of interviews among key stakeholders, corroborated that the results generated by MAPS had been significantly enriched through being developed in a collaborative way, integrating the experiences of researchers (the research team and consultants), expert perspectives of the SBT and political validation by the Steering Committee and representatives of the Ministry of Environment. The exercise of collaboration and co-production increases the understanding for non-experts of the limitations and opportunities that sectoral and macroeconomic modelling offers and also provides credibility and validity to the results, while recognising the levels of uncertainty that prevail in the results. In other words, these processes are an opening up of the ‘black box’ of modelling, which usually stays in the control of those that operate it.

Calfucoy explains that the integration of local knowledge through local experts and researchers made it possible to include in the exercise, in the best possible way, the micro-dynamics of the sectors, a better understanding of the productive structure in the country for emission estimations, and a better understanding of technological conditions and preferences. In particular, this was very important for discussions on the penetration rates of measures and the identification of the measures themselves. However, this approach may have trade-off with the depth of the discussion that can be achieved, much depending on the availability of specialists.

The iteration between all actors (research team, consultants, technical groups, SBT members and the Steering Committee) generates a built-in peer-review community, where assumptions, methods and results are subjected to public scrutiny by interested stakeholders in multiple stages. An excellent research core team is, nevertheless, essential to enhance the scientific rigour and to enforce high-quality and robust outputs when in-depth review is compromised by limited stakeholder feedback.

The second benefit of the approach towards research within MAPS is found to be its potential for impact on decision-making. In Calfucoy’s words, the process of integrating research through modelling, through participation of experts and through broad connections with the public sector facilitated a ‘socialisation’ of
complex results. The final result is not the only value of the process, but also the lessons learnt along the way. This is particularly true for the public sector. The MAPS processes provided the best possible transparency of the uncertainties and complexity of the estimates and the methodological decisions at the base of the studies. Stakeholders were able to identify the variables that influence estimations – thus providing better opportunities for recognition of the solutions and obstacles to implementing the mitigation options.

Beyond its co-production nature, the research that takes place within a MAPS process is applied, is made within the country, has a fundamental problem-solving character in response to a clear mandate, and is transdisciplinary, given its broad participative nature. According to innovation literature, these are key elements to be able to enhance innovation throughout the work. We hope to depict some of the innovation that has emerged from these processes in the following sections.

From a research perspective, the first step was to gather a research consortium, a research lead and a research plan. The integrity and richness of the research consortiums were critical to the credibility of the work and to make transdisciplinarity a reality. Regarding the integrity of the research consortium, we were concerned with the composition and leadership. The aim was to build a consortium with individuals who had all the required skills and capabilities.
The final configurations of each of the research consortia in the various countries were very different. The main considerations were the number of different institutions to be engaged (and the feasibility and complexity of its institutional arrangements), the range of skills needed and the need to build capacity along the way. For example, the Government of Peru expressed the wish to engage as many universities and national organisations as possible as a way to build capacity. Each of the research consortia had specific ways to interact with additional experts and the government-based Steering Committee. Each of these configurations had pros and cons. The more complex structures lead to huge efforts in coordination and harmonisation. The coordination hubs, as in the Chilean case, became a counterpart of external bodies that provided support to the processes, emerging as a best practice for management of external services.

Research Leads also had to be identified in each country. This leader would become critical to the entire process. The Research Lead would require excellent skills in process and research-related arenas, as well as vision, leadership and an ability to persuade. A challenge across countries has been the need to change the mindset of the research team. This was a continuous job for the Research Lead. Researchers often resisted the co-production approach because their work was timed according to process-related milestones, was continuously exposed to public review, and reviewed by people from very different backgrounds. Changing from producing a report to providing information to a process also required a different dynamic. Mónica Espinosa, researcher at Universidad de los Andes, emphasises that an appropriate alignment, coordination and allocation of distinct responsibilities for process and research activities is needed for the MAPS approach. Calfucoy’s MAPS Chile assessment reveals the researchers valued the final results due to the fact that they had reached a wide audience and had been validated and strengthened through the process.

The co-production approach also comes with the need to deal with unknown elements and adjust the plan as we advance. For this, we found the most important skills of the Research Leads were the ability to anticipate risks, challenges and conflicts; the willingness to take risks; the ability to adjust and change; the ability to listen and understand; the willingness to give, and knowing when to probe (in other words, searching for excellence); being able to trust in their team and results; and the sense of balance between strength of their conviction and open-mindedness. Last, but not least, the communication skills of the Research Lead became of utmost importance. Complex research work had to be explained in plain language to ensure inclusive process so as not to lose people and/or interest along the way. The Research Lead had to be a real powerhouse, in other words.
This search for suitable Research Leads was not an easy task, but it was pretty much taken care of in MAPS. We found Emilio La Rovere in Brazil, María Elena Gutiérrez in Peru, Rodrigo Palma in Chile and Ángela Cadena combined with Eduardo Behrentz in Colombia, all of whom followed in the footsteps of Harald Winkler in South Africa. All were highly regarded scientists in their respective countries. Having said that, they could not have done the job without a strong research team behind them, and strong Process Leads next to them.

With a core research team in place, planning had to start. Everyone applied the ‘do-it-yourself’ concept. Each team had to make do with local know-how and use local-driven and self-sufficient research capacity, as opposed to relying on external experts. MAPS research aimed at using world-class modelling and the highest-quality research standards but doing it all indigenously. In many instances, this was achieved. Highly valuable input came from offshore, from the Institute of Structural Research in Poland in the case of the Chilean team, and the Centre International de Recherche sur l’Environnement et le Developpement (CIRED) in France, for Brazil. The collaboration with other MAPS country peers and with the MAPS international team contributed further to achieving excellence.

What you put in you get out

Computer modelling programs are useful tools. They can be used to draw up scenarios that illustrate the possible outcomes of different emissions reduction actions and present us with a platform for comparison. The results, if communicated effectively, can assist decision-makers and other stakeholders to work together in order to steer their countries and economies towards a lower carbon pathway in the longer term. Modelling is central to MAPS.

Models aren’t perfect

In the context of complexity, the role of models is described in the following way by Csánya (in Boulding & Khalil, 1996: 148). A model is:

Any kind of scientific statement, concept, law, and any description of a phenomenon is a model construction that tries to reflect phenomena of the external world. Reality is extremely complex; it consists of strongly or more weakly related events. Science makes an attempt to separate and isolate different effects and phenomena. It seeks the
simplest relationships by which examined phenomena can at least be described or demonstrated. It creates simplified models which only partly reflect reality, but which allow contemplation, and what is most important, pragmatic, even if sometimes modest, predictions.

Clearly, we cannot deal with reality in all its complexity. Our models have to reduce this complexity in order to generate some understanding. In the process, something is obviously lost. Cilliers concludes that, while we have to work with these models, it is impossible to make a perfect model of a complex system, hence our knowledge will always have shortcomings, be flawed (Cilliers, 2002). Parties with opposing interests will, of course, find these flaws!

With the premise of models being imperfect but useful, MAPS processes adopted a forward-looking approach to mitigation assessment, which in fact gives precedence to mitigation goals (Shukla, 2013). Here the toolbox is huge. There are several different models that can be used for scenario-building in the context of mitigation and development. Some models run on off-the-shelf computer programs, as readily available as an Excel spreadsheet; others need custom-made software that requires high levels of skill to use effectively.

So which model is the right one?

The first step, when picking through this toolbox, was to identify the key policy questions that needed to be answered, namely those in the mandates, and then to match these with the best tool. Since no single model can address all questions of varied stakeholders, MAPS teams quickly realised it would be important to use a suite of apt (ideally linked) models. Energy systems, plus other key GHG emitting sectors such as agriculture, forestry and land use changes, contribute the bulk of the emissions in the MAPS countries, therefore these would require the largest modelling muscle. But the other critical question to be answered would be around the social and economic implications of the mitigation action, and thus economy-wide models would need to play a key role.

The full costs and benefits of low-carbon development and mitigation are estimated using two approaches, namely top-down (macroeconomic) or the bottom-up (technoeconomic). The best bet is to combine these, and hybrid models that include features of both approaches do exist (Shukla, 2013). These approaches are based on
traditional economics and belong to the Cost–Benefit Analysis method. This takes a utilitarian perspective by providing monetary valuations to all impacts involved (Scrieciu et al., 2014). MAPS teams were asked to provide information on abatement potentials, costs and benefits of individual and combined mitigation measures and to choose a combination of mainly econometric and simulation, bottom-up, end-use models, coupled with the use of macroeconomic models.

The choice of model and the level of disaggregation had to be made early on, as data gathering and analysis would be strongly shaped by this choice. The main considerations, in addition to the desired outputs defined by the policy questions, were the availability of skills in the country to operate the available models (Merven et al., 2013). The choice had to be realistic. Other considerations were: availability of funding to conduct the modelling work, data availability and time available for the study – all real-world choices. As the statistician George E.P. Boxhow said: ‘Essentially, all models are wrong, but some are useful.’

Table 5.3: Summary of all models used within MAPS.

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>Chile</th>
<th>Colombia</th>
<th>Peru</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy supply</td>
<td>Message</td>
<td>LEAP w/ optimisation</td>
<td>UPME models (MPODE for electricity generation) + LEAP + Other Excel-based model</td>
<td>PERSEO + Excel-based model</td>
</tr>
<tr>
<td>Energy demand</td>
<td>LEAP</td>
<td>LEAP w/ optimisation</td>
<td>UPME models (MAED) + LEAP + HOMER Excel-based model Buildings: HEED</td>
<td>LEAP</td>
</tr>
<tr>
<td>Industry</td>
<td>Excel-based model specifically developed</td>
<td>Excel-based model specifically developed</td>
<td>Excel-based model specifically developed</td>
<td>Excel-based model specifically developed</td>
</tr>
<tr>
<td>Transport</td>
<td>LEAP</td>
<td>Excel-based econometric model</td>
<td>Transportation: MEEAVE + Other Excel-based models specifically developed</td>
<td>Excel-based model specifically developed</td>
</tr>
<tr>
<td>Waste</td>
<td>IPCC Waste model</td>
<td>Excel-based specifically developed model</td>
<td>Solid waste: IPCC Waste model + Other Excel-based specifically developed models</td>
<td>Excel-based model specifically developed</td>
</tr>
<tr>
<td>Agriculture, forestry and land use</td>
<td>BLUM - partial equilibrium model</td>
<td>MESS + Excel-based model + AgriLU</td>
<td>Impact + DNDS + Land use model + Excel-based model</td>
<td>Excel-based model specifically developed</td>
</tr>
<tr>
<td>Macroeconomic</td>
<td>MACLIM - BR (Hybrid static CGE)</td>
<td>MEMO2 (DSGE)</td>
<td>MEG4C (Static CGE)</td>
<td>Static CGE</td>
</tr>
</tbody>
</table>
We have selected five common and varied challenges that hopefully illustrate, in a very simplified way, the complexity of the work that followed after the selection of tools. This is certainly not a comprehensive list of the challenges encountered. Some of these were resolved successfully, while others left much to be improved in future work. We start with discount rates, move into integration and coordination of bottom-up results, sequencing of interventions and reference case-related troubles. We dedicate a separate section to our central question of development. This includes our main analytical challenge: linking bottom-up sector-based and economy-wide models, the ‘unreal perfection’ of general equilibrium models, the research on poverty and mitigation and other co-benefits (or co-impacts, as the Chileans would remind us). We finally touch on three distinctive challenges in the Global South: data availability, highly uncertain futures and contentious implementation performance.

Discount rates

As per all cost–benefit types of analysis, one needs to reduce all costs and benefits to a single number in present value. This ushers in the well-known – but always controversial – discussion on discount rates. As we know, the discount rate has a significant impact on the final results of an analysis. As Dane and colleagues wrote, there is no consensus in the literature on which discount rate to apply (Dane et al., 2012). The debate is basically divided by the prescriptive (based on the principle of sustainable development and promotes ethically motivated decisions on the distribution of welfare across generations) and descriptive (based on observed phenomena and the efficiency criterion) approaches. Choosing which approach or mix of approaches to adopt is the first but not the only consideration. Further considerations include whether to use a constant or declining discount rate over time, or different rates according to the types of projects being considered and their time horizons. Regardless of the final chosen numbers, experiences from MAPS highlight the importance of transparency. Countries noted the need to clearly articulate the objective of the assessment and how this influenced their choice of discount rate, the process for determining the assumed implementing agent, and the local context variables that informed the final choice. MAPS teams dealt with this contentious issue within the broad participative process by varying the discount rate. This was done either over time, or according to different agents involved in the implementation of the respective interventions. Common values varied between 4 per cent in Peru and 10 per cent in Chile and Colombia. In Chile, various levels were used for different sectors and purposes, including values of 1 per cent and 3 per cent. The teams also undertook sensitivity analyses to unpack the impact of discount rates on the results.
Working with several models

Another common challenge was the integration and coordination of the use of several bottom-up models, housed with different specialist researchers. The bottom-up models are based on technoeconomic perspectives and are built on a disaggregated, sector-level representation of the economy (Shukla, 2013). They include detailed characterisation of technologies and reflect the optimistic engineering view of technological progress (Shukla, 2013). Every country agreed, in advance, the value of the main macroeconomic variables, as most of them would be the drivers of the emission profile of the sectors. They also agreed on the level of detail of the outputs, and specific output variables. The concerns were with overlaps and double accounting of interventions and the effect of interventions on each other. Coordination of research teams played an important role, and different methods, or even platforms, were developed for this task. Ultimately, a linked model platform, as we will explain in a later section, was a convenient solution to improve inter-effects. And lots of manual double-checking!

Sequencing

Whereas working with multiple models was a rather mechanical problem, the issue of sequencing was a challenge of a more intellectual type. In MAPS, we generally tried one measure at a time (minding measures that impact each other), as opposed to pre-assessing and defining combinations of measures, with particular sequence patterns that would make sense to a particular objective. The timing of the individual mitigation actions was the consequence of the expert analysis based on the questions, ‘when could this action start, in practice?’ and ‘what would be the expected timeframe of the action?’ There were no other systematic considerations for prioritising or delaying the implementation of an action, or shortening or extending it over time. Nor were there considerations of limited budget or investment thresholds – and, important to note here, optimising models were rarely used. There was a careful assessment of the compatibility of timing of different mitigation actions. The MAPS community has identified this as an aspect to be studied further, especially in relation to informing implementation. The optimisation of supply–demand interactions remains challenging, and further research is needed to improve current assessments.
Reference cases

Reference cases, and the choices for their development, was another challenge for MAPS, and indeed has been a global challenge for some years now. Bending the curve of the reference case presupposes an increase in costs if one assumes (as we often do) that the reference case is a scenario of equilibrium and least cost. But is this so in developing countries? In MAPS we have approached reference cases in a different way: by commonly internalising the fact that our economies are not as stable as those of the industrialised countries and, important for our analysis, that our countries have already put effort into mitigation policies. All our reference cases represent different interpretations of ‘Current Policies’ scenarios. However, to point out a pending challenge, we have not been able to capture the negative economic impacts of current action (that is, the cost of climate change impacts, such as storms and floods, on the system) in the reference scenarios (nor have others). This might be of little relevance for the 2030 timeframe, but not for a 2050 horizon. The challenge in doing this is, to a large extent, the disconnection between national action and global warming (what China does to reduce emissions has a far greater effect on impacts suffered in Chile than Chile’s own efforts). In addition, the controversies and scale of uncertainty related to the assessment of adaptation costs create real problems in terms of accuracy and rigour. Some MAPS teams did identify main national climate change impacts for a specific global scenario that
would be underlying the narrative of the reference case, and reflect the emerging constraints (for example, water availability) in the expansion plans. MAPS research teams accordingly recognise the urgent need to reflect the impacts more accurately. For some countries, the integration of water-related models within our future modelling frameworks was discussed. A baseline is more or less meaningless, and possibly hopelessly optimistic, without the costs of climate impacts – but what those costs really are is anybody’s guess. One intensified hurricane can lop off a chunk of GDP in a week, but how much of that is attributable to climate change? We still have a long way to go before we understand attribution.

So, in fact, MAPS and others have developed reference cases that account for the benefits of this pathway but ignore some of its costs – hence its ‘optimism’. Moreover, the assumptions and methodologies used in setting these scenarios have direct relevance to international negotiations and how the level of effort or ambition is assessed (Clapp & Prag, 2012). This was stressed when MAPS results started to feed into the development of Intended Nationally Determined Contributions (INDCs), and mitigation pledges were discussed as deviations below these scenarios – scenarios that include mitigation efforts to date.

It was not a surprise that the development of these baselines took a long time in each country. They are tough things to develop. They emerged mostly through an aggregation of sector-based baselines sharing common drivers and criteria for selection of underlying actions. They all included existing and planned climate policy. However, such inclusion (or not) of these actions was a value decision: how likely would these policies be enacted, and how effective would they be? In Colombia, these questions resulted in two reference cases: the inertial and the referential cases. These are the result of different assumptions on macroeconomic variables and varied expected outcomes of the economic and environmental policy measures. The scenario assumptions were validated by a cluster analysis to compare the current situation of Colombia’s economy with the past situation and the evolution of other countries’ economies – the selected peer comparators.

For IES-Brasil, the reference case was unique in a sense. It was a simulation of the current governmental plan, almost like a normative scenario – the unquestioned ‘current policy plan’. Stakeholders were not necessarily all that keen on this approach, with some arguing that the government plan for the future was far too optimistic (well, this is political, after all). The IES team stuck to this approach on the argument that the study was testing the socioeconomic implications of additional mitigation against the government plan, not a pathway hatched by the stakeholders.
Perhaps in a longer-term study, a few more reference scenarios could apply, but just where you stop (with an eye on simplicity) is also a tough question.

No matter how tough these reference case choices are, MAPS insisted – and all countries followed this agreed research standard – that choices made would be transparent. This would enhance the national and international credibility of the results. If we are wrong, let’s at least do it in broad daylight. The construction of reference cases was a functional key output of each of the processes. The baseline results also revealed the significance of ‘early action’ in our countries, with a modest decarbonisation which leaves all our countries with levels of GHG emissions per capita below current levels of industrialised countries by 2030, but an interrupted emissions growth profile driven by fossil-fuels-based energy supply in the medium to longer terms. They tell a development story. We look further at this in Chapter 7.

Development: A central question for MAPS

Policy-makers and researchers in the MAPS countries are interested in knowing what the socioeconomic implications of proposed mitigation actions will be in their countries. Understanding the developmental benefits of acting on mitigation can provide a strong case for more ambitious mitigation action. In any case, understanding the developmental implications was must-have information for our countries. Where costs of mitigation actions outweigh benefits, it is important to understand clearly who might bear the burden of such costs, to be able to manage them effectively. To carry out such analysis to provide good information, researchers would have to link sectoral or so-called ‘bottom-up’ models, which project the impact of mitigation actions within sectors, with economy-wide or so-called ‘top-down’ models. This is because these sectoral models, on their own, cannot provide us with the complete set of answers we are looking for. Sectoral models, such as those for energy and those for land use, often do not include variables like employment and poverty, and when they do they represent only the direct impacts in the sector and not the ripple effects throughout the economy and society. Policy-makers tend not to trust the optimism of bottom-up models. However, we cannot use economy-wide models to simulate the necessary shocks brought about by mitigation actions in the various sectors because top-down models are short on technological and disaggregated sectoral details [Moyo, Winkler & Wills, 2012]. We had to link the two approaches to address their respective deficiencies.
We start by looking closer at the economic models. Finance ministers and the like prefer to look at the economy through the lens of so-called top-down (a sort of bird’s-eye perspective) models. These models make an aggregate representation of the economy as it is, based on computable general equilibrium (CGE) theory. CGE models are a class of economic models that use actual economic data to estimate how an economy might react to changes in policy, technology or other external factors. You can ‘shock’ the economy, for example, by changing one thing and then seeing what effect that shock has on another element in the economy. A CGE model consists of (1) equations describing model variables and (2) a database (usually very detailed) consistent with the model equations. In Colombia for example, a CGE model run by the National Planning Commission was used to inform the decision-making process around the economy-wide commitments of the country for Paris, and the impact of different economic instruments to reduce emissions.

A few modellers, says Shukla, wish to be closer to reality than implied by most of these models (Shukla, 2013). They have attempted to develop macroeconomic top-down models that permit imperfect competition (Hourcade et al., 1996). CGE models are based on the assumption of perfect competition in labour and product markets. However, in many developing economies this is not true because they are characterised by, for example, significant barriers to entry into the labour market, powerful unions or labour market rigidities. These issues make a model based on perfect competition less realistic and the results it generates more questionable.

In MAPS we also tried to get a little closer to the reality.

First, we integrated the ‘bottom-up’ rich information in the CGE-based models. The Brazilian IMACLIM hybrid model is an obvious example of this. Regardless of the soft- or hard-integration of the information coming from bottom-up models, the sole fact of linking them would serve to educate and act as a reality check.

We considered a number of technical considerations: in Chile, a Dynamic Stochastic General Equilibrium (DSGE) model was used. This allowed for dynamic simulation of interventions, but also suboptimal macroeconomic behaviour, such as the existence of involuntary unemployment (Scrisciu et al., 2014). IES-Brasil also coded, within the IMACLIM, the possibility of representing the imperfection of the labour market by introducing certain fixed levels of unemployment. Lastly, every country carefully considered the closure rules, and applied those that would make
more sense to country circumstances.\textsuperscript{8}

The challenge of linking detailed sectoral analysis with economy-wide modelling is perhaps the biggest analytical challenge faced in MAPS. It is also the area in which the greatest methodological advances were made.

Two strategies are usually followed to link the two kinds of models, namely, soft-linking and hybrid (Shukla, 2013). What happens with soft-linking is that the relevant output from the run of one model is used to modify the information inputs to the other model. For example, the GDP loss resulting from a carbon-tax regime, which is assessed endogenously by the top-down model, can then be used to alter the exogenous GDP inputs or the end-use demands provided as the input to the bottom-up model (Shukla, 2013). The altered results of the bottom-up model, for example, technology shares, are then passed to the top-down model, and so on. The iterations are done by passing information exogenously and sequentially across the models (Shukla, 2013). Hybrid models, however, either incorporate macroeconomic feedback in the bottom-up models or include technological details in the top-down models. The latter is the case for the Brazilian IMACLIM.

The challenge of making complex results ‘talk’ across sectors and models, and across physical and monetary units now suddenly multiplies, and the resulting technical challenge of both approaches is not trivial. The challenge must be resolved by coding, or by developing complex bridge conversion spreadsheets. There are a very few studies that link top-down models with bottom-up models (Shukla, 2013), so the MAPS community was very much on its own. The modelling teams from COPPE in Brazil, the University of Chile, Universidad de los Andes in Colombia, IIAP in Peru and Energy Research Council (ERC) in South Africa (with thanks to additional support from the Climate and Development Knowledge Network [CDKN]), formed a team and set to the task. A summary of the efforts from this work was an advancement of the IMACLIM model to be able to address distributional questions;\textsuperscript{9} the development of a methodology to link the CGE-based model of Department of National Planning (DNP) [MEG4C] in Colombia with Markal, an optimising

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\textsuperscript{8} In any economic model we must make a choice as to what is to be determined within the model (the endogenous variables) and what is to be considered external to the model (the exogenous variables). Where we choose to draw the line between endogenous and exogenous, and exactly which variables we choose to be exogenous, depends on a number of factors. This is called model closure.

\textsuperscript{9} www.erc.uct.ac.za/Research/CDKN/14-Wills-etal-Brazilian_mitigation_scenarios.pdf [15 July 2015].
energy model;\textsuperscript{10} the understanding of the economy-wide implications of a carbon tax in Chile’s energy sector via a model framework linking a DSGE model with an electricity sector model;\textsuperscript{11} and the linking of an optimising energy model for South Africa and e-SAGE (CGE), and the assessment of the application of a carbon tax.\textsuperscript{12}

A leading modeller from India reviewed the linked modelling undertaken in MAPS and in the related CDKN project, and found this to be good practice for the Global South [Shukla, 2013].

Adding the socioeconomic implications to an in-country analysis of mitigation meant that, overall, we had a robust evidence base in MAPS countries. In practice, the hard- or soft-linked models were not always applied to the ongoing processes, given the time constraints, and efforts did vary. In Chile, Peru and Colombia, the macroeconomic models were used in an end-of-pipeline way, similarly to the original work undertaken in the LTMS. Having said that, the sole knowledge generated from running bottom-up models helped to ensure a sound picture – closer to reality – when the macroeconomic models were used. It helped keep our feet on the ground.

As Shukla said in his state-of-the-art modelling review, the MAPS and CDKN linking work demonstrates the urgent need and immense value of capacity-building for policy modelling in the developing countries.

In addition to linking, and in response to the challenge of understanding social and economic implications of the mitigation interventions, the MAPS research community grappled with other thought approaches: multi-objectives framings and methods, and co-benefits assessment. We elaborate on these in the following two sections.

\textsuperscript{10} www.erc.uct.ac.za/Research/CDKN/14-Delgado-etal-mitigation\_actions\_Colombia.pdf [15 July 2015].
Zooming in: Poverty and inequality

Poverty and inequality are, for many developing countries, far larger problems (at least as far as leaders are concerned) than emissions mitigation. Reducing poverty and inequality had to be brought into the core of MAPS work. Poverty and inequality remain pressing problems in many middle-income countries (Rennkamp et al., 2012). Our initial research work, upon completion of a comprehensive literature review, concluded that poverty alleviation often disappears as an explicit priority in the wider concepts like socioeconomic, low-carbon or sustainable development. Mitigation work rarely addresses directly the fact that large parts of the population live below the poverty line. Much mitigation discourse and analysis focuses on emissions linked to GDP growth, with assumptions that growth means development. ‘We know that we cannot equate GDP growth with development,’ said Rashmi Mistry from Oxfam during the MAPS Mitigation and Development Forum. Yet most mitigation work does.

The poverty research team within MAPS (at ERC) helped country teams by developing a conceptual framework for mitigation actions, which included a typology called Poverty-Alleviating Mitigation Actions (PAMAs). This typology could then be applied to mitigation actions identified by the country teams. This helped the teams to understand potential implications for poverty alleviation, even at micro-level (Wlokas et al., 2012). Wlokas and her team found theoretical potential for integrating poverty reduction benefits in all mitigation actions and identified options to achieve this. Wlokas and Rennkamp went further to develop a practical guide to rethink the way in which programmes and policies for reducing emissions are structured in order to reduce both poverty and emissions (see Poverty Paper II).

Regarding inequality, the Brazilian and South African teams undertook extensive analysis to understand the relationships between emissions and inequality. Rennkamp et al. explain that 2012 was a bit early in the MAPS programmes to reach conclusions, notably on whether there is a general trade-off between mitigating climate change and reducing inequality, and whether this has changed as income inequalities have changed. Further work with IMACLIM and e-SAGE models for Brazil and South Africa, respectively, including disaggregation of households according to income-levels, would throw further light on this important topic. Chile studied distributional incomes too. The impact of the mitigation scenarios on inequality was small, and the team was challenged to look at inequality based on expenditure at household level rather than income, as this initial assessment did.
In a further attempt to bridge different communities and disciplines, MAPS sought advice from experts in the field of poverty alleviation. A distinguished professor at the University of Cape Town, Susan Parnell, responded with a piece entitled *The (Missing) Link: Climate Change Mitigation and Poverty* (2014). She first reminds us all why, even under conditions of extreme poverty, climate mitigation cannot be ignored or overlooked. Second, she explores the reasons why, to date, climate adaptation has tended to dominate climate mitigation in the articulation of anti-poverty strategies. Third, she explains the tardiness in taking up climate mitigation within the poverty agenda by demonstrating that the fundamental methodological and conceptual apparatus, which has dominated poverty thinking over the period of climate change mobilisation, has not translated readily into mitigation action (Parnell, 2014).

Parnell finds that cities will need to become a more prominent point of consideration for climate practitioners, poverty specialists and policy-makers (Parnell, 2014). She suggests that the failure to date to adequately link climate mitigation and poverty, while it is understandable intellectually and politically, has undermined the impact and effectiveness of both strategies. There is interesting work to be done. Including multiple objectives of development into modelling is perhaps the new frontier.
Co-benefits

A nother angle to tackle the evidence needed on social and economic implications was the work in MAPS on qualification and quantification of co-benefits of individual mitigation actions. Both at MAPS programme-level and within the in-country processes, extensive know-how has been developed around co-benefits. Researchers at Universidad de los Andes in Colombia went first. They conducted an expert ranking approach based on a stakeholders-driven Multi-Criteria Decision Analysis (MCDA) of the co-benefits of the mitigation actions identified. Then interviews were held with public sector experts from each sector to understand their perception on the potential alignment or misalignment of proposed sector-specific mitigation actions with the sector-specific policy priorities. So far the work had relied on qualitative information, expert judgement or readily available quantitative information. The leadership team in Colombia decided to engage with actual quantification of co-benefits for a selection of all the identified actions. A world-class economic valuation was performed, leaving behind valuable know-how on quantification and its complexity. This experience contributed to the development of a MAPS Benefit Transfer Methodologies database that serves anyone focused on monetising co-benefits.

The Peruvian team also conducted an expert ranking process that contained several co-benefits-related criteria and identified co-benefits for each of the 77 identified actions. Some further research is taking place at the moment to execute the quantification of these co-effects.

For Chile, a dedicated work stream is focusing in 2015 on the assessment of co-impacts, both positive and negative, for a selection of actions. The team was extended to cover additional skills required for this work, such as anthropology and sociology. Five inter-disciplinary specialist technical groups of stakeholders have been convened to assess, in a detailed way, the cause–effect relationships between 11 mitigation measures and their main impacts. The work is currently perceived as critical to inform the implementation of these measures. The outcome is an appraisal for the design of the measures in order to maximise the positive effects and minimise the negative ones. The Chilean team has in this way shown the value of holding the micro-level quantitative assessment for the benefit of deeper analysis of implementation options.
In relation to this co-benefits work, the MAPS community also tackled the integration of mitigation and adaptation and went further to interrogate win-win policies and measures within MAPS countries (Montedonico et al., 2015).

Identifying and evaluating co-impacts, including their quantification, is a distinct challenge from ‘integrating’ co-impacts to effectively support decision-making. This is essential in the context of our countries where other environmental problems need to be urgently addressed, such as air pollution in our cities. For this, one needs to understand the relations among different impacts, the trade-offs and frontier points – also known by academics as the Pareto boundary. MCDA emerges as a complementary technique to address a number of the weaknesses of existing tools and was brought into MAPS work. MCDA specifically responds to the need for mitigation policy analysis to internalise interrelations and be interdisciplinary, including non-quantifiable dimensions and explicit trade-offs. It also enables input from a wide-range of stakeholders (Cohen et al., n.d.). The use of MCDA could address interdisciplinary shortcomings in analytical tools. This could help to cope with deep uncertainty and, therefore, avoid the fallacy of ‘unique optimal solutions’ (Scricciu et al., 2014). MCDA could, in fact, benefit from the information generated via, for example, the national CGE, sector-based models and the more complex linked and hybrid models – and then provide a structured assessment that enables decisions to be taken (Cohen et al., n.d.). MAPS teams were eager to understand how MCDA could work in practice, and highly regarded experts were convened around a workshop to unpack practical steps and give hands-on training to country teams. Our Chilean and Indian colleagues developed a methodology to apply a solid MCDA process to prioritise mitigation actions and hence inform policy-making.

In order to apply the multi-criteria principles within the existing modelling framework, we would need to be able to optimise more than one objective. So far within our models, we can optimise costs and constrain the carbon-emissions outcome; costs is the single option for optimisation. This common configuration produces a single solution. As an attempt to allow these models to be better equipped at tackling development and climate change interactions, MAPS added a challenge onto the research agenda: to develop the software capability that could run the existing energy and economic models as multiple objective optimisation models. Multi-objective optimisation would, in this way, not replace the linked modelling approach but rather add on functionality. With this extra ability built into the current linked models, they could become a powerful tool for mitigation assessments in the Global South because it would be possible to give equal precedence to development and mitigation goals. The South African-based team
will soon complete the optimisation of two variables, and from there will move upward to three or four variables.

Other challenges such as the time needed to run the models, visualisation and communication of results are some of the major considerations to make before moving up to multiple variables. In addition, regardless of the number of variables, a challenge is to have income distribution included as a variable for optimisation; in no little part because of the issue of inequality in our countries.

Where is the data?

No matter what the model, if the data is of poor quality, it opens the model (and project) results up to criticism. In other words, to improve the quality of the models it is necessary to improve the available information. The data needs for low-carbon development modelling studies are enormous: this is due to the global, long-term and socioeconomically pervasive nature of the climate change issue (Shukla, 2013). And it goes without saying that data availability is a large and often underestimated challenge in developing countries.

Snowy day, Lonquimay, Chile: Blanco.
In fact, an indisputable advantage of the MAPS stakeholder-driven assessments was the possibility to get local data and information directly from the source. The LTMS process in South Africa has been regarded, 10 years after completion, as successful, to a large extent for its potential to address the issue of the lack of data. This in itself unlocked some policy action at the time (Tyler & Torres-Gunfaus, 2015). The same LTMS review paper found that the process drew the issue of data scarcity to policy-makers’ attention, which is important in a number of ways. In Peru, where the struggle with primary data was significant, the PlanCC process led to the update of the GHG national inventory [base year 2009]. It was a necessary first step that had to be done, and it became an important co-product for the government.

Assumptions, as an alternative to primary data, can play a critical role in the results (Benavides & Diaz, 2014). A number of ways to manage the risk in using assumptions were employed by the different local teams. Chile, as an example, added into the Terms of Reference of each of the research teams and consultants the need to report on data quality. Regional data, comparisons with similar countries and values in the literature were extensively used as cross-checks.

At the same time, the participatory process gave rise to a legion of data-related queries from stakeholders, for example, within agriculture, forestry and land use (AFOLU) and transport sectors in Chile. However, within the context of our theory of change, data-based discussion about themes was preferable to what otherwise would have been an ideological discussion.

MAPS Process Leads and the Research Leads asked themselves all the time: what can corrupt data? How can we reduce data credibility risk born out of stakeholder disagreement and/or the lack of quality and integrity within the research team? Often we found that data agreement can be stronger than data accuracy. Reaching consensus on the input data was fundamental at all times and ‘trumped’ accuracy. The Research Leads anticipated data conflicts in order to action further research or to be able to adjust the process when appropriate.

A number of the conflicts emerged from the contradiction between ‘official’ and ‘expert-based’ datasets and inconsistencies among official data (for example, energy balances). Building the evidence based on official data, where available, had its pros and cons. In Colombia, it was found to be more effective to acquire data through government. The Reference Case of IES-Brasil was drawn from official data too, as it simulated the government’s plans and their implications as defined by them.
The task of finding reference case data was challenging across countries. Some commonly lacking datasets are: information on the informal sectors; historical trends in modal share in the transport sector; data for road freight and passenger transport; specific energy end-uses for the residential, commercial and public sectors; or characterisation of equipment and technologies within the industry sector, especially for small and medium companies. Generally, the lack of consistent historical data could have represented a problem for the robustness of the outcomes, especially given the extensive use of econometric models within the Latin MAPS processes. However, our experts concluded that it was not so much of a problem in the short and medium term – up to 2030 – given the rigidities of the economy and benchmarks available from similar countries.

In looking forward, Benavides and Diaz recommend conducting sensitivity analyses to quantify the impact of information lacunae on the results. Once the parameters or data that produce the greatest dispersion of results have been identified, the researchers or stakeholders should try to improve the quality of this information before developing the models further (Benavides & Diaz, 2014).

These missing datasets could eventually be obtained with more robust data collection systems, further research work and, importantly, with more time.

Other types of information and datasets would remain uncertain either way, and these, with this locked in uncertainty, we refer to as the ‘unknowns’. They are, for example, the costs of future technologies or the manner in which people will behave in the future. We discuss the challenges of these unknowns in the following section.

The other unknowns

Energy systems in industrialised countries are normally quite stable, as the economies and population have reached a stable level of development. This is not the same in developing countries. Energy demand is one of the greatest uncertainties developing countries face in exploring different futures, and this is a factor of both the economic growth and the nature of this growth. And the figures can get huge: the whole of sub-Saharan Africa (except South Africa) produces less electricity than Spain. The required investment is huge. The question is: will it happen? At what rate? With which technologies? And so forth. These are great unknowns that make projections very difficult.
We usually take the demand vector as a given for a certain GDP growth. Still, the rigidity of the patterns of demand is very questionable and much depends on future economic structure, technologies, social norms and human behaviour, to say nothing of governments actually doing stuff! When one wants to look far ahead in the future (>20 years), or the system under scrutiny is anticipated to imminently go through a substantial change (such as the African example), historical data is not that useful for projecting into the future. Much is unknown; black swans are around us again!

As we have seen before, scenario-building methods are actually conceptualised to address the unknowns by establishing different sets of coherent narratives. Within the scenarios, a well-established practice to deal with the uncertainties of the parameters behind these narratives is to take on probabilistic sensitivity analyses on them. As a matter of research excellence, this was generally done within the MAPS processes. It is good practice.

Complementary approaches were discussed within the MAPS community too. One worth highlighting here was expert elicitation. The Energy Research Centre, in partnership with UNEP, conducted a series of interviews with several experts to ask about their ‘best guesses’ on GDP growth, GDP distribution, coal prices or gas prices, depending on each expert’s field of expertise. Based on these expert inputs, probability distributions for each variable were defined. The model was now able to sample a distribution space, rather than a single number, to account for the uncertainty in what this number should be. This would leave one to resolve how best to represent the results in an accessible manner (See Figure 5.5).

We were reminded during a MAPS seminar (by Dr Grove Steyn of Meridian Economics) that the best strategies in the face of uncertainty were incrementalism, flexibility and diversity (a useful example is ‘The science of muddling through’ from Lindblom). We took away from this that, in one way or another, we have to hedge against exposure to uncertainty and ignorance. And so we started to work on this at the research-level: the development of hedging strategies. Whereas sensitivity analysis helps us to understand the level of uncertainty, given some pre-defined interventions, hedging strategies can help us to navigate the uncertainty without having to fix interventions in advance. We are ultimately asking whether it is safe to take a decision at any time in the context of existing uncertainties, or whether it is possible, or even more effective, to delay the decision until a reasonable level of certainty is achieved. We are still in the initial phase of exploration of this concept, but we are hopeful that it will be a powerful tool to inform decision-makers to achieve targets, safely and effectively, in a context of tight budgets and multiple objectives.
Figure 5.5: Probability distributions across a distribution space, rather than a single number, to account for uncertainty. These figures are examples of work on uncertainty considered in MAPS.
Generally, longer timeframes are coupled with greater uncertainties. But they also present greater opportunities to change, or even reinvent, the system. In response, the MAPS community concluded that it would be useful to use different methodologies when modelling over very long time periods, for example, up to 2050 or 2100 (EconLab, 2012). During the EconLab, we explored whether qualitative methodologies might be better suited for this purpose, partly because the available modelling frameworks were perceived as being restrictive and too static for these timeframes. For example, the MAPS Chile team reflected on the fact that many interventions could not be included in the building up of scenarios because there just wasn’t sufficient information about them. At the same time, there was a big urge to look beyond 2030, because, due to the rigidities in the system, the mitigation achieved was not much more than a mere stabilisation of emissions. The results up to 2030 were not showing radical changes on trends, and as some of the most ambitious stakeholders in Santiago said, ‘we have only scratched the surface’. So all together we asked ourselves, what if we think beyond 2030, and really think ‘out-of-the-box’?

The different ideas coming from the ‘out-of-the-box’ thinking for the 2050 assessments were immediately met with apprehension from stakeholders, who thought this could undermine and certainly not compare with, the rigorous short-term modelling done so far.
The big thing beyond 2030 will be the new technologies and responding human behaviour. The MAPS community has started designing protocols and facilitating spaces to enable expert elicitation about these future trends and technologies. MAPS Chile, uniting forces with a parallel process called Energia 2050 (launched by the Minister of Energy in Chile), exposed their stakeholders and core team to visionaries and international experts who could contribute to the ‘opening of minds’. This would be done by showing tangible examples and evidence of different trends in other countries, thoughtful research about the future and what the future could look like. This work was done through what we called ‘Thematic Panels’. This would be followed-up by other events, where individuals from other backgrounds would be invited to join. Space was open for all. Artists were welcome!

In parallel, the IES-Brasil team has started to obtain critical input with a view to launching a 2050 scenario-building process. It is sometimes hard to use literature on technology prospects directly in a local process without some form of local contextualisation. Such contextualisation would enable stakeholders to discuss meaningfully the prospects for a country to adapt to, or choose, a certain technology from a suite of options – or how learning rates could evolve. So in MAPS, we saw it as a two-step approach: first to understand how global technological change may happen, and second, essentially with local stakeholders, to understand how a particular country would react to this external wave.

What was clearer for the longer-term assessment was the need to reinforce the idea of working with an array of different qualitative stories of the future. As Professor Emilio La Rovere put in our first Out-of-the-Box Lab, the key drivers that would need to be discussed in the qualitative storylines would be about: consumption patterns; lifestyles and behavioural changes; time budgets as a function of workload and leisure time; the design of cities and spatial-development patterns; implementation gaps (namely governance and institutional capacity); and cultural values or world views. And extensive literature exists around these topics. What was less clear, however, were the tools that we would use to unpack these.

From the South African-based work under MAPS, we see that one of the more important drivers in the distant future up to 2050 (at least using current tools) is the underlying structure of the economy. Create or imagine a different future structure and the emissions profile will change significantly. Only once one has done so should one focus on understanding the impact of possible (mitigation) interventions. Therefore, significant effort must be applied to the identification of economic levers and how sensitive our tools are to changing these levers. The CGE-
based macroeconomic models the South African team has been using for the 2030 horizon has a rather linear and persistent relationship between costs, GDP impact and employment. This is obviously, to a large extent, due to the way the economy is simplified within the model. It was concluded then that the most relevant levers were investment (how much money is available to spend and where this money is being spent) and productivity. This means further research is needed to better understand how different investment and productivity paths lead to different futures.

As if the analytical challenges were not enough, the full 2050 assessments, including deep decarbonisation scenarios, sadly did not find a place in the MAPS countries during this initial phase, mainly because of other reasons. On the one hand, for reasons of timing and relevance, this pre-Paris time was not right for a longer-term examination. The development of INDCs with 2025–2030 time horizons has been the focus of the decisions to be made within these countries since mid-2014. High-level requests were made to the MAPS local teams to inform this work. The year 2050 was found to be of little relevance, in spite of the short-term implications that one would expect to find when looking at longer timeframes. Long-term goals were actually disregarded from the INDC MAPS Latin American country proposals as they stand at the moment. On the other hand, we suspect that there was a dose of common political, economy-related challenges – a kind of resistance. Pursuing radical change does not sit well with all the stakeholders, even within an exploratory exercise. The discussion about the different futures was perceived to be beyond the scope of the ‘mitigation’ work to which they had been asked to contribute. Identifying mitigation actions was straightforward, but discussing development pathways and their underlying values was slightly more controversial. Moreover, we learnt from the pioneering Chilean experience that the implications of changing from exploratory to normative scenarios within a stakeholder-driven process would not be a cakewalk. The Chilean team initially proposed to their stakeholder group the use of a so-called back-casting approach to the long term. This meant there would first be an agreement on the ‘end point’ – that is, the vision for Chile towards the second half of the century. Once the vision, or main elements of the vision, was in place, the work would be to unpack the interventions needed to bridge the end point and the starting one. Within a well-institutionalised MAPS Chile process, this implied that a steering committee, representing multiple ministries of the government, had to agree on that vision too, and mandate the team to unpack the ‘how’. The research team of MAPS Chile saw other opportunities too, and managed to apply the same back-casting principles to the parallel Energia 2050 process. The proposed end point in MAPS Chile was one of zero emissions in the second half of the century. This was politically unattainable at this point.
And is ‘implementation’ attainable?

In all our MAPS countries, successful implementability (of actions) has seeped into the scenario-building discussions. In fact, implementability has been explicitly taken into account when packaging scenarios in Chile, Colombia and Peru, defined as it was in different ways. In fact, the 77 mitigation options evaluated in Peru were already the result of a filtering process that would eliminate options with low chances to be implemented in the short term with available technology. Scoring on implementability has also been critical to the prioritisation of actions for further assessment. In parallel, the governments of these countries wanted to know what could be an ambitious but realistic target – easily said. Despite its critical role, a common challenge has been the absence of a robust and/or analytical process for the assessment of implementability: this would be crucial in order to say that an action is actually realistic. Our in-country work has relied on simplified and expert judgements on feasibility. These unpacked feasibility into a combination of variables, such as the existence of regulatory framework, the existence of institutions, the existence of skills and capacity, perception and attitude, among others.

We became intrigued by the way in which these expert judgements are made. We noticed that these judgements were heavily influenced by historical trends and past experiences. In the back of everyone’s mind was a certain perception that implementation is a struggle. Just because it’s feasible and doesn’t cost the economy, doesn’t mean it will happen. And actually, the challenge of achieving implementation at scale remains a major challenge across the globe, in particular in developing countries with tighter budgets, weaker institutions, more corruption, and multiple overriding priorities like poverty alleviation and peacemaking.

Whereas the result of our initial MAPS research work on implementation was concluding that mitigation actions are more likely to be implemented if a range of possible impediments or risks to implementation are considered earlier in the planning and selection stages (Boyd & Coetzee, 2013), the discussion about impediments and risks was putting a brake on ambition. It was serving also as a reality check to enhance the robustness and richness of the information generated. For governments, and by the time MAPS results were informing INDCs development, the fear of underachieving was just too daunting. One could almost feel this in each of the meetings. For example, in Bogotá, the representative of UPME (the planning unit assigned to the Ministry of Mining and Energy) reminded the audience that ‘while we have been talking during the last hour of the meeting – another 100 new
cars and about 90 new bikes had entered the streets’. This was repeated a couple of times. These fears may well lie behind an ‘inadequate’ INDC.

Significant desktop research, for instance, to identify examples of implemented actions in other countries was made. From a modelling perspective, we were confronted with the lack of spatial information within the models, except for the sophisticated land use models used in Brazil, Chile and Colombia. This talks to the next challenge among the MAPS community: the necessary step of being able to disaggregate models to represent sub-national levels and, ideally, within the boundary conditions of the national context, which has now been well described. The increased level of detail in the model will improve some elements of the ‘technical’ feasibility.

Beyond the feasibility analysis that went into the ongoing processes, the MAPS research agenda on implementation had a second objective, which was also probably the most important one. We can articulate this objective in these terms: how do we increase the likelihood of achieving the substantial material mitigation ‘on the ground’, driven by the mitigation potential emerging from the MAPS evidence-building exercises? What greater guarantees can we build to ensure that what has been shown as (technologically and economically) feasible, and urgently needed to avert dangerous climate change, will actually become a reality?

MAPS country processes in Latin America (learning from the push-back against the LTMS in South Africa) started to consciously create bridges into implementation, from policy recommendations to feeding into opening policy windows (not just with INDCs but also with domestic policy development), and connecting communities interested in project development, for example, in the case of NAMAs. The data generated in the MAPS processes has proved to be very valuable among project developers, and a number of data-transfer examples took place, particularly in Colombia and Peru. Data and information accessibility is, therefore, an important focus of our process completion strategies.

All these steps are rational and, we believe, necessary too. However, an explicit consciousness of the challenges of translating the analytical results of these processes, which are largely information about what might be possible and at what cost, into workable policies and implementation programmes and ultimately emission reductions on the ground, was emerging.
We asked ourselves then: do we really understand how implementation works? A research team based in Cape Town started to investigate what the ‘evidence base’ needed to assess and enable implementation is, using a number of case studies. We came to realise that implementation is typically chaotic and that we lacked the predictive or general causal theories to inform implementation. Through this research (Trollip, et al.), we reached an understanding that work done under MAPS should not be merely handed over to pertinent policy-makers and implementing agents at formal closing ceremonies. Such simple knowledge transfers would most probably not lead to actions on the ground. If mitigation implementation follows the processes observed over past decades, this process will be messy, happen at all levels and at odd times, not follow orderly sequences, get stuck, sometimes fail, change and, sadly, take a long time. To accept this and deal with it with appropriate planning is not to plan for failure, but to plan for the most realistic expectations for what managing these processes will require (Trollip et al.).

Trollip and his team go further to suggest that practitioners should not be thinking of an ‘implementation gap’, but of a continuum of policy-development-and-implementation, with evolving content as necessary. Referring to a gap perpetuates the misconception that implementing agents or the administrative machine is mainly responsible to achieve emission reductions on the ground, or the debunked idea that implementation is linear. Based on these findings, MAPS will be encouraging the country teams, champions and the respective steering committees to take responsibility for building on the work to date – not to wrap-up and hand-over. In doing so, MAPS will encourage them to be integrating with implementation communities and building work-streams, involving all elements, from top-down to bottom-up. MAPS will remind them that the chaotic realities of the worlds of implementation require appropriate resources and that attention has to be applied to assessing the requirements of ‘moving to implementation’. This should include the fact that practitioners internalise how implementation works by familiarising themselves with decades of literature and experiences on policy implementation, and undertaking investigations of actual similar processes from the recent past in their contexts. This has already borne fruit in Peru, where next phases of PlanCC look to the regulatory framework for implementation, among others, and a new project is being set up to look at an implementation accelerator.
Conclusion

This exploration of the thematic challenges we faced in MAPS is not exhaustive, but we hope it illustrates that we treated MAPS both as a real world exercise (with formal sovereign intent in each country) and an experiment from which one can learn, fail and innovate. We found that the structure of having teams that did heavy lifting in their countries, under a government mandate, could serve the first of these two aims, and the central ‘MAPS International’ team could keep up the experimentation, collaboration and learning. This did indeed work well!

Now we can move to the stories of the processes as they unfolded in the four Latin American countries in Chapter 6 and the national and international outcomes in the chapters thereafter.

REFERENCES


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After climbing a great hill, one only finds that there are many more hills to climb.

_Nelson Mandela_
In Chapter 5, we examined how Mitigation, Action Plans and Scenarios (MAPS) approached some key challenges and themes. We hoped to illustrate how innovation is essential to this work, as is problem-solving, failure, iteration, experimentation and collaboration.

*Aloe vera, El Roble, Chile: Blanco.*
In this chapter we shall sketch the events in each country process, outline the MAPS team’s interaction with the stakeholders, and consider the design and sequencing of the processes. With research teams gathered, models built and calibrated, stakeholders selected and invited, facilitators appointed, questions for the assessment set, government ministers formally opened the processes and knowledge building could begin.

In this chapter we shall try to illustrate how the processes were designed and sequenced and how they developed into ‘knowledge conversations’. We hope to show that this knowledge was, as processes should be, emergent.

In Latin America, the co-production of knowledge to aid decision-making was not widely used back in 2010. Stakeholders and experts, government officials, politicians and researchers were all entering relatively unknown territory. In the past (at the risk of generalising), leaders made decisions, sometimes consulting with small groups of influential actors. Now the entire government was participating with society at large on a major issue for the future of each country. There was risk for all involved, and not all players were equally enthusiastic, as one can imagine. Also, people had different levels of knowledge and ability to participate. Some stakeholders were no doubt aware of the United Nations Framework Convention on Climate Change (UNFCCC) process and the global negotiations. Others were mindful of more local problems: the price of steel exports, the cost of electricity and transport options. Some felt that mitigation was not a problem in their countries; others wanted the matter addressed. Process, after all, is about bringing disparate interests and competencies into the room and forging a common result.

There was even suspicion – a chief executive officer (CEO) of a truck hauling company in Peru asked Stefan Raubenheimer at the Peru launch event: ‘If you ask my company to reduce its emissions you are telling me to do less business, and you know I can’t do that.’ Stefan remembers saying to him: ‘Exactly. You should resist that in this process. You should look for efficiencies and alternatives that help you grow your business and not shrink it. This process is not to tell you to do something, but to go on an exploration to see how you can do it better.’
Chile

We will start down south in Chile and, by way of example, examine Chile in perhaps more detail than the others stories, in particular the set-up process.

At the Conference of the Parties to the UNFCCC (COP) 15 in Copenhagen in December 2009, Chile announced its willingness to contribute to global mitigation efforts by achieving a significant deviation of 20 per cent from its Business as Usual (BAU) emissions by 2020. The definition of this goal was a political commitment in which there were no formal estimates of the emission baseline for the country, nor for how much the deviation of 20 per cent equalled in CO₂ tonnes.¹ This voluntary commitment set out the following: ‘Chile will implement Nationally Appropriate Mitigation Actions (NAMAS) in order to achieve a 20 per cent deviation from the BAU emission increase trajectory by 2020, based on projections from 2007.’ The declaration also stipulated the need for a relevant degree of international support to achieve this goal. It stated that ‘the main focus of the NAMAS would be on measures relating to energy efficiency, renewable energies, land use, land use change and forestry (LULUCF).’ Of course, a critical sub-question was: what was this BAU trajectory? What did you subtract from?

Chile’s first task would be to find out what that 20 per cent reduction actually meant. Which mitigation actions would add up to this commitment, and what impact would this have on the economy? Were there any choices?

So during the first quarter of 2010, Chile’s Ministry of Environment headed an inter-ministerial task team, through the Inter-Ministerial Committee for Climate Change (IMCCC), in order to come to an agreement on the information Chile would present to the United Nations, to be included in Appendix II of the Copenhagen Accord, where developing countries register NAMAs to be implemented by 2020.

The president reiterated the Copenhagen Pledge in his speech on 21 May 2010, thereby formalising even further the political commitment to the goal proposed by Chile. The emissions-reduction effort was firming up in Chile.

¹ To date there was no baseline for the country, however there was an energy baseline (which included energy, transport, mining, industry and CPR) and a non-energy baseline (which included agriculture, forestry and waste). These could not be added together as they were methodologically different.
Parallel to this, in mid-2010, Stefan Raubenheimer and Harald Winkler presented the MAPS proposition to Waldemar Coutts and colleagues in Chile, inviting the country to participate. As a project that was part of South–South cooperation, the first point of contact was through the Chilean Chancellery. The timing was pretty good. The MAPS initiative was presented to the IMCCC on 13 August 2010, where an expression of interest was granted to the initiative, to begin developing a low-carbon development strategy for Chile.

The MAPS Chile design was overseen by a local consultant, Eduardo Sanhueza, who was central to setting up the programme in Chile.

During the first stage of design, the Ministry of Environment assumed the role of Executive Secretariat and asked the national ministries for nominations for the Steering Committee (SC). The first Inter-Ministerial Steering Committee meeting was held in January 2011, attended by representatives from the ministries of Foreign Affairs, Finance, Transport, Energy, Agriculture and Environment. Once again, Stefan presented the programme and the key issues to be addressed by the SC. It was also agreed that Eduardo Sanhueza would continue to provide technical support for the development of descriptive reports and define the basic structure of the forthcoming project.

The Inter-Ministerial Steering Committee met monthly and, by April 2011, had selected the two leaders of the project, a head of research (Professor Rodrigo Palma) and a head of processes (Hernán Blanco), together with an agency for implementation and a preliminary list of members of the Scenario Building Team (SBT). By mid 2011 the project design was developed in detail in the ‘Project Document’, which enabled communication on the project and obtainment of international funding.

Once the Project Executive Committee was formed, including the leaders of research and processes, a research team and an Executive Secretariat, the SC took a more decisive role and the project progressed at a faster pace.

In January 2012, six ministers under the leadership of the Minister of Environment, Maria Ignacia Benítez, signed a high-level political mandate in Cerro Castillo, the traditional Presidential Palace in Viña del Mar, and the scene of important national political events. Additionally, the funds for the project, now called MAPS Chile, were successfully gathered from international donors and the members of the SBT were invited to meet with the Minister of Environment. In March 2012, the MAPS
Chile project was formally launched at a public event attended by various high-level authorities, including the Minister of Finance. A seventh ministry would also eventually join the SC, the Ministry of Mining. The project was getting serious!

The initial stages of MAPS Chile occurred in a favourable political context for climate change issues. The country had recently assumed the political commitment we explored above. The commitment required a technical base to advance the formalisation of Chile’s agreements in international negotiations. In addition, other experiences with climate change issues in the country, such as the round table discussions between civil society organisations and the private sector to evaluate the 2008–2012 Climate Change Action Plan, made it clear to the Climate Change Office at the Ministry of Environment that there was a strong demand for the creation of participatory spaces in which to discuss this issue in the social and economic context.
This was a hot topic. More people than ever wanted to talk and saw the need to generate information that could provide an integrated view in terms of methods and coherence of results.

Moreover, the Climate Change Plan established a series of broad goals and greenhouse gas (GHG) projections at a sectoral level, built independently by each sector using its own methods and assumptions. Each sector was thus also keen to add flesh to the broad goals and then to integrate a composite view of future emissions in the country.

Faced with this challenge, MAPS presented a valuable opportunity, as it offered an approach and work methodology that resonated broadly. Government, for one, valued the possibility to define an emission baseline for the whole economy of the country, the focus on gathering technical information, and a strategic way to address agreements with the different institutions and stakeholders. Government needed options and data, and so was turning to MAPS Chile.

The component of participation, which is central to the MAPS approach, was understood and valued throughout the project process. There were some grumblings, for example, about some of the non-governmental organisations (NGOs) in the SBT, but after some discussion, these issues were resolved. Certainly at first, MAPS Chile was swimming with the current. A stripe of bilaterals with business and other sector leaders up front also helped a great deal. MAPS Chile was widely consulted. All the conditions for entry were pretty much in place.

In fact, the MAPS team spent a great deal of time worrying about this idea of ‘entry’: creating the space for a process to flourish meant focusing on the entry conditions. ‘Entry’ was to provide challenges in Brazil as well, as we shall see.

The project was rapidly institutionalised and the following groups would take charge of the process, ensuring that the government of Chile owned it in full:

- The Strategic Advisory Committee (SAC): this was specified as the highest political body with a direct communicative link with the ministers. The SAC met on five occasions between 2011 and the beginning of 2013. It helped to guide the SC.
- The SC was, and still is, responsible for making the main decisions on the project. It meets monthly and is made up of representatives from the seven participating ministries: Foreign Affairs, Finance, Transport and Telecommunications, Agriculture, Energy, Mining and Environment. The
executive team coordinates the meetings. Participating in the meetings were the leaders of research and processes and the project administrative body.

• The secretariat and administrators of the project formed its Executive Committee. This included the sectoral researchers from the University of Chile, the macroeconomic analysis team from the Catholic University, and finally, the process team. The head of research, Rodrigo Palma, oversaw the design and supervision of all research activities. He monitored the quality and integrity of results. The head of processes and facilitation, Hernán Blanco, oversaw the design, implementation, monitoring and reporting on all activities related to the participatory, research and dissemination processes.

• The SBT is the multi-stakeholder group that participates in developing the project. It is made up of nearly 70 individuals with proven experience in climate change and related topics (mitigation, adaptation and sustainability issues). The participants are from the public, private and academic sectors, and organisations and institutions from civil society. Participation is on individual, not institutional, terms. The head of processes facilitates the group, which works according to guidelines provided by the SC. It is an advisory group and its recommendations are not binding.

Setting up the SBT was a particularly sensitive task. It was formed after a discussion on criteria for participation, proposed by Hernán Blanco, Rodrigo Palma and Andrea Rudnick (head of the Climate Change Office), was presented to the SC. The criteria for participation were to have people with: knowledge and experience regarding climate change and related topics; knowledge of and access to information in the relevant sectors (such as energy, forestry, agriculture and technologies); strategic thinking skills; the ability to take action beyond the parameters of a specific sector; an understanding of, and agreement with, the project rules; a known track record for their technical leadership.

Individuals from academia, the public sector, private sector and NGOs formed part of the team. One of the notable shortcomings identified was low participation by NGOs. A fund was created to cover the costs of participation by NGOs, but it was not as successful as anticipated. Some of the reasons cited by individuals who did not attend regularly were: a need to focus on specific and contingent topics in view of the urgency and relevance of the short-term agendas for environmental issues in the country; a lack of interest resulting from the way in which the problem was approached because of an overemphasis on sectoral issues, without addressing local and territorial challenges; and a preference for implementation and political issues as opposed to the focus on research adopted by MAPS, among others.
• Specific and ad hoc working groups supported the technical work per sector. The technical working groups were composed of SBT members and individuals invited in their capacities as experts. Their main contribution was to gather information about the micro-dynamics in sectors in order to refine modelling and evaluations of mitigation measures. These groups were particularly important where there was a dearth of information or records, making it impossible for researchers to work independently to establish appropriate assumptions and methodological definitions.

• Consultants took charge of developing specific studies outlined in the project research framework. The use of consultants is the main difference between the Chilean and South African experience. In South Africa, consultants were not employed. In contrast, a permanent team of 30 people was put in charge of conducting all studies necessary for the project in Chile.

Coyhaique Alto, Chile: Blanco.

The structure and organisation of the MAPS Chile project created a system of governance that, according to participants, offered an alternative approach to responding to relevant challenges when defining climate change policy. It also offered an approach on how to deal with uncertainty and information gaps when estimating and projecting mitigation measures for the long-term, as well as creating cross-sectional, long-term agreements to advance finding solutions.
The modelling of GHG emissions for the medium- and long-term posed significant methodological and technical challenges for the project management, particularly the estimation of GHG for 2050. On the one hand, it was important to have complete and robust sector-level databases so that trends could be identified. On the other hand, it was necessary to formalise validated assumptions in order to make projections and clarify entry-parameters for modelling. Modelling is all about the future, hence this grappling with uncertainty. To cope with uncertainties within scenarios, sensitivity analyses and expert judgement would help with ranges and would validated sources of information. In this way, MAPS Chile could supplement limitations created by a lack of data, which is a condition typical of developing countries.

SBT stakeholders, using the best available information, determined the assumptions and entry parameters for modelling by the researchers. In this vein, the Ministry of Finance made its growth projections available for validation by the SBT members. The working teams, consultants and stakeholders discussed the projections – at different stages of participation with consultation – and proposed technology-penetration rates that they considered technologically, politically and economically feasible in the medium- and long-term, and submitted information on the potential investment and operational costs associated with the mitigation measures. Slowly, a picture started to emerge on Chile’s possible futures.

The work sequence of consultation and formulation of information during the project is presented in Figure 6.1.

Figure 6.1: The work sequence of consultation and formulation of information in MAPS Chile. Source: MAPS.
There are two aspects of this sequence that need to be highlighted. First, in discussions the Executive Committee always made a proposal or a clarification on the topics on which the SBT could or could not rule. Second, the issues that the SBT could address and decide on were relevant topics in that they directly influenced the quality of the results (assumptions, baseline data, methodological definitions, parameters, etc.). In this way, the conversation was tightly managed.

As part of the challenges of defining a long-term outlook, the need for two principles was considered when putting the project team together (including all the stakeholders involved). MAPS Chile had to ensure that the project work remained sufficiently independent and that the results would not be directly linked to a specific government’s agenda. But it also had to ensure that work would stay within the radar of politicians and the government and would be relevant to the political agenda of the country.

In order to maintain this precarious political balance, project governance took on the tightrope walk. The SC made sure that the project remained politically pertinent and relevant throughout, but stayed clear of influencing the results. Continuous report back on the progress of the project results kept the authorities, at least the middle ranks, continually linked, and at the same time it facilitated a connection between the Executive Committee and the needs and interests of the multisectoral representatives of government. In addition, the SC played a role in resolving differences between the SBT and the Project Executive Committee.

The Project Executive Committee – made up of a research team that included two prestigious local universities (the University of Chile and the Catholic University) – provided institutional backing to the technical definitions, adding to the credibility and legitimacy of the results (interview with a member of the SBT).

With all this design work behind them, the process itself could get underway.

The first SBT meeting took place in March 2012. Nobody knew if it would be well attended. It must have been a nervous moment for Hernán and the team. They knew they were starting a two-year project (as they had planned it), but little did they know at the time that it would extend to four years and how important it was to become. The invitation to stakeholders was to participate in a non-binding process. But when everyone saw who was in the room, they realised this process was going to deliver serious evidence with high-level buy-in. This was laid out very clearly by Rodrigo Castillo, Executive Director of the Association of Electric Companies, the union that
brings together the leading companies involved in the distribution and transmission of electricity in the country. He stated: ‘The government has invited us to participate in a voluntary process, to build evidence on climate change mitigation. We will be very naive to think that this information will not be used for public policy decisions.’

Discussions got hotter in the second SBT, when macroeconomic input parameters had to be agreed. The second meeting came after two breakfast meetings with SBT members and a round of sector-based technical meetings. Nevertheless, plenty of discussions still surrounded the nature and definition of the 2007 baseline. The research team was getting used to the lively nature of participatory process by now. When the proceedings took a break at the end of the day, Mr Rafael González, teacher and founder of Rudolf Steiner School in Chile, arrived as a guest speaker. The SBT members were initially surprised by an unexpected space for reflection about an all-important issue. The idea was to give them a mental break. It worked. The room was peaceful for once. Then, suddenly, an earthquake once again shook Chile! This hardly ruffled the feathers of the local Chileans, but the only foreigner in the room, Marta Torres representing MAPS South Africa, certainly had a bit of a moment.

Phase II started with SBT 5 on 5 August 2013. The main objectives included informing and updating the SBT on activities and project plans and discussing and agreeing on the assumptions for the baseline 2013–2050. SBT 6 on 17–18 October 2013, saw the presentation of the preliminary results of baseline 2013–2050 and the mitigation measures considered and their characteristics (costs, mitigation and feasibility). The team presented, discussed and defined the proposed mitigation

![Figure 6.2: Timeline of the SBTs in Chile. Source: MAPS.](image-url)
scenarios for the country (preliminary ‘packages’ of mitigation measures into scenarios). SBT 7 saw the effort continue on 8 and 9 January 2014. All preliminary results were tabled. This helped to bring the results for 2030 (and some extrapolated results to 2050) to conclusion for SBT 8 on 5–6 June 2014. On 30 October, after a mad period of final work, Phase II results were presented to government.

The Chilean process went off according to plan. A total of eight SBT, nine breakfast and four technical working group meetings had taken place. It had been meticulously designed and executed. Oddly, some in the team were left thinking that they had perhaps overplanned it, giving SBT members a sense that the process was a fait accompli.

In mid-2013, there was a change in the leadership of the project. Andrea Rudnick decided to leave the ministry for personal reasons, prioritising time with her husband and young children. This was sudden for the MAPS Chile team and caused a strong emotion in the MAPS International team because Andrea was a very active director and most of the communications were conducted through her. A few months later, Alexa Kleysteuber decided to return to the United States after living in Chile for five years. This was a second shake-up for the Climate Change Office because Alexa was the main mitigation and negotiations officer at the Ministry of Environment. Two strong women were leaving the team and they were not easy to replace. Fernando Farías, right-hand man of Andrea, took over and started leading the Climate Change Office and the MAPS Chile project. His vast experience in the public sector and his high esteem of the entire team made this transition much easier than expected.

In March 2014, the government lost the elections and the opposition took charge of Chile. In many developing countries this would have meant the end of a project such as MAPS. But in this instance, managing the transition must be considered an important milestone and a project success. Hernán played an important role in coordinating and overseeing the internal project process dealing with transition, as well as the project’s relation to its social and political environment. In anticipation of the change of government, Hernán held numerous personal meetings with SBT members, potential new authorities and people linked to the incoming government in order to introduce the project and create awareness of its relevance. He had to walk on eggs, not wanting to show political bias between the campaigning parties. As it turned out, the transition was seamless and the new government took up the task of seeing the mandate through and re-establishing the high-level SC.
Important to the political transition was the existence and institutionalisation of the SBT, which was a settled, all-inclusive group of prominent actors by then. Its prominence and societal integration provided the best conditions for the project’s continuity within the political economy and made it difficult to ignore or trash. The proximity of the COP 20 in Lima had everyone focused: there was a race to finalise the Phase II (2020–2030) results by the time of the COP and this was hardly a time to change horses (MAPS Chile, 2015).

MAPS Chile got the job done by Lima and could look to 2015 for the longer-term work and the all-important socioeconomic and co-impacts analysis. The SBT was provided with the opportunity to write a chapter of the final report – which is an example of its autonomy and independent expression. The aim of the chapter was to develop a narrative around the statistics generated in the study and an interpretation of the results according to the participants’ expertise (MAPS Chile, 2014). This ensured that a group of at least 12 people from different sectors conducted an in-depth study of the results and formalised their impressions on the scope of the results. The exercise had the primary goal of creating an independent narrative by the SBT (developed by voluntary participants) and also to enable the possibility of creating a closer link between the project results and the public policy agenda. In this way, the technical outcome was blended with a narrative.

The SBT could step back and say that its assessment had been a success.

The extension of MAPS Chile to a third phase unfolded as a natural evolution of the project. Phase III lasted 18 months from July 2014 to December 2015. It responded to external conditions (the change in administration in Chile in early 2014) and to internal conditions (the need to refine and complement the analysis developed so far). In particular, Phase III made the project a two-administration initiative, highlighting its governmental profile (rather than a single-administration project). Phase III added a revision and refinement of the results attained in Phases I and II, mainly for Intended Nationally Determined Contributions (INDCs) purposes; a co-impacts analysis to a subset of mitigation options to add a second layer of information to the mitigation options; a long-term analysis that focused on the period 2030–2050, with a mix of qualitative and quantitative tools and a non-traditional out-of-the-box approach to mitigation options; macroeconomic analysis on redistribution of income; a work stream on public policies, including the use of MAPS Chile results for the update of the Decontamination Plan of Local Pollutants in the Metropolitan Region of Chile and recommendations on public policy in the transport sector; a visualisation tool of results of Phase II, together with dissemination of results. We shall return to the results in Chapters 7 and 8.
Our section on Chile creates the impression that these processes are like machines, marching according to a plan, perfect. But it’s always true that process is messy, creative, destructive and uncertain. Sometimes they are just plain stressful and often funny. Charlotte Heffer, who project managed the IES-Brasil project (the name for MAPS in Brazil, which means Social and Economic Impacts of Mitigation), reported:

One moment that seemed a disaster at the time, but what I laugh about now was the printed material for SBT 2. The meeting was in Brasilia, and we were making sectoral presentations that were quite detailed, and so we decided to print out the presentations for each of the SBT members so that they could follow the presentations and see the numbers in the charts and see the graphics in close detail, and make notes or record questions where necessary. I personally went through each of the presentations (there were five sectoral and two macroeconomic presentations) looking at the level of detail in each slide, so as to provide detailed instructions to the designer about how many slides to print on each A4 piece of paper. Where there was lots of detail I asked for there to be one slide per A4, where there was some...
detail but not too much, I asked for two slides per page (so that each slide would take up half of the page) and where there was only a small amount of text I requested four slides per page. Neilton Fidelis [who administered the Brazilian Forum on Climate Change] was travelling to Brasilia on the day of the event and he stayed at work late the day before while the designer printed everything. When he arrived in Brasilia I asked for the presentations so that I could get them ready for distribution. When I saw them my heart sank. They were absolutely useless and all had to be thrown away. What she had done was print each slide exactly the same size, approximately 4 cm x 3 cm. Some pages were almost entirely white with just one tiny slide in the middle, and others had four tiny little slides spread out on the page. None of the slides were legible.

This is the banal stuff of doing difficult work – you spend thousands getting people to a certain city on a certain date, and then you are unable to hand over the printouts of the detailed graphics of months of work.

The Brazil team seemed to characterise the Brazilian reality – chaos is close to humour in that country. As Emilio La Rovere put it to Stefan once while talking about data and uncertainty: ‘in Brazil the past is as uncertain as the future’. At SBT 4 the same Emilio allowed his laptop to be used for presentations. After the SBT, the team went out for drinks in a nice square near the event, and everyone was carefree and happy that the day had gone so well. The following day, Emilio asked for his laptop back only to find that the person he had entrusted it to had left it at the event. After SBT 5 in Brasilia, when arriving at the airport terminal, Mariana realised that she did not have her laptop: going back to the event venue would mean missing the plane. In the nick of time, Emilio got in touch to say that he had retrieved the abandoned laptop; not only that, but he also found an enormous suitcase left at the SBT, which turned out to be that of none other than the senior researcher, William Wills. Brazil is a delightfully mad place with crazy people. All the wrong people were on the plane that night.

All that being said, the IES-Brasil project team organised and implemented a very ambitious project like clockwork. Don’t be fooled by the lost laptops and occasional vaudeville. The IES-Brasil project would be one of the first truly participative scenario-building exercises in Brazil’s history. And it worked.
The objective of IES-Brasil was different to the other countries: its focus was not so much to build new mitigation scenarios, but more to test existing plans to see what the social and economic implications of certain mitigation actions actually were. IES-Brasil needed to conduct a different analysis, one that was key to decision-makers. Of particular interest would be the impacts of certain measures on the poor. Brazil had already done a great deal of work on mitigation, and another project was developing official mitigation scenarios for the country. The period 2014–2020 would also not be modelled, as it was a key assumption to the assessment that Brazil would meet the commitments made in Copenhagen and written into domestic law.

The modelling was going to be done with bespoke tools designed for this social and economic analysis (which we looked at under ‘linking’ in Chapter 5). The team in Brazil also needed time to prepare the complex IMACLIM model for use in the scenario-building reality. Two years’ work went into that effort and was to be completed before the scenario-building process started in early 2014.

While the tools were being sharpened, the team at the Brazilian Forum on Climate Change (FBMC) took on the task of coordinating the project and hence had a responsibility to identify, invite and manage the expectations of the specialists/sectors that would comprise the SBT. They interacted with the research teams as well while the research consortium was being built. Professor Emilio la Rovere took on the role of Research Lead, Barbara Oliveira became Process Lead, and Neilton Fidelis and Charlotte Heffer led the project from within the FBMC.

The IES-Brasil project team worked as one, but may be considered to have comprised two parts: (1) the Research and Modelling Team with registered offices at the Post-Graduate School of Engineering at the Federal University of Rio de Janeiro, which also involved specialists from additional research institutions, and (2) the Coordination, Facilitation and Articulation Team coordinated by the FBMC. The SBT was constructed as a functionally independent body within the context of the project and was where the deliberative power was centred. The idea was to create a conversation between the SBT and the Research and Modelling Team to discuss all hypotheses, define the input data necessary to create the scenarios using the modelling tools, and to review preliminary results and do the required refinements.
The concept of having an SBT made up of highly knowledgeable experts was innovative in Brazil. The SBT meetings (after they started in early 2014) together with the interim working group meetings brought players closer together, creating a culture in which technical information was shared and decisions were made collectively. As with South Africa, the process morphed from formal meetings to sleeves-rolled-up creativity. Other GHG mitigation-scenario projects in Brazil, until that time, had constructed scenarios as technical or academic exercises, presenting them to specialists or the public for comment post-publication. The MAPS approach applied in the SBT made this scenario exercise one driven by the stakeholders and hence very different.

As for the identity of the SBT members, the initial idea was that the SBT members would be selected to take part in their personal capacities. However, during the collaborative mapping exercise, it came to light that this would not be possible in all cases. As such, government representatives took part in their institutional capacity, as was the case with the SBT members that were appointed by invited industry associations. At SBT 1, the Minister of Environment encouraged all participants to take part in the discussions as ‘humans working towards a more sustainable future’ rather than as interest holders defending their turf. SBT interactions were founded on trust and respect and by working together they were able to produce results that were more meaningful to them.
Presenting the project proposal to prospective SBT members, making adjustments to the project structure and adding new members to the preliminary SBT list, as well as awaiting formal appointments, took approximately six months. The SBT set up was time-consuming, notwithstanding the fact that the FBMC was a well-established stakeholder body. The five SBT meetings and several working group meetings took place over the course of 13 months in all. The writing of the preliminary version of the technical report, the comments from SBT members, and adjustments and presentations back to the SBT members’ organisations took a further seven months. In all that time, a real community developed around the SBT and supporting groups and teams.

Over the course of the project, more than 90 experts participated in the SBT meetings, each with a wide range of experience and work in varied sectors and institutions. The SBT was composed of members from the scientific community, the business sector, public companies, the federal government, NGOs and trade unions. These experts had experience in agriculture, cattle, cities, energy supply and demand, forests, finance, industry, transport, urban mobility, waste and other sectors. The entire range of Brazilian society was represented in IES-Brasil.

The SBT, as in the other MAPS country processes, met together in plenary sessions to discuss as a group all major inputs to be used by the modelling tools and the results of preliminary and final scenario runs. As and where necessary, working groups were formed to explore specific issues. These working groups were composed of SBT members and experts who were most competent to cover issues referred to the working groups. Also, during the plenary sessions, SBT members split into topical tables and worked together to discuss sectoral issues. The five topical tables that were formed at each of the SBT meetings were: agriculture, forestry, land use (AFOLU); energy (supply and demand); industry; transport; households, services; and waste. This division was defined according to the structure of the general equilibrium tool used in the research process, being the macroeconomic model IMACLIM-BR. This is an example of how process design had to mirror the technical approach.

During the SBT plenaries, the sectoral groups defined the feasibility and cost of an array of mitigation measures that might be implemented until 2030. After preliminary model runs, they analysed the impact of these mitigation measures on the economy and requested refinements. Finally, they reviewed the social and economic implications that the macroeconomic modelling tool suggested. A picture emerged, crucially, of whether mitigation in Brazil would harm the economy and, even more undesirable, make poor people worse-off.
The SBT interactions were not seen as negotiation forums, but rather as conversations. There was no intention to construct public policy or impose sectoral mitigation action. IES-Brasil was a true open assessment. It was an exploratory scenario-building exercise. The study did not aim to find a more ‘desirable’ or ‘preferred’ scenario either. The role of the SBT was to ensure that the scenarios constructed were legitimate, credible and useful. They would have to be internally consistent, impartial and appropriate to the realities of Brazil.

It is interesting to pause and look at ‘rules of the game’, which were set in all four country processes. Brazil was a good example: in the first SBT plenary meeting, members agreed to a set of rules of conduct that would govern the work carried out by the specialists within the scope of the SBT, and the IES-Brasil project. SBT participants confirmed tacit acceptance of two principles that governed the IES-Brasil collaborative process:

1. Adherence to the Chatham House Rules, which state: ‘When a meeting (or part of a meeting) is governed by the Chatham House Rules, the participants are free to use the information received, but may not divulge the identity and connection of the speakers or the participants’ (Chatham House, 2015) – this rule remains valid even after the process has concluded and the reports have been divulged, for an indefinite period of time. This was similar to the South African Long Term Mitigation Scenarios (LTMS). This helps stakeholders to feel free to divulge information and share data.

2. Respect for the confidentiality of the process, thus undertaking to: abstain from recording, in any form, the meetings and debates; and not to divulge, in any form, the private documents that were shared among the SBT and the preliminary versions of the IES-Brasil reports to third parties. Again, elements of these processes are contested, and a press lock-down helps stakeholders to avoid public revelations before the results are all out. Sensitive or strategic sectoral information, which was not yet in the public domain, would be treated as confidential and would be incorporated into the study only in an aggregated way. This would help avoid the disclosure of data that could impact on the competitiveness of individual companies.

The five meetings that took place to construct the 2030 scenarios had a specific dynamic, generally comprising three moments of interaction: (1) preparatory meetings – prior to the face-to-face meetings; (2) plenary presentations – during the first part of the face-to-face meetings; (3) teamwork between specialists at sectoral tables during the second part of the face-to-face meetings.
The large number of preparatory meetings that took place prior to the SBT 2, SBT 3, SBT 4 and SBT 5 meetings were organised by sector (AFOLU; Energy; Households, Services and Waste; Industry; and Transport) and were carried out using the virtual platform. The idea of having preparatory meetings came from the SBT members, who felt it necessary to have access to the information that would be presented in the coming meeting and an opportunity to discuss it before the meetings so as to make the most of the SBT plenaries. At these preparatory online meetings, assumptions used in the models, the mitigation measures considered and preliminary results were presented as a way of aiding the preparation of the contributions from SBT members.

At the SBT meetings, during the plenary presentations, the research team members would present the results of model runs based on the inputs defined by the SBT members in preparatory meetings. The members had an opportunity to question the results and request alterations. The plenary sessions were also used to discuss the progress of the project and the next steps.

It was at the sectoral tables that the bulk of the reflection work was carried out, specifically in the selection of mitigation measures, defining the costs of said measures and calibration of the results. Research team members facilitated these tables, bringing the modellers closer to the stakeholders. At SBT 5, a new table was formed, specifically to discuss how the social and economic implications of the mitigation scenarios might be adapted for presentation to various publics.

The SBT meetings took place over a year, as outlined in Figure 6.3.
After some final adjustments to the results (see Chapter 7) after the end of the process in July 2015, the IES-Brasil team shifted its focus towards communicating the results of IES-Brasil throughout the Brazilian economy. This shift was timed to coincide with the Ministry of Environment’s process of consulting with various entities to determine its INDC for the COP 21 in Paris. This was really a process for taking the deeply technical work to the public and to a broader community of decision-makers.
The IES-Brasil team, together with the SBT members, agreed that the outreach strategy would be more effective if all the participants in the study disseminated the results of the study in their own spheres of influence. In order to facilitate this process, the IES-Brasil coordination team held a series of ‘Workshops for Multipliers’ and created an array of presentations and publications for various publics.

Aside from these workshops, the core IES-Brasil team mapped the most important and influential entities that could make use of the results and potentially influence the government’s position in determining Brazil’s international and national policy process and set a series of strategic meetings.

In November of 2014, prior to the COP 20, the FBMC called a meeting to present the different mitigation and adaptation projects underway in Brazil. The purpose was to enable interested members of FBMC to understand the synergies and differences between the various studies, and the importance of each one. The meeting was chaired by representation of the Ministry of Environment, Ministry of Foreign Affairs and Ministry of Planning.

The turnout at this event, and subsequent feedback, was very positive, and so a second edition of the meeting was held in May 2015, this time with more of a focus on projects that sought to provide inputs for the Brazilian INDC. Representatives of the ministries of Environment and Foreign Affairs and the IMCC (Secretary Carlos Klink, Minister Everton Lucero and Dr Johaness Eck, respectively) attended.
The IES-Brasil project was the first successful attempt in Brazil to build GHG-mitigation scenarios with specialists, with a vast array of viewpoints, all in the same room at the same time, seeking to work together and create meaningful results. It was a special process in itself. New partnerships evolved. New dialogues were created. The results broke away from the traditional cost–benefit analysis of mitigation. This was new economics in action. The very fact that the scenarios sought to analyse the social and economic impacts of mitigation scenarios genuinely increased participants’ willingness to collaborate.

Colombia

Colombia’s environmental policy is mandated by Law 99 of 1993 that created the National Environmental System. This system is defined as the set of guidelines, norms, activities, resources, programmes and institutions that allow the implementation of the general environmental principles stated by the Colombian Political Constitution and Law 99 of 1993.

Specifically relevant to climate change was Colombia’s adoption of the UNFCCC by means of Law 164 of 1994. In 2000, Colombia validated the Kyoto Protocol by means of Law 629. In that same year, the Ministry of the Environment coordinated the National Strategy for Clean Development Mechanism (CDM) Implementation.

In 2001, Colombia presented its First National Communication to the UNFCCC. This Communication prepared by the Institute for Hydrology, Meteorology and Environmental Studies (IDEAM) contained, in addition to the inventory, information on vulnerability and possible adaptation actions.

In 2002, Colombia’s Ministry of Environment, Housing and Territorial Development (MAVDT) together with the Planning Department, set up the Guidelines for Climate Change Policy. It contains the main strategies for mitigation and adaptation developed in the UNFCCC, the Kyoto Protocol and the First National Communication. The institutional arrangement to articulate a strategy between sectors in order to facilitate and enhance the formulation and implementation of policies, plans, programmes, methodologies, incentives and projects on climate change was defined with the creation of the National System for Climate Change in 2011. It was intended to enhance mainly the following four strategies:
1. The National Adaptation Plan.
2. The Low Carbon Development Strategy.

Much had been done in Colombia before 2010. The first commitment to mitigate GHG emissions occurred during the COP 15 in Copenhagen, when the non-industrialised countries were invited to submit voluntary targets for reducing emissions by 2020 and by no later than 31 January 2010. Colombia established sectoral commitments in terms of appropriate mitigation measures (Ministerio de Relaciones Exteriores, República de Colombia, 2010) as follows:

- Ensure the participation of renewable energies and technologies to be at least 77 per cent of the total electricity generation installed capacity in 2020, subject only to the use of own resources.
- Reduce to zero deforestation in the Colombian Amazon by 2020, subject to the support of the international community.
- Establish mandatory blending of 20 per cent of biofuels for total fuel used, subject to the support of the international community.

The Copenhagen commitment was ambitious, and the sectoral approach reduces flexibility to accomplish a national reduction goal. As we have seen, the MAPS process straddled the period roughly between Copenhagen and Paris.
The National Development Plan 2010–2014, issued in June 2011, defined the Colombian Low Carbon Development Strategy (CLCDS). The ‘MAPS of Colombia’ was to be the stakeholder portion of this overall project. When Stefan Raubenheimer and Harald Winkler from the MAPS programme contacted Andrea Guerrero, who was part of the team of the Group of Climate Change team at the ministry, the country was ready to determine its mitigation approach. In the first approach, Stefan and Harald helped with the design of the project, the process and the research elements. This initial phase of design of CLCDS took approximately eight months and was led by the Group of Climate Change. The CLCDS was to focus mainly on defining a roadmap until 2014, during which the process would develop sectoral mitigation plans. One of the first documents capturing the design of the CLCDS is the project document of the ‘Capacity Building Programme for Low Emission Development in Colombia’ (PNUD, 2012), which established the objective ‘to identify, promote and implement alternatives and opportunities for low carbon economic and social growth, taking into account the development priorities of the country’.

The strategy was to build sectoral mitigation plans in specific productive sectors, namely Energy, Mining, Transport, Housing, Waste, Industry and Agriculture; these would have to be led by the respective ministries and serve as input for the development of policies, programmes and actions that contributed to efficient social and institutional carbon economic development.

This design set Colombia on a different course to the other MAPS countries. Colombia was taking a far more action-orientated route and was looking to directly decouple the growth of GHG emissions from the national economic growth, sector by sector. This was a high-growth country, after all. The aim was explicitly ‘to achieve the same level projected gross domestic product (GDP) growth while maintaining stable emissions’ (ECDBC, 2013). The decarbonisation of the country was not yet on the agenda. Nor, it would seem, were international commitments. This was to come later.

The CLCDS objectives are crisply described in Figure 6.5, as:
- Step 1: Sectoral scenarios showing abatement options.
- Step 2: Sectoral Mitigation Action Plans.
- Step 3: Implementation.
These main components can be amplified as follows:

Firstly an analytical process, which included the identification and analysis of information to develop abatement curves by sector, and was divided into the following stages:
1. Definition of baseline GHG emissions by sector and growth projections.
2. Exploring different growth structures and current and planned policy outcomes to understand deviations from the non-policy scenario growth projections.
3. Feasibility analysis of additional mitigation interventions by sector specialists and integration into future projections.
4. Finally, a document built with the results serves as input for the development of policies, programmes, projects and mitigation actions at sectoral level.

Then followed a planning process, with these stages:
1. Develop Mitigation Action Plans for each Colombian productive sector using the result from the analytical process and consulting the key actors within the sectors.
2. A qualitative co-benefit assessment to strengthen the cost–benefit analysis that was made before.
At all times capacity-building was blended in, seeking to strengthen cooperation in the following capacities:
1. Strengthened capacity in the public sector and academia to use modelling tools and behavioural analysis of GHG emissions.
2. Strengthened capacity in the public and private sectors to select and develop appropriate mitigation actions and NAMAs.
3. Training ownership in low-carbon technologies to the sectors involved in the CLCDS.
4. Strengthening financing options for mitigation and market mechanisms.

The Measurement Reporting and Verification elements were also included in the design of a monitoring and verification system to evaluate the CLCDS’s progress and the emissions reductions on implementation. The process of regionalisation of the strategy, and therefore understanding how the Sectorial Mitigation Action Plans (SMAPS) are to be implemented at local level, is a key element of the work programme. The CLCDS team is working for the mainstreaming of mitigation action in the local-level planning.

Finally there was a process of ‘socialisation’ where the project was presented to society. The CLCDS had developed into a complex project, with many donors and actors:
- Inter-American Development Bank (IADB);
- World Bank;
- British Embassy;
- Low Emissions Capacity Building Programme (LECB): a global initiative run by the United Nations Development Programme (UNDP), funded with support from the European Union and the German government to support initiatives in mitigation and Low Emission Development Strategies (LEDS);
- MAPS;
- USAID–EC–LEDS (Enhancing Capacities for Low Emission Development Strategies): a flagship US programme that has forged partnerships with 20 developing countries to develop and implement their LEDS.
- Low Carbon Resilient Development Programme (LCRD): this programme is funded by USAID and aims to support efforts framed in CLCDS Colombia and the National Adaptation Plan. The programme aims to support existing initiatives at national and subnational level.

Because CLCDS took a multisectoral approach, it required the involvement of a wide range of stakeholders from government, private sector, academia and consultancies. Two bodies would steer the project: Department of National Planning (DNP) and the
Ministry of Environment. An independent facilitator was appointed for the meetings, Javier Blanco, and research would mainly be delivered by the University de los Andes in Bogotá, under the leadership of Angela Cadena. Each sectoral ministry would steer its sector, and a ministry expert was appointed to lead on technical issues.

In hindsight, this stakeholder design had its flaws: interviews just held with stakeholders mentioned that the absence of a strong link with the Ministry of Finance was a shortcoming of the process, as was the Directorate of National Taxes and Customs (DIAN), which would have helped with the creation of tax incentives to promote low-carbon technologies. This may be one of the problems with the sectoral approach. Several of the actors also stressed the need to have a closer relationship with the regions. The approach also short-changes more generally focused groups such as cities, NGOs and other civil-society players. On the research side, there was some concern about a single-university model, where the generation of technical information depends on fractional contracts with one university. These limitations aside, the sectoral approach does pave the way towards a rapid implementation of plans at sectoral level. And for the sectors, this is critically important work.

The high-level and SBT meetings were carefully sequenced to stretch over 2012 (Figure 6.6).

Figure 6.6: Sequence of the Colombian process. Source: MAPS.

On 14 February 2012, a high-level meeting was convened of senior representatives of the private sector, ministers, trade association and government with the aim of linking and involving these actors in the formulation and implementation of CLCDS and, further, to identify the other experts who would participate in the sectoral SBTs. The Minister of Environment hosted this event, and Stefan Raubenheimer and Harald Winkler from MAPS presented the South African case and the proposed methodology. Several ministers and CEOs of the largest companies in the country attended the meeting, which was not common for an event of an environmental nature. This was
achieved, in part, because the convenor was the President of the Republic! The SBT participants were set and agreed on, and the process was kicked off.

This first SBT focused on raising awareness of the process of defining the CLCDS, presenting the characteristics of the developed models and discussing possible development scenarios for each sector. Economic modelling assumptions and growth prospects for each sector were agreed.

At SBT 2, assumptions for the construction of scenarios and the reference cases were agreed, and preliminary options for low-carbon development for each sector were identified. There were a lot of conflicts over the agricultural sector data and so a mini SBT for this sector was organised to clear the logjams. By this time, the government was requesting the immediate delivery of marginal abatement cost curves (MACCs), and this put lots of pressure on the research team, which was struggling with the pace and requirements emerging from the participatory process.

For the stakeholders, there was a challenge or two: during SBT 3, the stakeholders conducted a prioritisation of mitigation measures identified in SBT 2, using an agreed list of 15 social and economic criteria. Fifteen criteria multiplied by more than 60 measures is a lot. Stakeholders had to take some work home!

At the second high-level meeting that followed SBT 3, the advances made in the SBTs were presented together with a set of abatement cost curves. There was much relief that this element was complete. But this relaxation of pressure would not last for long.

During SBT 4, the results of modelling and both reference cases and scenarios were presented and implementation times for previously identified mitigation measures were established. In parallel, the core team had initiated the political process for developing Mitigation Action Plans based on that information. For this process, interviews were held with different ministries to understand the alignment between the sector objectives and the mitigation measures. It was another way to prioritise measures.

One last meeting was held (an ‘inception workshop’) during this closing phase, which outlined the scenarios and mitigation measures from the study and launched the high-level CLCDS process. Several deputy ministers and presidents of various guilds and companies attended this. This saw the formal ‘crossing’ from knowledge to implementation of the domestic mitigation action.
After this, in 2013, two additional meetings took place. The Universidad de los Andes conducted a modelling training workshop with the participation of UPME (Mining and Energy Planning Unit) to improve IDEAM’s capabilities. Another meeting to present and discuss results was organised for the end of the year.

This all sounds smooth and clear in description. But during the first phase, 2012–2013, there were some moments of great panic. Meetings with industry and agriculture were the most fraught. When the team presented the estimation of emissions to the industry sector, they pretty well freaked out and expressed, in very lively terms, that the estimations did not reflect the reality of their sector. Stefan remembered walking into an agricultural meeting, where a lot of people in a hotel room were shouting at one another. His terrible Spanish meant that this was an unintelligible disaster, and all he could do was run for help. The agricultural and livestock sector was especially difficult. Sandoval recalls:

They always argued that they needed much more realistic data about the sector. But such accurate data does not exist, and this fact always resulted in a very tense relationship within the agricultural sector. The government had hired consultants funded by USAID sitting in the Ministry of Agriculture, to help in the Ministry, but the acrimony became so intense that we woke up one day to find that they had all been fired.

This was serious for the CLDCS. Agriculture was a key department. Everything was being done under a time limit. For many months it was like this, tough and nasty, until the Ministry of Agriculture was restructured and a Department of Climate Change and the Environment was created. Processes like this can age people, and the team in Colombia had its battles.

Maybe these battles could help explain the high turnover of people on this journey. Although it is usual for the Colombian public sector to have a high turnover of staff, the changes that took place over a few years were unprecedented. Some of the people that MAPS saw coming and leaving were Andrea Guerrero (who initiated everything); Santiago Saavedra, Maria Paula Mendieta and Sandra Garavito (from the Ministry of Environment, who held the project together so well); Diana Barba and Oscar Beltran (who supported the communications and administration of the project for a while); Ana Maria Loboguerrero and Silvia Calderon (who engineered the macroeconomic model for DNP); Angela Cadena (who left the university to join
the government for about one year) and her team, Mateo Salazar, Juan Fernando Pérez, Juan Camilo Márquez and Katherine Ovalle (who strategically moved from the university to the Ministry of Transport and Environment, respectively) and Ana María Rojas (who was ‘rescued’ by the MAPS International team); and at least two facilitators, Javier Blanco and Ivan Lobo. Luckily, some of them came back, like Andrea (now in the Ministry of Foreign Affairs), Angela and Silvia. Others were coming and going, like Ramon Rosales and Mario Londoño, who were present intermittently due to discontinuities of financing. But most of the group remained working on climate change from different organisations and agencies. This rotation challenged the capacity and memory of the process, but probably added some richness too. Only two people stayed for the entire process: Monica and Ricardo, the two PhD students at the university. Ricardo said that, in order to finish his PhD, he should have quit the MAPS Colombian project. However, he stayed because, in his own words, ‘I had the opportunity to do something from the academia that will contribute to real policy. This might be a life-time opportunity.’

By March 2013, Rodrigo Suárez Castaño was appointed new Climate Change Director in the Ministry of Environment and Sustainable Development. A new era for the CLCDS was about to start.

In 2015, another difficult moment arose when discussions were confined to the INDC. The team was aggregating an economy-wide BAU or Reference Scenario, which presupposed revising all the assumptions. This is always a controversial element, given that it is the key reference point against which everything else is measured. BAU scenarios can be ‘gamed’ by players to suit their interests. Faced with a toughening economic situation in Colombia, some sectors now wanted to modify the BAU to take into account more pessimistic assumptions about the future.

In the first half of 2015, the technical team piled into an emergency updating of the data and the BAU. Then, the shock of a plummeting oil price hit the process like a hammer. Economic expectations were downgraded further. With the COP Paris approaching, every day for the process was tough, every day the question on the implementing team was: ‘do we dare to consult the stakeholders on this?’

Process work of this kind is so data-rich that sometimes you feel you are drowning. In early 2015, while scrambling to update the baseline, the team needed to wait for official data inputs from the IDEAM. On 29 December 2014, the preliminary official data arrived from government. This was a huge test for the Universidad de los Andes team. There was relief when most of the figures coincided. People
went on annual holidays in high spirits. On everyone’s return, however, there was an instantly sobering event. The team realised that the government figures had failed to consolidate waste sector figures and that the waste module was missing. Relaxation turned to panic, when further discrepancies, this time with the livestock sector, were found.

The work on mitigation scenarios was not simple either. Ministries and industry wanted to review the sectoral mitigation plans already approved or signed. High-emissions stakeholders wanted them presented in such a way that effort could be minimised, while others wanted it to be more ambitious for environmental reasons. Reductions of up to 20 per cent in some sectors were being demanded. Generally, this phase was critical and very, very difficult.

OK, so panic and struggle is part of this work. The MAPS processes are built on the assumption that this is a contested arena, and participants in this kind of process are constantly exposed to this contestation. Colombia had its fair share of tough times. But as we shall see in Chapters 8 and 9, the job was done, and done pretty well.

A typical country house, Chile: Blanco.
Peru

As in other Latin American countries, the public institutional framework related to the environment is relatively young in Peru. This framework remains under an articulation and assimilation process with regard to the state’s different environment management functions. PlanCC has taken place within this relatively new context. In fact, so much of Peru seemed youthful and changing. The teams that worked on PlanCC were young, the system was young, and volatile: PlanCC had to cope with numerous political and ministerial changes.

María Paz Cigarán, one of the specialists who supported the representation of Peru in the COP 15 negotiations, started discussions with South Africa and with government officials to shape the project in Peru. It was a very difficult process, as the Minister of Environment, Antonio Brack, had doubts regarding the idea of a strategy centred on mitigation. A lot of selling was going to be needed. Peruvian emissions are minor in the international context, and so a mitigation proposition had to be well argued.

After the departure of Antonio Brack in 2011, the new minister, Ricardo Giesecke, showed greater openness to the idea, but his administration lasted only four months, which was insufficient time to make decisions on the subject. His successor, Minister Manuel Pulgar Vidal, a lawyer who specialised in environmental law and with more interest in international negotiation processes, provided the political support needed for the Ministry of Environment (MINAM) to consider the project. Much later, his personal journey would see him elected as President of COP at the COP in Lima in 2014, and become a champion of the PlanCC process in Peru.

In a recent interview with Eduardo Durand, who was key to the PlanCC project, he indicated that the main subject of the early discussions referred to the character of the project. The worry was that the initial proposal had been externally suggested and had excluded the government actors in charge of environmental policy. The question was whether the initiative should be seen as an international cooperation project or an official state programme, which a government agency would have to oversee and coordinate.

As the process developed and outputs became evident, political support for the PlanCC project grew. This was further strengthened when COP 20 came into the sights of the government. But political support for a government-driven project was
enough to move the project forward from the start, as we have seen. Ownership (through the mandate and SC) was to strengthen as time went by. Uniquely, however, public officials indicated that they had opted for private administration of the project. This helped to isolate the project from other public-management processes and allow agile and efficient management. A private consulting firm – Libélula – was appointed as the technical coordinator of the project. This small consultancy, equipped with a professional and enthusiastic team, was to perform valiant feats to get the project done.

There was a wrinkle before the kick-off: what would the project be called? Chile had gone for the MAPS title, but the other countries had named the projects independently. ‘MAPS’ was out for Peru, given the debates around the origins of the idea, but the real problem was whether the project name should include the concept of mitigation. Mitigation was a responsibility of the North, not a problem for Peru. Calling the project by this name would raise problems for many. Even the INDC, when it was to arrive, was not restricted to mitigation action. It just wasn’t politically coherent to promote a programme that highlighted mitigation strategies as a main axis. Possibly for these reasons, the name of CCPlan was initially adopted instead of MAPS, as it was deemed more open to other strategies beyond mitigation. The team officially presented PlanCC (still called CCPlan then) to the two new vice-ministers and the new minister in the Department of Environment, Ricardo Giesseke, in January 2012. They were all very excited by the project and were committed to strengthening the mandate. They reported that, due to the recent social conflicts surrounding mining and other activities in Peru, the prime minister had launched a Multi-Sectoral Commission that would develop a ‘new environmental and social vision for investment in Peru’. However, the name issue was not settled yet.

CCPlan was dangerously close – at least for Spanish speakers – to CEPLAN, the name of the National Center of Strategic Planning, that would be invited to join the project’s SC. CCPlan was then cleverly inverted into PlanCC for ‘Planificación ante el Cambio Climático’. However, even ‘PlanCC’ was controversial, causing difficulties with some state and business actors as it gave the impression of articulating some sort of mandatory national plan. It stuck, though.

PlanCC had to proceed with caution. Nobody wanted to give the impression – at least during its first development stage – that their scope and decisions were binding or mandatory regarding future mitigation policies. This was an assessment, in the cloak of a project, whose name was a Plan. Not easy.
The technical process of PlanCC’s Phase I was going to be challenging, given that it was a pioneer experience in Peru. PlanCC was a first attempt to produce a systematised and validated multi-sectoral information base for building climate change mitigation long-term scenarios and options in Peru. And it started with very little data. After hard work by Eduardo Durand, Pia Zevallos, Maria Elena Gutierrez and others, and a key contribution to funding and administration from Helvetas in Lima, the project jumped out of the blocks and got going.

A huge burden fell on the fledgling research team to gather the necessary skills across research institutions and solve the central data problem. Seven sectoral groups of 35 researchers were placed in charge of macroeconomic studies and data inputs for the energy, transportation, agriculture, industrial processes, forestry and wastes sectors. The research process was accompanied by a set of national senior experts, in order to oversee the quality of data. International peers also assessed the final quality of each research product.

Peru also named its SBT by a different name: ENPCC, the acronym for Equipo Nacional de Prospectiva sobre Mitigación del Cambio Climático (the National Team of Foresight for Climate Change Mitigation). The ENPCC had the function of a multi-sectoral consultant group, with the task of guiding the process of generating scientific information on scenarios and mitigation options – formulated by the research team – to ensure the quality and legitimacy of the study.

The ENPCC members were experts and came from the public and private sectors, from NGOs, the academy and general civil society. The majority were not climate change experts, but knew their sectors well. The ENPCC allowed for the free flow of information, discussing and reaching consensus with all participating sectors on the mitigation focus and examining options, scenarios and measures to be elaborated.

Just as with the other projects, technical advisory groups, GTCs, (the Spanish acronym for Grupos Técnicos Consultivos) were set up, and constituted another participative space in which to analyse and discuss PlanCC’s inputs and products. The consultations in the ENPCC had the character of a political validation, despite the fact that the processes involved specialists among the sectoral representatives. The GTC consisted of small sessions doing the heavy lifting, oriented towards the dialogue with experts and thematic specialists.
Figure 6.7: The timeline of the Peruvian process. Source: PlanCC.
During the two years of Phase I, five meeting rounds were convened between participating sectors and the GTC (which were summoned by MINAM), eventually involving over 400 specialists!

Much of the technical weight fell, as so often is the case, on the shoulders of one person, in this case, María-Elena Gutiérrez, the Lead of Research. In general, the interaction between the research team, the GTC and the ENPCC, under the direction and facilitation of the technical coordination and SC, managed to consensually produce a series of products: (1) an updated inventory of GHG emissions for Peru (September 2009); (2) the BAU and Required by Science (RBS) scenarios (March 2013); (3) proposals for mitigation measures and their potential costs and co-benefits in MACCs (September 2013); (4) a proposal for mitigation scenarios towards 2021 and 2050 (March 2014); and (5) a final report reviewing and proposing an ideal scenario for Peru towards 2021 and 2050.

One of the factors that added complexity to the technical process was that access to all the sectoral information needed to update inventories and build scenarios wasn’t as direct as expected, and the quality of the available information was not always optimal. As a result, a large investment of time was required to localise and systematise unorganised data from different institutions. Despite this, at some points there was just no data available, and the team had to work based on assumptions and estimations. The GTCs helped a lot in obtaining the ‘expert judgement’ required to build these assumptions. For this reason the GTCs were facilitated by the research coordinator in order to obtain consensus quickly, faced with very technical content.

This analytical complexity was not only a problem for researchers, informants and validators; it also created difficulties during the interaction between the technical experts of the research teams. For example, when attempting to perform integrated cost–benefit or macroeconomic modelling analyses, the sectoral technicians struggled, and one reported that there was a constant need for more data, because different research teams insisted on greater granularity as the study wore on. It’s tough to combine engineers and economists at the best of times: MAPS required this interaction constantly, and it needed to work.

In the last quarter of 2011, Lupe Guinand was appointed Project Coordinator of PlanCC. The party could start. The launch of the project was happening! A table of high-level speakers, including General Director Javier Roca (Ministry of Finance), Vice-Minister Javier Beraún (Ministry of Foreign Affairs), Minister Manuel Pulgar
ENPCC 1 took place on 7 June 2012, where members were introduced and the ‘Rules of the Game’ agreed upon. The ENPCC 1 was important because it helped to define the mandate from the ENPCC to the research team. It helped with the questions: what did they want to measure? What did they think was ‘low-carbon development’? What were the evaluation indicators for a move towards a low-emission future?

ENPCC 2 followed on 13 September 2012. This meeting saw the presentation of the results of the updated GHG inventory and defined indicators to measure a low-carbon economy and mitigation scenarios of long-term GHG emissions. Then ENPCC 3 followed on 20 March 2013. Main objectives included validating the proposal of the research team on the BAU and RBS scenarios. Thereafter came ENPCC 4 on 26–27 September 2013. Here tasks included revising and validating the mitigation options and their cost and emission-reduction potential. The packages of options were also determined. The initial mitigation scenarios for period 2021–2050 were presented at ENPCC 5 and then further scenarios were presented at ENPCC 6 on 8 May 2014. Also presented were the economy-wide impacts on GDP and the income and poverty data of each scenario. The MACC’s was presented. As the giant MACC diagrams appeared, ENPCC members rushed around taking photographs. The dissemination of Phase I results followed, taking place in three labs, at 10 meetings, in three training courses for the public sector and for the private sector and in congress (10 subnational meetings, five breakfasts with private sector, three congress meetings).

PlanCC was looking good.

The first six months of 2014 were spent bringing Phase I of the PlanCC project to a close. When the first results were presented at ENPCC 5, over 90 people attended. Eduardo Durand and Claudia Figallo, on behalf of the Ministry of Environment and the PlanCC SC, respectively, opened the proceedings. Claudia stressed that the information validated and legitimised by the SBT was an important input to determine the national contribution for GHG emission reductions in the climate change negotiations. A representative of the Ministry of Economy and Finance went on to stress the importance of the cost-effectiveness of mitigation options in the design of well-researched sectoral policies. At ENPCC 5, 77 prioritised mitigation options were presented, as were the country’s MACCs and the two boundary emissions scenarios for Peru (2010–2050).
A number of high-level political engagements were held later in the project, including two meetings with the Minister of Environment and the Minister of Economy and Finance. In March and April, PlanCC Director Lupe Guinand and Research Coordinator Maria Elena Gutierrez met with the Minister of Environment, Manuel Pulgar Vidal, and the Minister of Economy and Finance, Miguel Castilla. The CEO of Libélula, María Paz Cigarán, and MAPS representatives also attended these meetings. The project was well received at these high levels of government, with government signalling an intention in March to consider using PlanCC for the country’s engagement within multilateral forums such as the UNFCCC.

In his closing remarks at the final ENPCC, the Minister of Environment said that PlanCC had brought together public- and private-sector representatives, academia and research institutions, to establish mitigation scenarios based on a solid diagnosis required to steer Peru towards a low-emission development pathway. Peru was about to step onto the world stage as the host of COP 20, to be held in Lima.
In sweltering heat at an intimate and well-organised COP, PlanCC outputs were prominently showcased (RPP Noticias, 2014; PLANCC, 2015), suggesting a high level of success and impact for Phase I of the project. The Minister of Environment and COP President, as well as the Minister of Economy and Finance, made several references to PlanCC in side events, and addressed the media and various other events as the main informants for the Peruvian INDC. COP 20 permitted the Peruvian government to streamline coordination efforts.

In 2015, PlanCC focused on ensuring uptake of Phase I results into national policy processes via the establishment of Phase II (planning for implementation) and PRONAGECC (institutionalisation) projects. It will support MINAM (and the national Multisectoral Commission in charge of the approval of the INDC) with technical inputs, in the development of the INDC up to submission to UNFCCC, and complete the outreach of Phase I results, including improving access to data. Peru had pulled off a major project, and done so with flying colours.

So it all worked out, right? Well, it’s a little known fact that PlanCC nearly, nearly fell apart. And this time it was not about politics, world affairs, donor funds, or the rotunda dance of the ministers: this time it was about a baby. Maria Elena Gutierrez was heavily pregnant before ENCC 4, and so the meeting was brought forward to avoid clashing with her labour, and also to ensure that she was present. As the day approached, it seemed that she would go into labour at any time. The day before the SBT the baby was still relaxing, while on the outside all hell broke loose. The entire research team was in a basement in a hotel, which became known as ‘the bunker’. There was a crazy rush to complete all the preparation for the SBT. During the chaos, a box fell and struck MEG (her nickname) on her belly. For a moment she couldn’t feel her baby. In distress, she still put in an all-nighter to get the presentations for the meeting done. A healthy baby arrived soon afterwards, neatly between pressing work programmes.
Every country process has a story, but there is a common story too. During the last five years, the different teams were continuously collaborating with each other and with the team in Cape Town. The collaboration took place in many ways and served different purposes: from pure technical assistance to reflection and blue-sky thinking spaces. There was collaboration between facilitators and researchers, with best practices exchanges, intelligence sharing. There were, simply, spaces to emotionally discharge and get an energy boost. All of these were needed along the way.

More than 40 individuals were engaged from Cape Town to drive this collaboration, mainly from Energy Research Centre (ERC) and SouthSouthNorth (SSN). These individuals became known as the MAPS International team. Only a few of these were exclusively working on MAPS. Four of these became key in leading MAPS with old-timers Harald and Stefan. From the start, there was Michelle du Toit, who became the foundation in the MAPS organisation, as its dedicated and indispensable Programme Manager. But apart from good management she brought a combination of warmth, discipline and continous self-criticism that would shape the leadership team. In mid-2011, Marta Torres was recruited from Spain and packed up her
family to move from Barcelona to Cape Town. MAPS benefited greatly from this personal choice. Over time, Marta was to become the third director of MAPS and brought huge dynamism and drive to the process, and, importantly, the single fluent Spanish speaker to the Cape Town team! Not for too long though, two Latin Americans joined this core international team: Ana Maria Rojas helping out with research, and Andrea Rudnick acting as a director in the Latin field. She brought exceptional skills and authority to the programme. Together these two formed the first ‘MAPS office’ on the other side of the ocean. This quartet of powerful women became a driving force in the MAPS story.

The spine of the collaboration was structured around a ‘Lab programme’, where we found ourselves learning from the past developments, anticipating the next set of challenges, and experimenting with possible approaches to problem-solving. During this period, people took more than 1 000 trips to meet their MAPS fellows face-to-face, in addition to the use of online means for distance-based collaboration. Collaborative events were patched onto externally organised events such as UNFCCC negotiations. A total of about 20 Labs took place, spread equally across our five countries, including South Africa. We started with general workshops for the core teams and we gradually moved into more thematic and specialised spaces.

When we met first in Cape Town in 2011, no one could imagine how the relationships within this new and unfamiliar crowd would evolve. Today we are all friends.

Labs were a time to make friends and explore cities and places. Stefan and William Wills had a now-famous meeting, floating for almost two hours with the gentle current in the warm waters of Ipenema Bay, much to the consternation of William’s wife, Fernanda. Peru, of course, has food from heaven, and the Peruvian team bragged happily about their perfect restaurants. Each workshop had its social activities, and every host country team attempted to improve the experience of the previous time. Not all the adventures were equally memorable, but surely Geoffrey Cannock, Carlos Benavides and Maria Elena Gutierrez will remember the hike up Lions’ Head in Cape Town – or at least the hike down – in full work suits and in total darkness. Because one thing is true, the teams worked hard and until late during these meetings. Jet lag was a killer. But good Chilean wine helped.
The South African team, as facilitator of the collaboration and guardian of the country processes, had its extra dose of travelling. Some of us got used to the 29-hour journey from Cape Town to Bogotá and the bumps crossing Los Andes; we became very knowledgeable about the little secrets of the Guarulhos Airport (yes, there were not many in the old airport), and got addicted to the Peruvian and Chilean Pisco brandy (the best of which is a well-kept secret).
Moving all these people around was not an easy job, but Lorraine Dimairho and our trusty travel agent, Belinda Welgemoed, managed that gargantuan task in an outstanding way. Lorraine, and this is not a surprise, is the most popular person within the MAPS community.

The sense of community grew and grew over the years and today it is considered to be one of the important values of the work. The regional collaboration works by itself now at different levels: at government, research and practitioner levels. The value lies in the potential to generate innovation and the southern-driven approach. Collaboration enhances cost-effectiveness for these complex and time-intensive processes.

Our community should have a lasting impact. Today, as an example, three researchers from MAPS Chile, Colombia and Brazil have applied for scholarships to visit the University of Cape Town in 2016. The team members involved in the international negotiations will soon (at the time of writing) be having dinner together in Bonn next to the river, as they usually do, and asparagus crème brulée (yes, they make that in Germany) will be on the menu.
REFERENCES


Not everything that counts can be counted, and not everything that can be counted, counts.

Albert Einstein
Results and impacts (domestic)

Back in South Africa

As reported by Tyler and Torres in their review of the Long Term Mitigation Scenarios (LTMS) (Tyler et al., 2015), South African policy on mitigation is still based on the study. The LTMS was completed in 2007. In mid-2008, the South
African Cabinet released the Vision, Strategic Direction and Framework for Climate Change Response Policy (Van Schalkwyk, 2008). The Department of Environmental Affairs (DEA) held a National Climate Change Response Policy Summit in March 2009, where a pre-policy discussion document was presented for consultation. This document referred in detail to the LTMS and confirmed that South Africa would follow a peak, plateau and decline emissions trajectory (South African government, 2009). This remains a cornerstone, if deeply contested by some, of government policy.

In 2010, a green paper was finalised and National Treasury released a carbon tax policy document. South African climate initiatives were focused on 2011, given that the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) (COP) was to be held in Durban at the year’s end. The current white paper was finalised just in time for the COP. A Mitigation Potential Analysis study was conducted in 2013, and, in the same year, a second carbon tax policy paper was released. A National Greenhouse Gas (GHG) Inventory for the period 2000–2010 was developed in 2014. Work is ongoing, led by the DEA, to implement the white paper, including a real-time GHG inventory, monitoring and evaluation procedures, identification of Desired Emission Reduction Outcomes (DEROs) at a sector and company level, and support for a set of flagship programmes. National Treasury is also working towards implementing the carbon tax, with a 2016 start date identified. It could be argued that, at the time of writing, climate mitigation is moving from a formulation phase into an implementation phase.

In direct and superficial terms, the LTMS was used first as a basis for Cabinet’s Vision, Strategic Direction and Framework, second, as the basis for the Copenhagen numbers and conditional commitment, and third, as the basis for the DEA’s policy documentation process.

The shadow the LTMS casts is long and, for some, perhaps dark. Turning to Latin America, less time has passed for such reflection and reaction as is found in the Tyler and Torres paper, but time will tell. We will start to look at how each country built the evidence base. For those technically-minded readers, a useful comparison to South Africa’s approach can be found in Harald Winkler’s book (Winkler, 2010).
Results and impacts (domestic)

Results: An evidence base for Latin American MAPS countries

Introduction

Stefan and Harald came to Latin America with the perfect pitch. The offer was to develop a project to answer complex questions using a different and innovative approach. They offered to introduce the South African experience, adjusting it to the reality of each country and actual circumstances. Andrea Rudnick remembers that this was a humble approach. They did not offer a method, nor to implement a checklist, but a ‘methodological approach’, a way to address the problem. Countries felt free to design the project as best fit their capacities and political context, but in the end would share the same main elements of the approach.

The co-production of evidence with stakeholders was based on building scenarios. The research plan had several logical steps: build a reference case scenario, analyse mitigation actions in all sectors of the economy, package the mitigation actions into mitigation scenarios, analyse the mitigation scenarios using an economy-wide model, and, for some, build a Required by Science (RBS) and Equity scenario. These main research blocks have proved very useful for climate change practitioners and stakeholders as a very comprehensive and coherent manner of addressing the actual policy questions. The results – and the process to build the evidence – would ultimately inform the climate change mitigation policy at domestic and international levels.

After years of work, here is a quick summary of each of the four programmes.

MAPS Brazil – known as IES-Brasil – developed Economic and Social Implications: GHG Mitigation Scenarios 2030, which focused on development paths that align socioeconomic and environmental objectives, generating GHG emissions scenarios for the period 2020–2030. A Scenario Drafting Committee formulated the different emissions scenarios by involving, from the beginning, the government, the private sector, academia and civil society. This group agreed upon assumptions for two scenarios with selected additional mitigation measures going beyond the extension of current governmental plans, one including measures costing up to US$20/tCO$_2$-eq, and the other up to US$100/tCO$_2$-eq. The study also assessed the

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macroeconomic and social impacts in Brazil should a global carbon tax on burning fossil fuels be agreed, testing both US$20 and US$100 per tCO$_2$-eq.

MAPS Chile$^2$ aimed to generate the best possible (data-based) evidence to inform decision-making on climate change mitigation and low-carbon development in Chile. It comprised Phase I, which ran from the end of 2011 until the middle of 2012, Phase II, which ran from 2012 to 2014, and Phase III during 2015. Phase I of the project developed a baseline for the period 2007 to 2030, which included the ‘natural’ evolution of technologies in the different sectors. Phase I also considered possible trajectories for Chile of what is required from a scientific perspective. Phase II developed an emissions baseline for the period 2013 to 2030, conducted an analysis of individual mitigation actions and presented a set of mitigation scenarios. Phase III focused on assessing co-impacts for selected mitigation measures, analysing long-term (2050) mitigation actions, and deepening the public policy recommendations.

In Colombia, work on the Colombian Low Carbon Development Strategy (CLCDS)$^3$ during 2012 and 2014 focused on the development of sectoral plans of action for individual sectors for the period 2012–2040. Two baseline scenarios were considered for each of the sectors, being an inertial scenario in which the share of technologies in the mix remains as it has been over the past 10 years, and a reference scenario that includes the impacts of policies, regulations and projects which have a high probability of coming on board in the next few years. The impact of mitigation actions on reducing GHG emissions against these baselines and on socioeconomic indicators was then modelled. For each sector, a Sectoral Mitigation Action Plan was developed. In 2015, with the purpose of preparing the Intended Nationally Determined Contributions (INDC), the baseline and mitigation actions were refined, complementing (and in some cases replacing) the previous work and aggregated at national level.

In Peru, the MAPS process is known as PlanCC.$^4$ The first phase of PlanCC, which ran from April 2012 to July 2014, sought to generate qualitative and quantitative evidence about climate change mitigation opportunities in different sectors in the country. The process considered six sectors, namely, Agriculture, Energy, Forestry, Industrial Processes, Transport and Waste. The analysis used 2010 as the initial

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$^2$ Available: www.mapschile.cl/ [15 August 2015].
$^4$ Available: www.planccperu.org/ [15 August 2015].
year for the projections and considered an emissions reference scenario and potential mitigation opportunities for the period to 2050. Then, mitigation actions were packaged into scenarios to assess the socioeconomic impacts they would have, if implemented.

Reference scenarios

The first step in these processes was to build reference scenarios. This is required for supplying a reference level evolving over the time horizon, allowing the calculation of emission reductions and costs of mitigation scenarios (IPCC SAR WGIII, 1996; UNEP Risoe Centre, 1998). Several countries, except Brazil, defined the reference cases as Business as Usual (BAU) scenarios. A BAU scenario may be designed according to a number of different approaches (for example, keeping the same values of a base year; linear or exponential growth rate extrapolated from a chosen past period; extension of current policies and market behaviours, least cost pathways, etc.).

More generally, in a climate change mitigation context, a reference scenario may be used to describe a possible trend of GHG emissions without any additional efforts to reduce emissions. In all MAPS countries, it was used to describe the economy powering ahead, successfully, using a forward-looking approach to estimate the future economic growth rates, in order to assess the economic and social impacts of achieving a mitigation goal. A mitigation scenario set against a reference scenario provides insights on the additional efforts that a country might need to put in place to achieve a target and the corresponding implications for different sectors, the economy and the society as a whole.

This is a technical section of our book, so bear with us. But one has to remember that reference scenarios take our vagabond countries (at least in the imagination) from developing to near to developed. Behind the technical figures, there is a story. This story could also be told as: ‘Look, if we were to become like you, this is what we would look like and this is what our economies would emit into the atmosphere.’

Building this scenario is not an easy task, as there is no agreed single international methodology or guideline to do so. More importantly, this scenario needs to serve a purpose, and we found different stakeholders had different purposes in mind. MAPS country teams adopted a number of measures to enhance the transparency and robustness of these reference cases. For example, using international data sets for fuel price projections, using official local gross domestic product (GDP)
projections, including the Kyoto Protocol basket of GHGs, including all economic sectors as established in the GHG inventories guidelines, and, most important, presenting clear up-front data and assumptions proposed to be used for discussion among stakeholders. When reference cases are used for target setting, transparency is key to prevent the fear of ‘gaming’ (that is, making the baseline artificially high so that the mitigation scenario appears to be cutting a huge amount of GHG emissions). Hence, countries are sensitive about a critique of national reference scenarios (Torres et al., 2014). For the task at hand, MAPS teams were very careful about the definitions and criteria for the development of the reference scenarios, as this would have an impact on the identification of mitigation options and its potential. There are several methodological challenges in building reference scenarios, and based on our experience, assessing and communicating uncertainties or the consideration of technological trends were among the common ones. The LTMS BAU took more than a year to build.

‘Baseline scenario’, ‘BAU scenario’, ‘reference scenario’: these concepts are often mistakenly used interchangeably but there are subtle differences between them. Semantics are relevant for countries in the context of international negotiations, as these different terms refer to quite different concepts behind them, so one must be careful. In Brazil and Colombia it was named ‘Reference Scenario’, in Chile it was named ‘Baseline Scenario’, and in Peru it was named ‘BAU Scenario’. All four countries made the best effort to consider the most reasonable set of assumptions and data that best describe future changes in emissions in the absence of governmental mitigation policies and measures, additional to those planned and implemented to date. The Scenario Building Team (SBT) members participated in defining the reference scenario, including its nature, its assumptions, as well as the compilation of base year data. Through MAPS, there was collaboration on assumptions and inputs.

In all countries, except Colombia, reference scenarios were developed at national level for consideration. In Colombia, these were developed at sector level and were not aggregated in the first phase. The aggregation work was done at a later stage, as part of the follow-up work to inform the Colombian INDC.

In Brazil, the reference scenario was called the Government Plan, and assumed the implementation of the Government Energy Plan and the sectoral mitigation plans designed to achieve Brazil’s voluntary goal – under the Cancun Agreement of the UNFCCC – to reduce GHG emissions by 2020. From 2020 to 2030, a plausible pathway of extending current policies and market behaviours underway up to 2020
was designed. The Government Plan scenario was built on the basis of projections and assumptions made officially by the government. These estimates included demographic, social and economic variables at national and global levels, as well as assumptions of energy supply and demand in different sectors of the economy. This scenario included policies under implementation or planned for implementation, such as: increased use of renewable sources in energy and industry, as considered in the National Energy Plan 2050; treatment of waste, as in the National Policy on Solid Waste; a decrease in deforestation, as in the Plan for Prevention and Control of Deforestation in the Amazon and Action Plan for Prevention and Control of Deforestation and Fires in the Cerrado; incentives to agriculture, as in the Plan for Low Carbon Agriculture, and mitigation measures in the transport sector and in industry. The Reference Scenario in Brazil reached 1,666 Mt CO$_2$-eq in 2030, which is above the 1990 emissions level, but still below the 2005 level, with an increase of 40 per cent with respect to 2010. The Brazilian population reached 223 million by 2030, with an increase of 14 per cent with respect to year 2010. This scenario also considers an average annual growth of GDP for 2005–2030 of 3.88 per cent (IES-Brasil, 2015).

In the case of Chile, two baselines were built: Baseline 2007 and Baseline 2013. Both baselines were the result of aggregating sectoral baselines, which were based on coherent and homogenous macroeconomic data, such as population growth, GDP growth rates, exchange rates and fuel prices. Seven sectors were considered to be the most relevant in terms of GHG emissions and sinks: generation and transport of electricity; mining and other industries; transport and urbanisation; commercial, residential and public energy consumptions; agriculture and land use change; forestry and land use change; and anthropogenic waste. For each sector, a model was developed. The purpose of the Baseline 2007 was to inform the Chilean voluntary commitment under the Cancun Agreement of UNFCCC, consisting of a deviation of 20 per cent in 2020, below the BAU emissions growth trajectory, projected since 2007. The macroeconomic variables and fuel prices were coherent, as predicted at the end of 2006. This was particularly difficult, as a counter-factual scenario was being built. The research team had to build a hypothetical scenario of what would have been projected at the end of 2006, independent of the real experience. The discussions among the SBT members and research team were intense, as it was not easy to understand the purpose of reconstructing the past. It was a political debt, so it had to be done.
Baseline 2013 was built with the most up-to-date available information in order to analyse additional mitigation efforts from 2013 onwards. The Baseline 2013 included all early policies and actions implemented after 2007 and until 2013 to reflect the mitigation efforts of the voluntary commitment. It also included the natural technological renewal of each sector. It definitely benefited from the earlier exercise and models could be further refined. Several GDP growth rates were used to draw both baselines, leading to an ample range of GHG emissions profiles. This was mainly to reflect the uncertainty around projecting GDP. Economists were reluctant to project GDP beyond four years.

I can’t tell my schedule of meetings next week and you are asking me to project the Chilean GDP until 2030! This is not possible, we [economists] don’t work in such time frames.

(The senior economist within MAPS Chile research team)

The stakeholders and the Steering Committee (SC) of MAPS Chile agreed to use the medium GDP growth-based scenario as the final 2013–2030 reference case. As a result, the Baseline 2013 reached 179 Mt CO$_2$-eq in 2030, with an average growth rate of emissions of 4 per cent, and a real growth rate in 2030 of 3.3 per cent. Emissions doubled between 2013 and 2030. The reasons behind the growth in emissions were mainly the increase in coal-based power generation by 2030 (that is, 5 500 MW of additional capacity), the increase in electricity demand driven by enhanced industrial activity, the increase in private passenger transport (road and air flight), and an increasing demand for copper up to 2030 (MAPS Chile, 2014).

The Colombian team had a different approach. GHG emissions of four sectors of the economy were analysed in the first stage: agriculture and livestock, waste, energy, and transport. Emissions were estimated for each sector for 2010, which is the base year of the analysis, and would then be projected to 2040. The sectoral emissions would not be aggregated into a national baseline, as in the other countries. Later in the process, the Colombian team recognised the need to build an aggregated national baseline, which would provide more flexibility to fulfil any mitigation commitment (Universidad de los Andes, 2014).

Two baseline scenarios were developed in each sector. The first was the Inertial Scenario, which represents the emissions of each sector that would occur if the same management practices observed today are considered, that is, without changes in technology or energy efficiency. The so-called Reference Scenario was the most
likely scenario according to sector experts – and includes goals and policies under implementation, as well as those that are expected to be implemented successfully during the period of analysis, together with the technology changes expected for each sector. Given the mandate to work on a sectoral approach – used as support for the design of governmental sectoral action plans – the interaction between different sectors was not formally addressed. The results show that all sectors would increase their emissions in the coming decades under the Reference and Inertial Scenarios. For the Reference Scenario, and with respect to year 2010, these emissions would increase: almost three times for the energy sector, two and a half times for the transport sector, two and a half times in the waste sector, and one and a half times in the agricultural and livestock sector by 2040. The reasons behind the growth in emissions are mainly: the increase in livestock and consequently the increase of enteric fermentation and manure emissions; an increase in the demand for cement up to 2040; and an increase in the demand for electricity, driven by the industrial sector. During 2015, official data from the Colombian national GHG inventory became available and all the sectors were recalculated. Therefore the refined baseline scenario uses officially reported emissions up to 2010. Additionally, the agriculture, forestry and land use (AFOLU) change sector was included. Finally, an aggregated emissions scenario for the total of GHG was built. This last baseline scenario was the one used as the reference scenario for the INDC design.

In Peru, the BAU Scenario for 2050 projected a population of 40.1 million people, emitting 8 tCO₂ per capita (equivalent to a developed or high-emitting country at the moment). In other words, a Peruvian would emit as much CO₂ as a citizen of a current developed country. This scenario shows a 40 per cent increase in emissions per capita compared to year 2010. GDP would increase significantly: it would be multiplied by more than five times between 2010 and 2050. This would imply that Peru would reach the current level of GDP per capita of Italy by the year 2048 (PlanCC, 2014).

By 2050, in the Peruvian BAU Scenario, there would be 26 per cent participation of renewable and hydroelectric energy in the final energy consumption structure. The rest would be coal, natural gas and oil derivatives. In addition, energy intensity would be 0.93 terajoules for every million soles⁵ produced in 2050. One of the drivers of emissions is that 99 per cent electrification would be achieved by 2050, with Peru reaching the same electricity consumption as a developed country such as Denmark. As a whole, national emissions in Peru would grow 1.9 times, reaching 320 Mt CO₂-eq by 2050 (PlanCC, 2014).

⁵ The Peruvian currency.
In all four countries, the results of the reference scenarios show that emissions grow significantly, in spite of mitigation policy to date. The main drivers of emissions are GDP growth and population trends, with increases of between 10 and 25 per cent by 2030. With population growth and increasing wealth, and taking into account the current development deficit, energy demand increases dramatically. Nonetheless, emissions per capita and emissions per GDP reached by 2030, although aligned to current world averages, are in fact much below current rates in the industrialised world. In Figure 7.1 we can see the largest emission growth rates take place in the energy and transport sectors, driven by increased final energy demand.

**Figure 7.1: Sector breakdown of GHG emissions growth by 2030. Source: Rojas et al., 2015.**

**Required by Science and Equity scenarios**

APS has encouraged national conversations on equity, particularly in the context of building a scenario framework, and eventually informing climate mitigation policy making. RBS and Equity scenarios are normative by nature and represent the fair share that a country will have to contribute in order to meet the global 2 °C goal, given a number of equity considerations such as capability and historical responsibility. Equity has been, and will continue to be, a central component of climate negotiations at both international and national levels.
In Chapter 8, we shall look at the work MAPS International did in the equity space. Here we will look at its influence on the domestic processes.

Equity essentially poses the questions: What is fair? What is the fair effort of a developing country to reduce emissions, allowing for adequate time for development? How, based on science and fairness, can we share or distribute the remaining global carbon space among all countries? (Torres & Du Toit, 2014).

The challenges of translating these questions into a scenario centre on the estimation of the overall required global effort to stay below the 2 °C pathway, and the criteria – together with weighting of criteria – to share the overall carbon budget among the countries. This is a veritable puzzle because, in order to do so, we need to understand the differences in national circumstances and capabilities and how these differences among countries impact emissions, potentials and costs.

As one can imagine, equity can be a sensitive issue. And one can easily skew the calculations to suit country interests.

RBS and Equity scenarios were considered in Chile, Colombia and Peru as a form of ‘creative tension’, stimulating the stakeholders to consider more ambitious mitigation action. In the case of Brazil, the focus was different: the assessment of social and economic implications of mitigation action. For this type of assessment, one needs an ‘interventions-rich’ scenario that can be analysed in an economy-wide model, and the focus is not so much on equity externally as equity within society.

Country teams explored their ‘relative fair effort’ in different ways. The scope of the debate varied from country to country, but a common understanding was the need to have a low benchmark – a reference path against which one could assess the emerging mitigation effort levels. For some, the existence of that scenario was to provide information that could drive greater ambition at the national level. For all the countries, the starting point was the development of the global RBS scenario. This is understood as the global emissions scenario that enables a temperature increase of less than 2 °C above pre-industrial levels. Then the local teams, together with the stakeholders, identified and applied different equity-related criteria to distribute the global domain to national levels. The sum of these national emission trajectories should fall within the global RBS scenario (Torres & Du Toit, 2014).
Methodologically speaking, information from the Inter-governmental Panel on Climate Change (IPCC) or the UNEP Emissions Gap Report was used to build the global RBS scenario. For the next step of distributing this global scenario to countries, a number of considerations were taken into account. There is no single criterion that reflects the complexity of the fair effort to which each country should commit. The approaches used by the MAPS teams were based mainly on the principles of the UNFCCC, that is, their common but differentiated responsibilities and respective capabilities. Although all approaches agree in pursuing compliance with the principles of the UNFCCC, they differ in the interpretations of those principles according to a national perspective or their own understanding of the principles and other equity-related considerations. It can be somewhat chaotic, this issue!

In Chile, the global RBS scenario was built using Scenario B1 from the Fourth Assessment Report of the IPCC (IPCC, 2007) for the period 2006 to 2100. The distribution was done using three different criteria: percentage of global emissions (Chile’s participation in total emissions remains constant); emissions per capita (the greater the indicator, the greater the effort required); and GDP per capita (the greater the indicator, the greater the effort required). These criteria were not combined into a single scenario, so they represent extreme considerations of equity. For each of the above criteria, two scenarios were developed: the first comparing Chile to all countries in the world, and the second comparing Chile with other Latin American countries. Figure 7.2 shows the trajectories according to the three criteria used, comparing Chile with all the countries. The results vary significantly from criteria to criteria. All three criteria show that Chile’s emissions should peak around 2040 and then decline to reach a range of emissions of 16–50 Mt CO₂ in 2100. This means that a reduction of 73 per cent by 2100 is required under the most demanding alternative. Meanwhile, a reduction of 15 per cent by 2100 is required under the least demanding alternative, compared to 2006 emissions, as reported in the Second National Communication of Chile. Figure 7.3 shows the RBS domain embracing all three criteria.
At a later stage, Chile would have to scramble to update its analysis using the Fifth Assessment Report of the IPCC, which provides a more stringent scenario consistent with the overall target of the UNFCCC. The effort by Chile came in too late to influence the mitigation scenarios, which were built using the RBS scenario based on the Fourth Assessment Report of the IPCC.
In Colombia, the scenario was named ‘RBS and Equity’ and the time frame used was 2010–2050. The global RBS scenario chosen was obtained from the medians of the results of all models considered by the UNEP in the Emissions Gap Report (UNEP, 2014). The distribution of the global scenario to the national scenario was done using three different criteria:

1. **RBS simple per capita**: every person on the planet, regardless of their country of origin, has a ‘right’ to emit a certain amount of GHG per year. By using the rights to emit of the inhabitants and a projection of the national population, you get the level of emissions that the country should follow.

2. **RBS simple per intensity**: it is assumed that the carbon intensity per country converges into a single annual value. Thus, by using this carbon intensity and a projection of the Colombian GDP, you obtain the level of emissions that Colombia should follow.

3. **RBS combined**: two equity criteria were combined into a single scenario. The first equity criteria used was the historical responsibility, which consists in the accumulated emissions of Colombia from 1850 to 2010, divided by the population in 2010. The second criterion used was the mitigation capability criteria, which uses income as a driver of capacity and is calculated by using the income per capita in 2010. A 50–50 weighting factor of both criteria was used to get the combined scenario.

Figure 7.4 shows the results of the RBS and Equity scenarios for Colombia. The responsibility and capability-related scenarios are very similar in magnitude and much stricter than scenarios resulting from applying per capita and intensity convergence approaches. The RBS and Equity scenario chosen as a reference is the combined one. For this one, and as illustrated in Figure 7.4, emissions would need to be reduced by 50 per cent, compared to the BAU scenario, by 2030.

The Peruvians developed two scenarios for the period 2010–2050. One is a simple RBS scenario based on a ‘national’ proportion of the global goal, in a similar way to the South African option in the LTMS process (Figure 7.5). The research team explored another scenario that was distributed according to the concept of equity and differentiation, based on the proposal by the Group of Experts from BASIC.6 The results of the latter scenario showed a less stringent pathway. After discussions with the stakeholders and the SC, the more demanding pathway, in terms of GHG emissions, was chosen by Peru as the reference RBS scenario.

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6 The BASIC countries are a bloc of four countries – Brazil, South Africa, India and China – formed by an agreement on 28 November 2009.
The team has found this task particularly challenging as new information and findings continually evolve within the international scientific community. The team used the Fourth Assessment Report of the IPCC. It was interpreted that at least 50 per cent of emissions need to be reduced by 2050, compared to 2000 levels. In addition, they added another constraint, namely that emissions would need to peak by 2020, as stated in the UNEP Emissions Gap Report (UNEP, 2012). The Peruvian RBS curve was then developed using quadratic equations and polynomial functions. The results show that Peru would need to emit 60 Mt CO$_2$-eq in 2050, which is an 81 per cent reduction below the BAU. By 2030, this means 105 Mt CO$_2$-eq, which equates to a reduction of 57 per cent below the BAU. The estimation of the BAU was refined at a later stage to inform the INDC of Peru, modifying slightly the reduction efforts compared to the RBS scenario (PlanCC, 2014).
Mitigation actions and scenarios

The four countries followed a similar approach regarding the analysis of mitigation actions: defining the most relevant economic sectors in terms of emissions; identifying mitigation actions for each specific sector, and analysing for each of them the period of implementation, investment, operation and maintenance costs, income, technical feasibility and the potential emissions reduction, including scales and rates of implementation. There were also noticeable differences among the four countries: there were distinct time periods, and they used different categories to group the economic sectors, as well as different methodological approaches and modelling frameworks to estimate abatement potentials and costs from the actions.

The mitigation scenarios were built by packaging mitigation actions. If a mitigation scenario is compared with a reference scenario, it also reveals the amount of avoided emissions over a period. The countries used different ways of packaging. The periods of analysis also differed. In Brazil, the period considered was 2010–2030. In Chile, the mitigation actions and scenarios were analysed for the period 2013–2050: however, results were only presented until 2030 due to high levels of uncertainty for the longer term. In Colombia, the analysis was done until 2040 during Phase I, and until 2050 during Phase II. Finally, in Peru the mitigation period considered was 2013–2050.

We shall try to navigate through this diversity, and this gets quite technical!

Brazil modelled mitigation actions in these sectors: energy supply; energy demand in transport, residential and services, and agriculture; industry and industrial processes; AFOLU; and waste emissions. The models used at sector level were MESSAGE for energy supply, BLUM for AFOLU, LEAP for energy demand, and their own-developed model for industry and waste process-related emissions. IES-Brasil modelled emissions reductions against the Government Plan scenario (GPS). Mitigation actions additional to those already included in this plan were identified for the 2010–2030 period. The discount rate assumed, in order to estimate the net present value of the costs, was 8 per cent, the official rate used by the government. After modelling the selected actions, these were divided into two groups according to their mitigation marginal abatement cost or their difficulty in overcoming the barriers to implementation. In general, mitigation actions with an abatement cost of US$20/tCO$_2$-eq or less would inform the nation-wide Additional Mitigation Scenario 1 (AMS1). While mitigation actions with an abatement cost of US$100/tCO$_2$-eq or less
would go into the Additional Mitigation Scenario 2 (AMS2). Thus AMS2 includes the measures from AMS1. In total, 51 actions were assessed for the eight sectors. Twenty actions were modelled for AMS1.

The agricultural and forestry sector had the largest potential to reduce emissions compared with the GPS, with 410 Mt CO$_2$-eq in 2030 for the AMS1, and 249 for the AMS2, down from 570 in the GPS. The transport sector had the second largest reduction potential with 277 Mt CO$_2$-eq in 2030 for the AMS1, and 210 for the AMS2, against 383 in the GPS.

The analysis of the mitigation options at sector level was passed on to an economy-wide model to capture cross-sectoral effects. Four mitigation scenarios were then developed: AMS1, with and without a carbon tax, and AMS2, with and without the tax. The scenarios without the tax assume that the mitigation options are implemented with the help of regulation and microeconomic measures, whereas the carbon tax scenarios imply the existence of a fiscal policy. The carbon tax is introduced for emissions originated by fossil fuel burning in the power sector. A tax of US$20/tCO$_2$-eq was added to the AMS1 and a tax of US$100/tCO$_2$-eq was added to the AMS2. Each scenario was called AMS1+T and AMS2+T, respectively. Both scenarios assumed that the revenue from the tax collection would be used to offset an equal amount of labour burden. Thus, the adoption of the carbon tax would maintain fiscal neutrality, just shifting the tax on labour to fossil fuels. The implications of the use of a tax are explained in the section on social and economic implications.

The potential to reduce emissions of the scenarios with tax was very similar to the scenarios without tax (curves are overlapped in Figure 7.6). The selected additional mitigation actions result in a significant reduction in emissions by 2030. This reduction is of 22 per cent in the AMS1 and AMS1+T scenarios, and of 39 per cent in the AMS2 and AMS2+T scenarios, compared to the GPS (see Figure 7.7). Without adopting new mitigation measures, emissions in the GPS start to grow from 2020, with an increase in emissions, particularly in the energy and agriculture and cattle-raising sectors. This increase could result in 1.67 billion tCO$_2$-eq in 2030, which is above the 1990 emissions level but still below the 2005 level. In the AMS1, with the implementation of a selection of significant additional mitigation actions, emissions in 2030 would be in the order of 1.3 billion tCO$_2$-eq, keeping national emissions 5 per cent lower than the 1990 level. In the AMS2, the implementation of a selection of more ambitions mitigation actions would allow the country to continue on a trajectory of decreasing emissions, which, in 2030, would reach approximately 1 billion tCO$_2$-eq, 25 per cent lower than the 1990 level (IES-Brasil, 2015).
The most ambitious scenario developed under IES-Brasil stabilises GHG emissions in spite of a substantial growth in GDP. To achieve such levels, the country undertakes an additional massive effort to restore degraded land, both in the Amazon and the Atlantic areas, increase the area of planted forests and increase renewable energy production based on biomass. This scenario (AMS2), therefore, combines highly efficient biofuel technologies with an expansion of forest stocks.

Figure 7.6: Evolution of emissions scenarios, 1990–2030. Source: IES-Brasil, 2015.

Chile selected seven economic sectors for the analysis: electricity generation; industry and mining; residential, commercial and public consumptions; transport; agriculture; forestry; and waste. The models used in Chile for the bottom-up analysis include MESSAGE, an econometric own-developed model for transport, commercial-residential-public consumptions, anthropogenic waste and AFOLU (Phase II), AGRI-LU, LEAP, and LEAP-WEAP. Emission reductions were measured against the Baseline 2013 scenario and were represented in a marginal abatement cost curve (MACC). Three discount rates were considered: two social discount rates, 1 per cent and 3 per cent, and the rate used by the private sector, 10 per cent. In total, 96 mitigation actions were analysed for the 2013–2050 period. The final list of mitigation actions was a result of discussions and feedback from technical working teams, the SBT and the SC. The top three actions with the largest accumulated reduction potential were linked to the electricity generation sector. Regarding marginal cost abatement potential, the first 10 most cost-effective actions assessed by MAPS Chile belonged to the transport sector. Setting energy consumption and CO$_2$ emissions goals for the average new car fleet, establishing a grant programme for electric bicycles, and launching a training programme to teach efficient best practices to drivers are some examples.
After evaluating the actions individually, they were combined into mitigation scenarios. The SBT of MAPS Chile proposed three scenarios defined by the levels of mitigation effort each of them made, namely Base Effort, Medium Effort and High Effort. Effort levels were related to abatement costs, mitigation potential and feasibility to develop the actions. SBT members would classify an action with large marginal cost and low feasibility, for example, into the High Effort scenario.

Mitigation actions were also packaged into five thematic mitigation scenarios: energy efficiency; non-conventional renewable energies; renewable energies; nuclear energy; and ‘80/20’. Non-conventional renewable energies included all solar, geothermal, wind, biomass and small hydroelectric actions. Renewable energy was the non-conventional, renewable-energy scenario complemented by the major hydroelectric plants. Nuclear energy incorporated nuclear energy developments post 2030. The ‘80/20’ scenario combined a limited group of actions that, in total, had a high mitigation potential. Finally, the SC of MAPS Chile proposed a carbon tax scenario. The research team modelled a carbon tax of US$5/tCO₂-eq and another of US$20/tCO₂-eq in the electricity-generation sector. These were simulated independently from the other mitigation actions in order to observe the effects the carbon tax would have on the economy. The High Effort scenario would mitigate the greatest amount of emissions by 2030, potentially reducing 32 per cent of the baseline emissions in 2030. This was followed by the Medium Effort scenario, which would reduce 28 per cent of the baseline emissions in 2030. The 80/20 scenario, in third place, would mitigate 22 per cent in 2030, showing that there is a small group of actions that reduce the highest quantity of emissions. In all scenarios, the sectors with the greatest potential to contribute to emission reductions are the electricity generation, transport and forestry sectors (in absolute terms). In percentage terms, the sectors that could contribute the most to reduce emissions are the electricity generation, waste and forestry sectors.

The most ambitious scenario developed by MAPS Chile stabilises GHG emissions in the period 2013–2030, in spite of a continuous growth in GDP. To achieve this stabilisation, Chile would need to substantially increase the electricity generation with liquefied natural gas, implement hydropower projects in the Aysen region, and reach 30 per cent of non-conventional renewable energies by 2030.
Colombia modelled emissions and mitigation actions from seven sectors: electricity generation, residential, industry, mining, transport, agriculture and waste. The bottom-up models used in Colombia include LEAP, HOMER, WARM (Phase I), MARKAL, MAED, MPODE, MEEAVE, IMPACT/CROPS/LAND for AFOLU sector (Phase II) and custom models specifically developed for some sectors in both phases (for example for the transportation and waste sectors). The impact of mitigation actions was evaluated with respect to the sector-based Reference Scenario. During Phase I, the actions were used to build MACCs for each of the sectors, and at a later stage, the sectoral baselines were aggregated for mitigation scenarios for the period 2010-2040. In total, 97 actions were assessed for the MACCs. The energy demand and transport sectors contained the largest number of actions, 29 and 19, respectively. The energy demand sector had the largest potential to reduce emissions for the 2010–2040 period, with 369 Mt CO$_2$-eq. The agricultural sector had the second largest reduction potential with 344 Mt CO$_2$-eq. The actions in the residential sector were the most cost-efficient ones, followed by the agricultural sector with negative abatement costs.

The individual mitigation action with the largest reduction potential was intensive silvopastoral systems. It had the potential to reduce 208 Mt CO$_2$-eq between 2010 and 2040. This was followed by the burning of recovered biogas from all landfills in Colombia. Replacing incandescent lights with efficient light bulbs and improving the efficiency of diesel-oil boilers in the food and beverages subsector were the two most cost-effective actions assessed by the Colombian research team.
During Phase II, all the mitigation actions were recalculated, since relevant changes to the modelling assumptions were detected (that is, a drop in the international oil price and lower expectations on mid-term economic growth, among others). The forestry and land use change sector was included in this phase in order to model the total GHG emissions of the country. A modelling framework was defined across the sectoral teams in order to build an aggregated, national emissions baseline and mitigation scenarios. The mitigation actions that were identified in Phase I, together with new actions from Phase II, were assessed. The Colombian research team then modelled three mitigation scenarios with increasing levels of effort. The so-called ‘Green Scenario’ included 82 actions and represents the largest deviation from the BAU (a 34 per cent GHG reduction in 2050). The ‘Realistic Scenario’ was based on the Green Scenario, but it excluded actions with abatement costs over US$30/tCO$_2$-eq and some actions that would require international support for their implementation. Finally, a scenario called the ‘Grey Scenario’ was based on the Realistic Scenario, but it additionally excluded those actions contested, or not considered feasible, by government entities and business organisations during the discussions at the sectoral meetings. It includes the most feasible and accepted mitigation options considered by government entities and business organisations during the sectoral meetings. One could say that this scenario reflects these agents’ aversion to change.

The scenarios analysed were identified as plausible, with the third one being the least plausible due to the incremental costs of implementation. As a result of the government’s interest in increasing the ambition of GHG mitigation, a fourth scenario was built. The fourth scenario is the most ambitious scenario yet, and includes emerging technologies, bigger penetration rates of the previously identified mitigation actions, and very ambitious goals to reduce deforestation, and increase reforestation and restoration. This last scenario was identified as being unlikely without international support in terms of capital, funding and technology transfer, among other considerations. This scenario was identified as the mitigation scenario conditional upon international support.

Finally, Peru modelled emissions and mitigation actions from six sectors: energy, transport, industrial processes, waste, agriculture, and land use, land use change and forestry (LULUCF). The models used in Peru for the micro-level analysis were own-developed econometric models and a least-cost optimisation model with detailed hydro data for the power sector (PERSEUS). The research team, together with the stakeholders, developed an MACC for the period 2013–2050. PlanCC prioritised 77 mitigation actions, according to the following criteria: potential
emission reduction, technical and economic feasibility, co-benefits, reliable data to calculate the costs of implementation, and not modelled in the BAU scenario. The energy and forestry sectors contained the largest number of actions, 21 and 15, respectively. The forestry sector had the largest potential to reduce emissions, that is, 2,415 Mt CO$_2$-eq, followed by the energy sector, at 646 Mt CO$_2$-eq. The transport sector mitigation actions were the most cost-effective ones, followed by the industrial processes actions. In terms of individual mitigation potential, the top three actions were related to sustainable forestry management. Sustainable management in permanent production forests had the largest mitigation potential of all actions assessed in PlanCC, that is, 553 Mt CO$_2$-eq. Relating to individual marginal abatement cost, the top three actions were in the transport sector. The first one involved converting from gasoline to natural gas for light, private vehicles. The second action involved the introduction of low-emission buses to replace old minibuses and taxis. The third was a training programme to inform and instruct professional drivers in efficient driving practices. Considering all of the above, the research team packaged the mitigation actions into four mitigation scenarios: a Fast Scenario, a Savings Scenario, a Sustainable Scenario, and a Sustainable + Carbon Tax Scenario. (Figure 7.8)

![Figure 7.8: Emissions scenarios constructed in PlanCC. Source: PlanCC, 2014.](image-url)
The Fast Scenario consisted of 14 mitigation actions that were more feasible from an implementation point of view, according to the project’s Prospective National Team on Climate Change Mitigation. This scenario contained mostly energy and transport mitigation actions and reached 11 per cent reduction below the BAU in 2050. The Savings Scenario consisted of all actions that had net savings per tCO$_2$-eq (47 mitigation actions), reducing 21 per cent of emissions below the BAU in 2050. Most of the actions were from the energy sector, although the forestry ones had the greatest potential to reduce emissions and the transport sector actions were the most cost-effective. The Sustainable Scenario contained all actions that, throughout the period of evaluation, were able to reduce at least 40 Mt CO$_2$-eq and also had social and environmental co-benefits. Thirty-three actions were included in this scenario, reducing GHG emissions, notably, to 47 per cent below the BAU in 2050. The Sustainable + Carbon Tax was the same as the Sustainable Scenario, complemented by a transversal carbon tax. This tax was applied on 2026 at a rate of US$15/tCO$_2$-eq and gradually increased to reach US$50/CO$_2$-eq in 2050. The only sector that was not affected by the tax was the carbon-capture forestry sector.

Finally, the most ambitious scenario developed by PlanCC – the Sustainable Scenario – increases the share of non-conventional renewable energy, achieving 37 per cent, together with hydroelectricity, of the electricity share in 2050. In addition, the country implements the metro lines in Lima, generating a big opportunity for investment. This scenario also combines the reforestation of half a million hectares of degraded areas of the Amazon rainforest, the increase of productivity of timber, together with preventing the loss of 34 per cent of primary forests.

The mitigation scenarios show a decoupling between growth and emissions in all countries. Figure 7.9 shows that the biggest reduction in carbon intensity is coming from Peru, with huge climate-mitigation effort already included in the reference case. This is very similar in Colombia. In spite of this, emissions keep growing. In Brazil, the ratio between emissions and GDP (measured in tCO2-eq/million US$ in 2005), which was halved from 2 to 1 tCO2-eq per US$ million between 2005 and 2010, would be 0.66 in the GPS, 0.5 in AMS1, and 0.4 in AMS2, in 2030 (IES-Brasil, 2015). In Chile, efforts are more difficult because there is no deforestation and forestry is a net carbon capture sector.
Figure 7.9: Emissions per GDP in all four countries in tCO2-eq/million US$ of 2011. Percentage reductions in the graph refer to changes against the base year data. Source: Rojas et al., 2015.

Compared to the reference cases, carbon intensity of the most ambitious scenarios in Brazil decreases 40 per cent, in Chile, 37 per cent, in Colombia, 26 per cent and in Peru, 54 per cent. So carbon intensity of the economies falls dramatically for all scenarios compared to reference cases, and even more significantly compared to the carbon intensity of the base year data (68 per cent in Brazil, 37 per cent in Chile, 57 per cent in Colombia and 78 per cent in Peru). The emissions intensive sectors grow at a lower growth rate than GDP.

**BOX 7.1**

Across MAPS countries, a great number of mitigation opportunities have been identified, with technical, political and economic feasibility, together with co-benefits assessment. More than 250 actions are ‘ready’ to be packed as Nationally Appropriate Mitigation Actions. If we look at all the scenarios in the four countries, the most ambitious ones are between 26% and 47% reduction below the reference scenario by 2030. Waste and forestry sector actions have the absolute largest abatement potential across the four countries. Some transport sector actions in Chile and Peru are among the cheapest across the four countries. On average, Brazil’s actions have the largest mitigation potential and Peru’s actions are the cheapest.

(Rojas et al., 2015)
Social and economic implications

The national implications of the mitigation action and development prospects stemming from mitigation were crucial to each of the MAPS assessments. World-class modelling approaches were applied to the task, as explained in Chapter 5, namely CGE-based models in Peru and Colombia, DSGE in Chile and the hybrid CGE-based model, IMACLIM, in Brazil.

Results in Brazil show that additional mitigation actions to those already planned by the government may contribute to the increase in GDP, and GDP per capita, if they can be adopted without a carbon tax. With the tax, the impact on GDP will depend on the tax level required: up to US$20/tCO₂-eq, GDP would not grow less than in the reference case, as shown in the result of AMS1+T; but with a tax of US$100/tCO₂-eq, used in AMS2+T, GDP growth would be lower than in the reference case, as a result of the decrease in total economic activity due to the tax levied on all countries.

Also, additional mitigation actions create more jobs, pushing down the unemployment rate in all additional mitigation scenarios. The average annual household income increased in all mitigation scenarios, with greater gains for the poorest families, contributing to a slight improvement in income distribution. There is also huge potential in biomass employment – up to 22.7 per cent in 2030 compared to the reference case scenario, and the biomass sector creates about 1.3 million jobs more than in the reference scenario. The selected additional mitigation actions have a positive impact on purchasing power, even given the increase in the level of prices. In the scenarios that consider a global carbon tax, only the richest class would lose purchasing power compared to the reference case, while the purchasing power of the low- and middle-income classes would remain higher than in the reference case. In the scenarios that do not consider a global carbon tax, the gains in purchasing power are higher across all income classes.

In scenario AMS1+T, the Brazilian foreign trade surplus is almost the same as in the reference case, while in the more ambitious scenario with carbon tax (AMS2+T), the trade surplus almost doubles compared to the reference case. In this case, the higher trade surplus is due to the increase in competitiveness of national industry on account of its lower carbon footprint in the production of energy-intensive goods (including chemical products, non-ferrous metals, pulp and paper, and steel), reducing the imports of some products (such as non-ferrous metals) and increasing the exports of others (such as pulp and paper).
So mitigation does not necessarily lead to a decrease in economic growth, but in the event that it does, employment can be protected. Finally, a global carbon tax may increase competitiveness, for instance, in steel production. There are opportunities to harness growth from increased efficiency and low-carbon development in the future if mitigation starts now.

For Chile, in the short term (2020) there is an insignificant negative impact on employment and production in almost all mitigation scenarios, except for the carbon tax scenario. The mitigation scenarios are cost effective by 2030, in the sense that they verify an increase in the GDP and in levels of employment, except in the carbon tax scenarios. In the case of a carbon tax, the link between growth and employment is apparent, with an elasticity close to 1. Strong capital spending in the short term, which corresponds to investment in machinery and equipment acquired mostly from abroad, involves a small fraction of spending on domestic goods to move to spending on imported goods, which leads to a lower domestic demand, and, consequently, a negative deviation of GDP relative to the baseline scenario.

There are synergies between mitigation and growth – a positive deviation of 7.4 per cent in GDP for the High Effort scenario in 2030, compared to the baseline. The Dynamic Stochastic General Equilibrium model predicts less reduction in emissions for scenarios in which there are positive growth effects, and more reduction for scenarios where growth is lower than the baseline.

In Colombia, most of the mitigation actions lead to improvements in efficiency, thus in productivity. However, the results from the macroeconomic analysis show that the amount of capital investment required to implement these actions might reduce the flow towards investment in the economy. This produces a net reduction of the expected economic growth rate in the mid-term with a slight recovery in the long term. This fact clearly shows that one of the biggest barriers for implementation could be capital financing.

The take home from Peru is that low carbon emissions development has the following implications: new investment, an increase in population income, increased energy security, savings through efficiency, productivity and better competitiveness for business, improved environmental quality for citizens, and GDP growth in the long term. In Peru, all mitigation scenarios have positive effects on GDP in the long term, but in the short term the effects are negative – the same as Chile, with high capital investment in the short term, followed by efficiency and productivity gains from the medium term. In the Sustainable Scenario, the implementation of 33 sustainable
development mitigation actions lead to additional investments of over 7 300 million soles, accounting for 26 per cent of the current pro-investment project portfolio, a third of which can be carried out by the private sector. This is equivalent to an additional initial investment of 53 750 million soles, and continuing with regular investment of about 46 460 million soles. Welfare, measured in terms of household consumption, follows suit. This is because, in the short term, the cost of production goods rise, which translates into an increase of domestic goods. In the long term, the productivity of the private sector increases and the price of domestic goods decreases, which generates savings for families. Regarding the inclusion of the tax, the positive effect of GDP, due to reflux of revenue collection in the form of public investment, increases the accumulation of capital and accelerates the growth of the domestic product. There is a slight reduction in inequality by 2050 in the Sustainable Scenario (−0.7 per cent variation of the Gini coefficient). A main driver of this result is the focus on forestry; a third of the measures in the sustainable scenario are focused on the forestry sector, which then have a positive impact on the communities in which these measures are applied, improving salaries and income in these poorer communities. The Sustainable + Tax Scenario has the highest level of public investment and accumulation of capital in the long term due to the greater impact of tax revenue. The Sustainable Scenario and its expanded version tend to lower the tax rate, however, these measures favour the importation of goods due to higher costs associated with domestic goods. With respect to household income, the effects of short and long term are similar to the results for GDP, when distinguishing between income quintiles, with both the poorest and the richest affected in the short term. Finally, we see improving income distribution in the long run for all packages, being relatively better with the Sustainable + Tax Scenario. In the short term, the situation is the reverse. In conclusion, the measures included in the Sustainable + Tax Scenario reduce inequality the most. Its impact on GDP and welfare of households is similar to other measures. The impact is positive in the long term, but negative in the short term. Therefore, it is recommended that policies for implementing the measures be accompanied by compensation mechanisms (Rojas et al., 2015).
For policy-makers, the most salient feature of this mitigation analysis has been the impacts of these interventions on development goals. Results are clear on the positive impact of mitigation action in the long term, in particular for GDP growth and employment. The results of MAPS processes tell us that there are opportunities for low carbon growth in each of these countries. In a number of scenarios, growth is even higher than in the reference or BAU cases. Gains become more apparent in the long term, even without considering the costs of potential climate change impacts and adaptation. The short term remains more challenging, and early capital investments generally result in losses in GDP. Generally, the results confirm that taxes could have a negative effect on growth, but there are ways to redistribute funds and increase employment and welfare. The main lesson from the MAPS macro-work, consequently, is that there are synergies between mitigation and inclusive growth. Some gaps remain in the analysis of the mitigation and development solution space, where further work is needed.

(Rojas et al., 2015)

MAPS processes have been totally driven and implemented by local teams. This includes drawing on existing capacity and, where necessary, developing the local capacity across research institutions, government, the private sector, and civil society to conduct the process, and developing a new way of working. The in-country capacity development has, thus, become one of the most distinct features of the MAPS experience. The indigenous work has a number of co-benefits and ultimately creates a foundation for local action. It comes with trade-offs, such as the use of more sophisticated models or time-investment. At its core, MAPS endeavours to drive change at multiple levels through the action of people, based on continuous learning. Rather than applying old techniques and methods, new tools and skills have been developed by the South with a development first approach and to answer country-specific questions (Boulle et al., 2015).

MAPS was, indeed, from the South and for the South. The impact of the capacity generated will last for a long time.

**Domestic impacts**
Brazil

Currently it may be too early to analyse the impact of IES-Brasil on climate change policy and practice in Brazil, but there is no doubt that the participative methodology has had an impact. Already more than one SBT member has suggested the creation of regional versions of IES-Brasil, utilising this multi-stakeholder approach. All those who have participated in a presentation of the results of the project have congratulated the Brazilian Climate Change Forum and the Research and Modelling Team for having carried out such a rigorous and legitimate study.

The international position of Brazil in Paris is, at the time of writing, still unclear. Before IES-Brasil began, a representative of the Ministry of Foreign Affairs strongly supported the idea of the project at a presentation to the Inter-Ministerial Committee on Climate Change (IMCCC) in Brasilia in August 2013. The focus was on the international element. He stated, 'the more qualified inputs we have to create and defend the Brazilian position at COP 21, all the better for those of us that represent the country in the international negotiations'. IES-Brasil should help that immensely.

In Brazil, there was a deepening in the exchange of expertise between stakeholders as a consequence of the IES-Brasil process. There was an increase of the level of knowledge in the scientific, business, governmental and social organisation communities in relation to the macroeconomic and social implications resulting from the mitigation scenarios in Brazil. There was also a promotion of a culture in which scenarios are used as tools to provide insights to the decision-making process.

One of the lessons learned during IES-Brasil was the need to train the modelling team and researchers in process work, dialogue tools and facilitation techniques, helping them to build a ‘facilitator attitude’. Researchers like to be behind computer screens – now they had to be in front of people. Through briefings and one specific training session that took place in June 2014, the researchers deepened their capacity to approach research issues from a dialogical perspective, improving collaboration among all involved. The computer buffs came out from behind their screens! In addition, all facilitators involved in the process had specific directives for every session. These included goals, objectives, constraints, possible drawbacks and anticipated conflicts. This proved to be useful throughout the process, as the whole team became co-facilitators somehow, adding to the depth of collaboration with SBT members.
The expansion of facilitation skills must reach the depth of interaction required for this type of work (Oliveira et al., 2015). The generation of knowledge, by balancing research and participatory process, requires maturity, planning and time for the interaction between the research and facilitation teams. The research and facilitation teams must work together beforehand, as one unified team, to allow time to build the trust needed for both components to interact in a productive way (Oliveira et al., 2015).

The creation of capabilities also needs time. Making time in the process to create capabilities for exploring different points of view and world visions, as presented by different stakeholders, increases effectiveness in decision-making processes. The processes then become more constructive and focused (Oliveira et al., 2015).

Over the course of the participatory process, much has been learned. The construction of partnerships and new forms of collaboration took place between the SBT members. The presence of specialists with experience and knowledge from the private sector, NGOs, sectoral organisations and syndicates, government, academic and other economic players, was highly relevant in order to achieve the IES-Brasil objectives, as they brought a range of sectoral perspectives, validated concrete data relating to their respective sectors, in addition to visions and sectoral scenarios to obtain and refine results (Oliveira et al., 2015).

During the collaboration process, the SBT members evaluated the information and material prior to meetings and provided regular feedback with regard to the use of their inputs in the models. They needed to feel that they belonged and mattered in the process. This permanent interaction made the communication very effective. The stakeholders had time to prepare themselves prior to the meetings and could discuss the inputs and suggested parameters in more detail. This is a new way of evidence generation: co-production. This is highly valued by stakeholders. Valuable inputs arose from the discussion between members and the research groups involved, such as the study of the synergies between the different sectoral measures, in particular, between energy, forestry and agriculture; the inclusion of adaptation and its interaction with mitigation in the long term; and the request to carry out a RBS scenario. These elements were all generated through stakeholder request. IES-Brasil has significantly strengthened a collaborative culture and a participatory process for strategic decision-making in public policies. We may see more of this approach in the future.
At the end of 2014, the Brazilian Climate Change Forum hosted a meeting to promote an exchange of information between the various projects and initiatives on mitigation that were taking place at the same time in the country. The IES-Brasil project was thus presented with other projects. This helped to strip away the competitive element so often present in research work.

Finally, the time that the SBT members have had together is precious. We are talking of esteemed and significant people in their specific area of work. These are the top actors in Brazil (and the same applies in the other MAPS countries). The main gift of these processes is the depth of the face-to-face discussions among participants. This roll-up-your-sleeves and work together ethos comes after a little while. Once this resonates through the groups, the exchange of information in good time and the construction of long-lasting and solid co-operative relationships flourish (Oliveira et al., 2015).

A network has been created within and outside the IES-Brasil project, as with the other projects.

**BOX 7.3**

MAPS processes work to engender trust between and within different interest groups. For MAPS, building a community of practice is fundamental to achieving impact at national and international levels. After all, effective change relies on people to bring about action. MAPS has brought together communities of practice that traditionally would not have interacted, and in so doing, has cultivated relationships combining different skills sets and developing new multidisciplinary ways of working. Most importantly, though, the MAPS experiences tested and then validated the understanding that each country of the South is best placed to generate and answer its own development and mitigation challenges. Overcoming distrust and knowledge sharing through southern peer networks is a valuable mechanism for doing this effectively, and the MAPS community has been an example of such.

(Boulle et al., 2015)
Chile

The impacts of the MAPS Chile results co-exist on different levels. Firstly, the project has made methodological contributions that have strengthened the capacity and knowledge for the discussion on climate change in the country. Stakeholders mentioned that they could transfer the methods learnt in MAPS Chile to other consultations and governmental projects. They had learnt something valuable.

Secondly, the project contributed to improving the availability and dissemination of better sources of information, and methods for estimating emissions and evaluating mitigation measures.

Lastly, through the project, participants learnt and integrated in their practices a different approach to evaluating the possibilities for integrating science and multi-stakeholder participation for decision-making. Particularly, the methodological transfer between MAPS and the long-term planning exercise (‘2050 Energy’), which is being developed by the Chilean government via the Ministry of Energy, is a significant early transfer of this kind. Although it is a different exercise, there are principles and methodological design elements that strongly resemble the MAPS project. The new project includes participants from MAPS Chile, who recognise the influence MAPS has had on formulating this project7 (Calfucoy, 2015). Also, the mitigation measures analysed in Phase II have been used as input for the establishment of the goals and action plan on energy efficiency for 2050 Energy.

Another significant contribution was the extent to which Chile collaborated with other countries in the MAPS community and beyond. Chile grasped this opportunity to contribute, based on the MAPS experience, to South–South cooperation, thus strengthening the capacity of other countries to generate information to inform their climate change policy (Calfucoy, 2015).

A further co-benefit is that the results of Phase II have informed domestic public policy on local pollutants, leveraging on the update of the Atmospheric Decontamination Plan of the Metropolitan Region of Chile.

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7 The official documents presenting the 2050 Energy methodology identify MAPS as one of the relevant sources for carrying out the work, together with the results and experiences of the ‘Energy scenarios’ and ‘Sustainable mining’.
MAPS results were aimed at guiding decision-making without being binding – but ended up being the main source of information for the mitigation component of the Chilean INDC. This contribution, discussed in Chapter 8, turned out to be extensive. Although the results were fundamental for drawing up the draft INDC of Chile, the project mandate posed questions about mitigation measures and policy instruments that would make it possible to achieve the anticipated results. In this way, the project design could incorporate a focus on disseminating results to high-level ranks of public and private decision-makers in the country (company directors, ministers, trade associations, congress commissions, etc.) and could use a robust method to gather background information for formulating public policies on climate change issues (Calfucoy, 2015).

Finally, stakeholders widely agreed that the participative process adequately defined and constantly clarified the scope of the exercise and its results. Their expectations of the process were met, largely due to the strong leadership of the process leader, Hernán Blanco. His leadership was recognised as being impartial, formal and clear – critical aspects in strengthening a good system of governance of process. At the same time, the charisma of Hernán and the reputation of the research team

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contributed towards creating a work environment based on collaboration among the SBT members. Despite tensions around developing the project, participants positively valued the opportunity to participate as SBT members, and as they knew their time was valued, they had the opportunity to learn from their peers, and they recognised the value of taking part in an influential group, which was made up of people recognised nationally (Calfucoy, 2015).

Stefan and Hernán went on to co-design a special facilitation course that they ran for over 20 aspirant facilitators, including some to-be MAPS facilitators.

**BOX 7.4**

A new way of participation has been positioned within and outside the MAPS Chile project, creating a new culture of facilitation in the country.

From the early experience with the LTMS, MAPS has concerned itself with developing new ways of working. Its keystone is innovation. Implicit in this approach has been drawing upon and further developing in-country capacity and letting it take creative leaps. Learning is the principle driver of progress. Learning happens through an action-reflection-action approach. Innovation results from this. This learning has ranged from the facilitation skills required to run the process, to enhanced collaboration capacity, to improved research capacity in new areas of work. The capacity required for a MAPS process did not exist in any of the countries before MAPS commenced, and now there is close to five years of experience of running these processes. The creation of the associated know-how is one of the most significant elements of the MAPS legacy.

This new way of working includes: strong facilitation skills to manage the process and incorporate all affected parties; research skills that are at the cutting edge of scenario development, such as linking sectoral and economy-wide models; and the ability to evaluate co-benefits of mitigation scenarios are also key components. These developments have been made possible through time and resource investment in capacity development, in and across country collaboration, with structured and targeted knowledge sharing. This was achieved particularly through the MAPS lab programme, which has covered topics such as: co-benefits, linking economic and sectoral models, AFOLU, INDCs, and others.

(Boulle et al., 2015)
Colombia

One of the challenges of the CLCDS was to include climate change in both the public and private agendas. As a result of this strategy, stakeholders are aware that mitigation and adaptation are intertwined with the economic, environmental and social development of the country. Climate change is, for them, more than just ‘an environmental issue’. But it is also fair to say that another problem rings bigger bells for now:

The issue of climate change is not a priority for the country. I think the priorities are the post-conflict and peacebuilding, but climate change has achieved an important position against other environmental issues. An example is the fact that 30% of the country’s environmental goals are focused on low-carbon issues. I think the next step is to articulate climate change priorities with the main goal of the government, which is the peacebuilding process.

(Technical adviser of CLCDS)

In the words of a member of the research team, on these same issues: ‘finally you are considering the issue of money, environment and poverty. Obviously the environmental struggle is not only protecting the environment, but combating poverty.’ And poverty lies at the heart of so much conflict. Thus, a direct result of the process is the inclusion of the Low Carbon Development Strategy within a national development context, recognising climate change as a cross-cutting issue with potential to positively influence the development process and the challenges facing the country around issues such as conflict, peace, poverty, protection and preservation of natural resources, among others (Lema et al., 2015).

One of the main achievements is the creation of a new community of practice with new forms of relationship between the actors involved in the strategy.

There is a network of focal points in the ministries, consultants and people working with us that can now build the necessary inputs, and have the know how to rightly influence, aligning the analysis with the priorities of each sector. This is key to success.

(Coordinator Cooperation Programme)
Another achievement generated from the process of CLCDS occurs around structuring of the strategy by sector, which was perceived by the stakeholders as a very positive aspect, helping to move quickly toward implementation.

A further strength of the CLCDS has been to conduct two processes in parallel: while information is generated to inform public policy, the strategy itself has been institutionalised.

The participatory approach was key to the process, as it legitimizes and allows you to create consensus. Generating scenarios in teams of 30 or 40 people is a complex issue with such divergent interests, but when you have the results you see the richness of processes of this nature.

(Founder Cooperation Programme)

**BOX 7.5**

Facilitated dialogue between key stakeholders in government, business and academic groups enables difficult discussions to take place, tensions to be aired and agreements to be reached. Data and modelling acts in several ways: as a source of credible information on which to base discussions and policy decisions; as a shared focus for disparate interests; and, ultimately, as a valuable output for general, broader use. It becomes a persuasive tool for lay publics and social movements. Shifts in mindsets happen due to the exposure to new information and ideas that are made credible and legitimate by a broad group of strategic thinkers and experts. Furthermore, the information available can be influential in solving factual disputes or dispelling commonly held myths. The MAPS community acknowledges the need for providing spaces and means for assessing different world-views, and generating robust evidence about them.

[Boulle et al., 2015].
Peru

The Phase I of PlanCC submitted its main products according to the initial design: different long-term mitigation scenarios, and the prioritisation of a set of options for mitigation policies in the energy sector, transport, industrial processes, agriculture, forestry and waste. But much that resulted from the process was not so planned or designed. There were impacts that were expected and those that were not explicitly expected at the beginning of the project. It will take time to look back and unpack all these impacts. That is worth some research in itself. Here are some.

The PlanCC project is the first effort that opens an institutional discussion regarding mitigation strategies. The private and public actors agree that PlanCC has become a milestone, in terms of positioning the mitigation topic in the technical debate within and outside the state (Chávez et al., 2015).

In the case of Peru, project PlanCC was a platform of multisectoral discussions that allowed the climate change conversation in sectors beyond the Ministry of Environment. We are still far from saying that it has accomplished the mainstreaming of policy. But the MAPS methodology has generated dialogue spaces and given viability to the following steps....

(Climate and Development Knowledge Network [CDKN] representative)

Even though this process is in its first stages, it has already modified perceptions (about the relevance of investing in mitigation) within the state, civil society and certain economic sectors.

The research process produced a systematised and up-to-date set of available information regarding the mitigation of GHG emissions and the macroeconomic effects derived from the different scenarios. Even in those themes in which it was difficult to ensure optimal levels of information, technical criteria were developed to estimate emissions (Chávez et al., 2015).

Even though it was not a specific objective of PlanCC, its results and products provided the Peruvian government with important foundations to define its position in the framework of the COP 20. The information generated by PlanCC is recognised as the most articulate base of evidence to date to contribute to the defining of the international commitment of Peru:
The PlanCC process helped generate information which we did not have for the decision-making process. Before PlanCC, the State had nothing but disarticulated data that had not been analyzed from a climate change point of view.

(Representative of the Ministry of Economy and Finance, PlanCC SC)

Another of the accomplishments was the identification and creation of linkages between specialists, institutions and officials currently capacitated and trained in foresight processes for the management of climate change.

The shared experience of having to construct a relatively novel process, in terms of policy design, opened the institutional discussion on topics never prioritised before. This has had an effect on the initial construction of personal and institutional networks among participants, who now have technical counterparts and partners to continue the discussions:

Two major changes have occurred: the first is the creation of a group of researchers that today serve as a consultancy team for the government; and secondly to position the topic of climate change in the internal discussion within sectors which was previously unaccounted for.

(Representative of the Ministry of Economy and Finance, PlanCC SC)

Several of the stakeholders mentioned that, at the beginning of PlanCC, they ignored or did not comprehend the relevance of climate change mitigation, but after participating in the co-production of evidence and witnessing the results, they ended up recognising the potential benefits of the implementation of mitigation options on their sectors or organisations. This comprehension has prompted several of them to join more actively in discussions that will drive final products and projects. PlanCC has influenced their disposition to participate in the next phases of the project, and even to promote the topic in their own spheres of activity.

Other actors highlight that, even though they considered themselves to be experienced in climate change, the exposure to new methods and the experience gained from conducting a pioneering effort to construct evidence-based scenarios for the country has widened their vision and technical capacities. Particularly, it was highlighted that the more interesting lessons had to do with the interdisciplinary
and multisectoral work processes, which were the main challenge throughout the project (Chávez et al., 2015).

The discussions within and the results of PlanCC contributed to the definition of goals and a measurement criteria of sectoral instruments, which had previously lacked precise indicators or posed insufficient goals:

PlanCC motivated several public organisms to propose quantifiable aims ... Only after PlanCC proposed, based on evidence, a reforestation goal of 5 000 hectares, SERFOR\(^9\) could better evaluate their capacity to set goals twice its original aim ... By proposing calculations and estimations in a systematic manner, PlanCC constituted a ground wire that enabled other programmes to specify their outreach, role, and terms ...

(Research Team of the Forest Sector)

**BOX 7.6**

MAPS strives for innovation, in which locally co-produced ‘new’ knowledge answers some of the outstanding questions associated with the transition to prosperous low-carbon societies. ‘New’ knowledge is understood as ‘new’ to a country, ‘new’ to a sector, ‘new’ to an interest holder. MAPS processes resulted in uncovering existing data or generating local data that did not exist before. MAPS teams have generally used new tools and new methods, or built on existing tools. All countries had different starting points, with certain countries needing to first establish basic models and approaches, while others were concerned with developing sophisticated models, or linking different models in a more comprehensive single framework. Collaboration meant that there was intense interaction between countries, each presenting strengths and weaknesses and learning from each other.

(Boulle et al., 2015)

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\(^9\) National Forestry and Wildlife Service (SERFOR).
For further details on methodological approaches, modelling frameworks, data sets used and results per country, please consult the country reports in the project websites ([www.mapschile.cl](http://www.mapschile.cl); [www.minambiente.gov.co/index.php/component/content/article/469-plantilla-cambio-climatico-25](http://www.minambiente.gov.co/index.php/component/content/article/469-plantilla-cambio-climatico-25); [www.planccperu.org](http://www.planccperu.org)), the MAPS sectoral modelling working papers, the MAPS process analysis papers, and the research paper, ‘An overview of the analytical results of MAPS Latin American processes’ ([www.mapsprogramme.org](http://www.mapsprogramme.org)).

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What happens in this stadium is not a game. There are not two sides but the whole of humanity. There are no winners and losers, we all either win or lose in the future we make for ourselves.

Christiana Figueres
While Mitigation, Action Plans and Scenarios (MAPS) was not conceived as a programme to influence the climate negotiations, it is still impact driven. MAPS hopes that its work helps decision-makers. Much of the process in the countries was designed to create ‘bridges’ between the modellers and stakeholders in the scenario teams, as well as between the scenarios built and the national policy. However, in the last two years of MAPS, 2014 and 2015, the international dimension suddenly became central. When the international community agreed to the system of national contributions, it was hoped that MAPS-generated knowledge would assist in the formulation of these Intended Nationally Determined Contributions (INDCs).

In fact, this international dimension was never very far away from MAPS. In the early months of the programme, while reaching out to Brazil, India and China, MAPS became involved in an expert group called together by the BASIC ministers. Harald Winkler had the opportunity to talk about the MAPS idea at the third meeting of BASIC ministers in Cape Town, April 2010. Minister Ramesh from India was quick to pick up on the idea, and built on the concept of BASIC as a ‘platform’ for more than simply political statements. The ministers’ statement from that meeting contained:

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1 The BASIC countries are a bloc of four countries – Brazil, South Africa, India and China – formed by an agreement on 28 November 2009.
13. Ministers emphasized again that BASIC is more than a forum focused on negotiations. They supported collaboration among experts from BASIC countries and welcomed the creation of an on-going forum, including work on adaptation and mitigation action plans and scenarios [emphasis added].

(BASIC ministers, 2010)

As it turned out, mitigation work in China, India, Brazil and South Africa took place more or less independently, but this statement was influential and encouraging. Everyone was essentially doing preparatory work, with an eye on the international dimension.

The MAPS Programme did not coordinate the BASIC Experts’ Group, but did provide assistance from behind the scenes. The experts were given a number of tasks by the ministers, and met four times a year in the days before the ministerials. One of the tasks stands out for special mention and was international in dimension: the issue of equity.

The origin of this thing called equity

Equity is perhaps one of the thorniest issues in climate change. It just keeps popping up: for a certain perspective, have a look at the words on equity in the much spoken-about *Laudato Si’*, Pope Francis’s encyclical of May 2015:

51. Inequity affects not only individuals but entire countries; it compels us to consider an ethics of international relations. A true ‘ecological debt’ exists, particularly between the global north and south, connected to commercial imbalances with effects on the environment, and the disproportionate use of natural resources by certain countries over long periods of time.... There is a pressing need to calculate the use of environmental space throughout the world for depositing gas residues which have been accumulating for two centuries and have created a situation which currently affects all the countries of the world. The warming caused by huge consumption on the part of some rich countries has repercussions on the poorest areas of the world ...

(The Holy Father Francis, 2015)
It is, indeed, vital to resolve this gap, or debt, between the Northern (developed) and Southern (developing) countries. Mistrust has hung like a cloud over the United Nations climate negotiations since they started, and has only recently faded. While the North must take full responsibility for its greater share of historical emissions, the South must also take action to ensure a sustainable future. At the same time, it is necessary to make space for countries to develop sustainably. A limited amount of greenhouse gas (GHG) can still be emitted globally before we risk dangerous climate change, and this is required for development in the South, and for maintenance of economic health in the North. So who gets what? And how much is there? The quantum of this ‘carbon budget’ and the way in which this can be distributed, needs to be understood. But calculating this kicks up the dust of considerable controversy. The BASIC ministers wanted a better sense of the problem.

The BASIC weighs in

At the BASIC meeting in Rio de Janeiro in July 2010, Minister Ramesh quickly identified equity as a key issue for examination by the experts’ group. The question Minister Ramesh posed to the expert group was: How can we be sure if we are doing our fair share as countries in achieving the 2 °C goal? He challenged the group with words to this effect: ‘if we can’t resolve this between us, being such differently endowed countries, how do we expect the global community to resolve this thorny issue?’
Answering this question took two years’ work among the BASIC group of experts, with the MAPS South African team participating in what was, indeed, a fascinating and sometimes difficult discussion.

So if, in the equity discussion, the first step is to determine what future global carbon budget remains available globally and the second is to apportion this and the associated costs of reductions fairly between countries, the BASIC group needed to meet these two calculations head on and see if they could find agreement.

Initially views were far apart and tempers frayed. After all, the four countries have such different profiles: India and China are immensely populous, and South Africa is tiny in comparison. Brazil has a low-carbon energy system, whereas China and South Africa rely heavily on coal. India still has a huge poor-class with almost negligible energy consumptions, and so on. India and China, at the time, more or less supported the idea that all individuals should have an equal right to the global commons, in other words, to pollute an equal amount. This, in effect, meant that the average Indian had a lot of carbon available for their development, whereas the average American had long exceeded their rightful share. Equity was a red flag issue.

Through continued discussion and analysis, the group managed to come up with a joint publication (BASIC experts, 2011) with four chapters, one from experts from Brazil (Miguez & De Oliveira, 2011), another from China (CASS/DRC joint project team, 2011), a third from India (Jayaraman, Kanitkar & De Souza, 2011) and a fourth from South Africa (Winkler, Letete & Marquard, 2011), plus a joint chapter, which included the concept of an ‘equity reference framework’. The publication was launched in Durban at the COP 17, with lead negotiators opening a side event with presentations by the experts.

In the report, the expert group resolved some central issues. By including the total GHG emitted since the Industrial Revolution, it is possible to estimate the gross amount that the world could still emit while, nevertheless, limiting temperature rise to a maximum of 2 °C above pre-industrial temperatures (Meinshausen et al., 2009). As a consequence of scientific uncertainties, a remaining available budget for the period 2000–2049 of 1 440 gigatonnes of emissions of CO₂ has roughly a 50 per cent probability of exceeding the 2 °C limit. There are ranges around these probabilities, but a roughly even chance to keep below 2 °C is a reasonable starting point.
Given this global budget, a formula to distribute these available emissions fairly between countries had to be determined to meet Minister Ramesh’s challenge, and to address the legitimate concerns of all countries; not only should the result be fair but it should also be arrived at in a fair, multilateral process. Article 3 of the United Nations Framework Convention on Climate Change (UNFCCC) specifies the ‘basis of equity’ and ‘accordance with ... common but differentiated responsibilities’ (United Nations, 1992) as fundamental to any response.

Industrialisation and the right to sustainable development

Developed countries are responsible for much higher levels of past GHG emissions – a consequence of their long history of industrialisation and its benefits. Developing countries, however, still face the challenges of eradicating poverty and reducing inequality (today countries don’t necessarily fit neatly into these two groupings, but we will retain their use). While they lack the technological and financial means to pursue a less carbon-intensive economic path, many, including all BASIC countries, have pledged to slow down their rate of emissions increase (either as a deviation below Business as Usual [BAU] or a reduction in the carbon intensity of gross domestic product [GDP]). Central to the principles of equitable access and sustainable development is time, which developing countries need to address poverty through infrastructural and industrial development. The claim of developing countries to carbon space is effectively not a claim to a right to pollute.

The Equitable Access to Sustainable Development (EASD) report found that over-occupation of atmospheric space by developed (Annex I) countries – evident in Figure 8.1 – is so extensive that, even if they were to stop emitting tomorrow, there would not be sufficient remaining future carbon space for developing countries to be able to emit their equitable share. The actual carbon budget, which developing countries will be able to access, depends on the extent to which Annex I countries reduce emissions and pay for any shortfall. Sharp and immediate reduction commitments are required by Annex I countries if they are to ‘take the lead’, in the language of Article 3 of the UNFCCC.
In calculating the available carbon space, start with developing countries

In reducing emissions, if some countries do less, others must do more if the same level of temperature increase is to be avoided. Annex I countries have already achieved development by consuming more carbon space than an equitable allocation would entitle them to, leaving only a small remainder within which non-Annex 1 countries are now expected to develop. This conceptualisation should thus be reversed: non-Annex 1 countries should implement the actions to which they have pledged, and Annex I countries should work within the constraints of the remainder of the carbon space (that is, turn the formula around to read: Annex 1 = available global emissions – non-Annex 1).

Towards a framework for the equitable sharing of carbon space

The EASD report suggested various approaches to achieving equity in the allocation of the remaining atmospheric space and support, operationalising both Articles 2 and 3 of the UNFCCC. In essence, these were:

- **Per capita.** Equity demands that more populous nations require greater amounts of carbon space. The Indian and Chinese experts propose that the global carbon budget is shared by an equal *per capita* distribution of cumulative emissions (including past and future emissions).

- **Historical responsibility.** In the Brazilian experts’ approach, mitigation effort is shared in accordance with countries’ relative historical contributions to temperature increase. Historical emissions must, therefore, be taken into account in determining the balance of a country’s efforts to bend the curve of emissions downward.

- **Responsibility, capability and sustainable development.** The South African experts, following the principles in Articles 3.1 and 3.4 of the UNFCCC, propose using criteria that reflect a country’s responsibility for historical cumulative emissions, capability to mitigate (quantified in terms of GDP per capita and other aspects of human development), and their right to sustainable development.
The group set about agreeing some common principles: they proposed different approaches to the equitable sharing of carbon space, but all recognised (1) the right of developing countries to sustainable development, (2) the need for developed countries to take responsibility for historical emissions, and (3) the equal right of every person. A ‘formula plus’ approach could further be used to allow for the particular resource endowments and other national circumstances of particular countries.

The EASD report applied these different equitable approaches to assess the share of the global carbon budget to which each country would be entitled. They used 1850 as the year commonly taken to start assessing historical emissions, as well as a more recent year, 1970. Figure 8.1 compares the results of their analyses. The general findings were:

Figure 8.1: Future carbon budgets compared, using various approaches to ensure equitable access to sustainable development, in gigatonnes (Gt) of CO₂. Source: BASIC experts, 2011.
• Developing countries should implement the actions pledged and Annex I countries should work within the constraints of the remainder of the carbon space, not the other way around (Box 8.1).
• Annex 1 countries have negative available global carbon space remaining. The only way to provide equitable space to developing countries is through financial flows and equity around the question: who pays?
• South–South transfers can enable those developing countries that have already used up a large portion of their carbon budget to gain access to the needed emission space for their sustainable development.

Financial transfers and South–South cooperation

If developed countries cannot reduce emissions to stay within fair carbon budgets, they should pay for mitigation in developing countries. The BASIC experts actually calculated the financial transfers that are implied, using different carbon prices. The South African experts reached a figure of between US$231 and US$2,058 billion per year, and the Chinese, between US$8.04 trillion and US$20.1 trillion as a one-time payment. In all cases, the financial transfers were much larger than the $100 billion per year that Northern countries pledged to mobilise in Copenhagen in 2009.

The group further concluded that some developing countries have cumulative emissions that have already reached 50 per cent or more of their entitlements for the entire period 1850–2050. South Africa was one of these countries. The BASIC experts proposed a novel financial mechanism for South–South cooperation. South–South transfers can assist these countries to gain access to the needed emission space for their sustainable development. Given that these Southern countries’ contribution to total global emissions is only 3.36 per cent, the future entitlement to be addressed by mutual cooperation would be limited to 19.6 gigatonnes of CO₂.
The equity debate continues ...

The publication was warmly received as an attempt to cast light on this difficult issue, at least between these four disparate countries. The ideas in the papers had some impact in the negotiations – but this has not been fully operationalised as yet. But the publication was seen as significant and represented a bona fide attempt by a number of experts to find middle ground on this thorny issue.

Following this work, a South African, Xoilsa Ngwadla, wrote a paper on the relevance of EASD to negotiations and actions on climate change (Ngwadla, 2013). This was a key piece at the MAPS EASD laboratory in Cape Town in March 2013, which brought together 30 thought-leaders to consider the issue of equity. MAPS commissioned a further paper on the equity reference framework (Ngwadla & Rajamani, 2014). Subsequently, the Africa Group proposed a principle-based reference framework in
negotiations (Africa Group, 2014), indicating that this should be used to assess the adequacy and fairness of INDCs, informed by Articles 3.1 and 4.7 of the UNFCCC. MAPS also invited input by the artificers of the Tryptich Approach, which was used by European countries to allocate the Kyoto target among Member States (Phylipsen & Blok, 2014), as well as experts on European Emissions Trading System (EU ETS) to explore lessons learned on allocation methods (Wyns, 2014). These were, in fact, two real experiences of allocating responsibilities, including equity considerations.

In the period after Minister Ramesh, India reverted to earlier positions on equity. A commentator, Lavanya Rajamani, described this as India using ‘equity as a shield to avoid committing to emissions cuts … [rather than] as a sword to shape the climate agenda’ (Rajamani, 2011). It certainly makes clear that there is no linear progress on equity. Of course, in the end the international climate negotiations had to avoid an almighty allocations dispute, and agreed an entirely different approach, which we shall turn to shortly.

The issue of equity is a book on its own, and is both politically sensitive and technically complex. It is a fascinating topic for reflection.

The national contributions, with equity still lurking there

At the Warsaw Conference of the Parties to the UNFCC (COP) in 2013, an idea was developed to avoid the deadlocking conflict over emission-reduction commitments (the idea also side-stepped the problem of determining what an equitable commitment actually was). The idea aimed to embrace a more self-determined approach by countries to mitigation. The upshot was that all countries would be invited to offer contributions to emissions reductions after 2020 (the end date for the Copenhagen pledges). These were to be called the INDCs. The top-down commitment approach now gave way to a bottom-up, nationally driven approach, contained in a top-down agreement.

Of course, the background worry for such an approach was how to ensure that everyone did not contribute insipid cuts, falling collectively far short of the 2 °C target. Hence, in Lima in December 2014, negotiators tried to determine what would be a good INDC – but, in the end, negotiators were unable to reach agreement. Some rules were defined in the Lima Accord adopted at the COP, calling for each party’s INDC to ‘represent a progression beyond the current undertaking of that party’.
Long before INDCs were even a twinkle in any negotiator’s eye, MAPS processes were ‘nationally determined’, but the currency and the urgency of the INDC process lent a totally unexpected importance to the MAPS processes in all five countries during 2014 and 2015. The president of the Lima COP, Minister Manuel Pulgar-Vidal, in an early speech at the event, said that his country was privileged and fortunate to have been part of the MAPS collaboration, crucial as the work was to the preparation of the country’s INDC.

Given that there was going to be concern about the adequacy of the INDCs, some considerations of equity still remained alive. In the Long Term Mitigation Scenarios (LTMS), the baseline and options had been compared to a Required by Science (RBS) scenario, which had some broad equity elements. In the Latin American countries, there was considerable debate about including an equity scenario for the sake of comparison. The experience of the South African team, with the RBS Scenario in LTMS, and by engaging BASIC experts, had some impact in Chile, Colombia and Peru. Several teams undertook in-country work, exploring their own versions of ‘what is required by science and equity’ – learning from the LTMS, but also modifying and improving the analysis significantly, as detailed in Chapter 7.

MAPS and the INDCs

The COP decision in Warsaw (2013) had invited ‘all Parties to initiate or intensify domestic preparations for their intended nationally determined contributions’ – for MAPS teams, the term ‘intensify’ applied, as they had been working for three years already. This head start was to prove invaluable. The MAPS donor, the Children’s Investment Fund Foundation (CIFF), understood the INDC opportunity, and continued with its support beyond the original three-year timeframe, which proved crucial.

As if to directly test our MAPS Theory of Change, the INDC process tested the relevance and applicability of the knowledge that had been built through the MAPS processes. Country teams in Chile, Colombia and Peru were asked by their governments to use work done under MAPS Chile, CLCDS and PlanCC for the mitigation component of the INDCs. IES-Brasil results were also communicated through the Minister of Environment in their process.
MAPS experts were invited repeatedly to present at formal UNFCCC expert workshops on initiatives that supported the INDC development, next to the United Nations Development Programme (UNDP) and World Bank, and other major programmes. Presentations followed thick and fast from Peru, Chile and Colombia. An INDC laboratory was held in Lima in July 2014. Teams from Chile, Colombia, Peru and South Africa presented work in progress. There was much interest in the form of the INDCs – whether expressed as a deviation below the BAU baselines, as intensity targets, as GHG trajectories, or other forms. This led to a paper on the different forms of the INDCs (Torres-Gunfaus et al., 2014). Some members of the South African team (Harald and Andrew) already had experience with LTMS and its use before the COP in Copenhagen. The thorny issues of stakeholder push-back, for example, had been deeply considered.

Undoubtedly, the INDC work added pressure on the teams. The international focus, arguably, had some trade-off with the focus on in-country work, and the urgency meant some chaotic schedules for MAPS team members. Another casualty was the long-term scenario work. In Brazil, Chile and Colombia the teams wanted to consider scenarios beyond 2030, with the view being that the real decarbonisation of developing societies is expected in the 2030 to 2050 period, and not in the INDC phase. But with INDC preparation dominating government agendas, Brazil had to abandon this work (funding could also not be secured) and Chile was left with a preparatory process.

Despite the wholesale uptake of the MAPS work in each country, we shall never know what would have happened \textit{without} the INDCs. This is, indeed, a counterfactual enquiry. The MAPS work is still informing domestic policy, as we saw in Chapter 7.
Peru

Peru had a special role as host of the COP 20, and would start the last negotiations before the all-important Paris COP, thus shaping the 2015 Agreement. The country knew that it had a reputation to uphold and also that it could lead by example.

In December 2013, at the second high-level meeting of PlanCC, Manuel Pulgar Vidal, Minister of Environment, asked PlanCC to provide technical support for the process of defining the INDCs in Peru.

In the words of the minister:

How can PlanCC be used to make it the basis of the national contribution, which at some point during 2015 we should put on the table? The way PlanCC is evolving is the ideal way to analyse [with prospective groups, expert groups] in a transparent, and cross cutting way and to build a national position.

(2. High-level meeting PlanCC)

The responsibility assumed by Peru to develop their INDCs was also later confirmed by President Ollanta Humala, when in September 2014, during his speech at the United Nations Summit on Climate Change in New York, he stated:

I want to announce that consequent to the role it played in this decisive phase of the negotiating process, Peru is preparing its own national contribution to mitigation and adaptation.... Peru has designed its climate change commitments within a national objective of sustainable development, with a focus on green, inclusive and competitive growth. We want to support and coordinate our economic growth with social inclusion, sustainable use of our resources and energy efficiency while contributing to the global effort to reduce greenhouse gases. For that, we are prioritizing actions in the sectors to achieve these objectives and have substantial co-benefits.

Following the mandate received from the Minister of Environment, the Directorate General for Climate Change and Water Resources, in coordination with the Director of Project PlanCC Lupe Guinand, and international donors of the project (CDKN,
SDC (Swiss Agency for Development and Cooperation) and CIFF), agreed that, in addition to products and research deliverables of Phase I of the project that PlanCC had planned for the month of June 2014, the technical team of Project PlanCC would support the Directorate of Climate Change in the development of the INDC in a direct manner. This would add more pressure to the team in terms of meeting the deliverables as planned, but also in terms of adjusting the scientific and technical results to the political economy.

During the months of February and March 2014, discussions were held with the Deputy Minister of Strategic Resources and the Director General of Climate Change to define how the work of the contributions would be made. The decision was that the governance, supervision and monitoring of the process would be directly supervised by the Deputy Minister of Strategic Resources of the Ministry of Environment and an ad hoc high-level commission was to be established in the coming months. The PlanCC Project Steering Committee would be kept away from this, more political, process (PlanCC, 2015).

Between December 2013 and March 2014, the mitigation team of the Directorate of Climate Change led the process and summoned and twice convened a multisectoral working group to discuss progress and challenges of low-carbon development in Peru. The aim of the initiative, called the ‘Climate Change Mitigation Road Map’, was to make an inventory of sectoral initiatives for low-carbon development and to identify the alignment of the national policy of low-carbon development with sectoral policies. The initiative had the support of the UNDP Low Emissions Capacity Building Programme, the German Agency for Technical Cooperation (GIZ) and the International Partnership on Mitigation and MRV (Measuring, Reporting and Verification).

After a third meeting, the goals from this group could be seen to overlap with the concrete progress being made in the PlanCC project, and the minister asked for even closer collaboration. In late March 2014, the PlanCC technical team made a specific proposal to the Deputy Minister of Strategic Resources of the Ministry of Environment on: (1) the scope of the investigation for INDCs on mitigation; (2) the process suggested; and (3) a proposal of stakeholders to be consulted. Based on this proposal, and in order to formally start the process of analysis and consultation of INDCs, the deputy minister convened the first meeting of the Technical–Political Group of the INDCs in April 2014. The parallel process with PlanCC was now firmly underway.
On 3 July 2014, the results of Phase I of PlanCC were presented publicly. Publications were distributed and there was a lot of press coverage, bringing the project results to public and private actors. Some of the results (that is, the catalogue of mitigation options) generated confusion because some saw these as the official proposals of Peru that would be presented in Lima at COP 20. Strong reactions (positive and negative) by various public actors, private and civil society were aired in the media.

Some business associations, such as the National Society of Mining, Petroleum and Energy, took the issue to the Ministry of Environment, the Ministry of Energy and Mining and other ministries, requesting clarification and additional information. Other non-governmental organisations (NGOs), such as Environmental Law and Natural Resources (DAR) and Ashanika Community of Rio Ene (CARE), organised events and meetings in which they requested the team of PlanCC to make presentations and/or provide clarifications. The Steering Committee decided to issue a statement on the website of the Ministry of Environment, clarifying that the results of PlanCC inputs were not official public policy, but just the results of a study.

The strongest reaction came from the energy sector. The PlanCC team took this situation as an opportunity to build a closer relationship with the political authorities of the Ministry of Energy and Mining to spread, explain, socialise and improve the results of PlanCC.

From August to October 2014, the PlanCC team developed terms of reference, work schedules and recruitment for the team that would assist the development and improvement of calculations for the INDC. These teams were largely the same as the ones that had worked on Phase I of PlanCC. From October, after the Summit on Climate Change in New York and regional and municipal elections in the country, the Directorate of Climate Change of the Ministry of Environment assumed strong leadership on the issue of the INDC and began to monitor the research frequently and to include the policy-makers of the sectors involved in the process.

By late October 2014, researchers of PlanCC had delivered the first reports on technical evaluation of the feasibility of compliance with the voluntary commitments of Peru to the UNFCCC in the three priority sectors by 2021 (energy, forestry and waste). The BAU developed in the PlanCC project showed that in 2021 emissions would reach 212.62 Mt CO₂-eq [PlanCC, 2014]. Depending on the interpretation of the 2011 Copenhagen commitment, this goal could be more or less difficult to meet. PlanCC continued the work by building mitigation scenarios until 2030 with updated information which now had to be factored in as well.
By November, the government of Peru was in a frenzy of preparations for the COP. Even on a physical level, the erection of the entire COP campus became a huge task. In the end, the country carried its head high and the COP was well organised, with negotiators achieving a modicum of progress on the road to Paris.

During January and February 2015, the Ministry of Environment requested PlanCC to review and update the sectoral BAUs and some of the mitigation options developed during Phase I. In April 2015, a new multisectoral commission, which would be responsible for developing and presenting the INDCs at a political level, was finally established. This commission is temporary in nature and is responsible for preparing the technical report containing the proposal of the INDC, which includes adaptation, mitigation, sectoral goals, feasibility, the horizon of work, the implementation strategy and monitoring mechanisms (PlanCC, 2015).

The multisectoral commission was made up as follows:
- Ministry of Environment, who will preside;
- Ministry of Foreign Affairs;
- Ministry of Agriculture and Irrigation;
- Ministry of Economy and Finance;
- Ministry of Energy and Mines;
- Ministry of Transport and Communications;
- Ministry of Production;
- Ministry of Housing, Construction and Sanitation;
- Ministry of Health;
- Ministry of Education;
- Ministry of Culture;
- Ministry of Justice and Human Rights.

On 7 June 2015, Peru finally submitted its draft INDC for public consultation, including the target to reduce GHG emissions (including forestry sector) by 31 per cent below a BAU scenario by 2030. Although it is referred to as a BAU scenario, it is important to note that it corresponds to a scenario that includes mitigation policy to date.

Under this BAU scenario, it is estimated that Peru would increase its annual emissions to 243 Mt CO$_2$-eq by 2025, and to 269 Mt CO$_2$-eq by 2030. There is an argument that this projection does not take into account feasibility studies for the measures proposed, international funding and private investment strategy; this is bound to be a subject of debate as the draft is discussed. In the end, Peru considered four scenarios for the INDC:
• Scenario 1: including 21 different mitigation projects, reducing 4 per cent of emissions based on a BAU baseline leading up to 2030.
• Scenario 2: including 44 different mitigation projects, reducing at a rate of 14 per cent of emissions at BAU to 2030.
• Scenario 3: including 58 different mitigation projects, reducing at a rate of 31 per cent of emissions at BAU to 2030.
• Scenario 4: including 76 different mitigation projects, reducing at a rate of 42 per cent of emissions at BAU to 2030.

One can see that the choice fell at the ‘ambitious but pragmatic end’ of the spectrum of scenarios. Time will tell how this is received in Peru and how it will line up for the final Paris announcement.

Near Temuco, Chile: Blanco.

Chile

The members of the MAPS Chile team started to assist government in mid-2013 to inform the mitigation component of the INDC. By 2015, at the request of government, the full team was involved in making continuous refinements. The Ministry of Environment (Climate Change Office) drove the process, but Foreign Affairs played an important role; and from the start, the Council of Ministers for Sustainability (and Climate Change) also played a role.
The domestic narrative centred on Chile being included in the Organisation of Economic Cooperation and Development (OECD), that Chile wanted to do its fair share as a soon-to-be developed nation, and that it needed to build on its Copenhagen commitment. As a trading nation, it was also seeking to increase its efficiency and competitive advantage, reconciled with sustained growth. Another central concern was the current levels of inequality. The INDC had to align with a lot of elements – it was a tall order in many senses.

Chile also wanted to show international leadership and to link this with domestic policy. A carbon tax had been approved in Chile, and there was discussion about expanding the carbon market mechanisms.

MAPS Chile Phase I and Phase II results were considered the most sound, accessible and recent base of information in the country. It was important, for this reason, that MAPS Chile results were based on an official/UNFCCC-relevant baseline. More than 100 mitigation actions had been examined, and, for the INDCs, these actions had been packaged into scenarios and their impacts on GDP and employment assessed. Government could see the scenarios graphically and consider how they were made up. As a result, two key mitigation actions rose to the surface in Chile, and both were huge: the linking of the Chilean electricity grid to those of other countries in South America, and the need for hydroelectric plants in the south of the country.

The President of the Republic, Michelle Bachelet, laid down a mandate for the creation of the country’s INDCs during the Summit on Climate Change held in New York in September 2014. Her government created the INDC Roundtable, which is technical in nature and comprises government representatives from the departments of Environment, Energy, Transport, Foreign Affairs, Finance, Mining and Agriculture. These were the same representatives who had been on the Steering Committee of the MAPS Chile project. It was a mirror. They rapidly proposed that the contribution of Chile should be sustained on five pillars: mitigation, adaptation, capacity-building, development and technology transfer, and financing.

With regard to the mitigation pillar, the INDC Roundtable focused first on the form of the contribution, and then determined the amount of GHG emission reduction. Following a discussion, the Roundtable decided to present INDCs for the period post 2020 using the format of emissions intensity, which could achieve mitigation in all sectors of the economy. It gave priority to the sectors of electricity generation and transmission, transport, industry, mining, housing, waste, and agriculture and forestry.
Methodologically, the contribution was to consider two components: (1) a carbon intensity target, expressed in emissions of GHGs per unit of economic development (GDP), which included all sectors likely to make mitigation in Chile, except the forestry sector; (2) an exclusive goal for the Chilean forestry sector.

The country then developed a ‘Tentative Draft National Contribution (INDC)’ which was prepared by the Climate Change Office, Ministry of Environment, acting as Executive Secretariat to the INDC Roundtable. This draft was submitted for public consultation from 17 December 2014 to 15 April 2015.

The two options proposed for the carbon intensity target, excluding the forestry sector were:

Option A:
Chile is committed to reducing its CO₂ emissions per unit of GDP by 30 to 35 per cent below 2007 levels by 2025. In addition, Chile is committed to reducing its CO₂ emissions per unit GDP by 40 per cent to 45 per cent below 2007 levels by 2030.

Option B:
Chile is committed to reducing its CO₂ emissions per unit of GDP by 25 to 30 per cent below 2007 levels by 2025. In addition, Chile is committed to reducing its CO₂ emissions per unit GDP by 35 to 40 per cent below 2007 levels by 2030.

The specific contribution to the forestry sector is: with domestic resources, Chile is committed to restore about 100 000 hectare of degraded land (afforestation), with an estimated US$250 million, to reach an area of at least 100 000 hectare of native forest managed by 2035.

It is important to note that the INDC Roundtable used the results of the MAPS Chile project as input for its proposed contribution. This does not mean that there was complete consensus on these results, as some issues were difficult to analyse and, in some cases, controversial (for instance, consensus on the baseline BAU, hydroelectric proposals in the energy sector, and results of the macroeconomic model used).
Over 250 inputs were received. After the consultation, the political dialogue began at ministerial level, led by the Minister of Environment, Pablo Badenier, and the Under Secretary of Environment, Marcelo Mena. The idea was now to seek a ministerial consensus on the INDCs.

The original date for achieving that consensus was 30 June 2015. However, the low business cycle in the country, the fall in copper prices, and the questioning of some measures included in the MAPS Chile project caused a delay in reaching an agreement. The main difficulty was the allocation of national funding to implement mitigation measures, since such financing was seen to compete with other priorities for development. Chile was now facing the issue of trade-offs in development investments and mitigation action. The political economy had started to influence the Chilean foreign climate policy.

Chile is currently undergoing a process of relevant reforms for the country in the fields of education and health. The search for consensus on the contribution of Chile continues, and an agreement is expected in September 2015.

*Strong winds, Coyhaique, Chile: Blanco.*
Colombia

In 2014, Colombia started an inter-ministerial process, coordinated by the Ministry of Foreign Affairs and the Ministry of Environment, to define their contributions in three key areas: mitigation, adaptation and means of implementation (financing, technology transfer and capacity-building).

Although the process was expected to be completed by March 2015, this was not possible given two main reasons. First, the ministerial and directorial changes that occurred following the presidential and parliamentary elections in the third quarter of 2014. Second, the team had to give attention to the preparation of the 2015–2018 National Development Plan.

Thanks to the latter, an important political reference for the INDCs is the current National Development Plan of President Juan Manuel Santos, which includes a cross-cutting strategy of green growth measures and specific goals to be achieved by 2018. The INDCs would have to align with this plan. The idea was that a technical team would present four or five options for the INDCs to the Council of Ministers and President Santos.

The first meeting of deputy ministers to discuss the contributions was held in November 2014 and was convened by the Deputy Ministers of Environment and Multilateral Affairs of the Foreign Ministry. The Deputy Ministers and representatives of Agriculture, Transport, Mines and Energy, Waste, Housing, the National Department of Planning and UPME (Mining–Energy Planning Unit) also attended the meeting. The process was formally underway.

For raw material, the INDC Preparatory Team turned to the Colombian Low Carbon Development Strategy (CLCDS), but there was a problem: since all work in the first phase was sectoral, the big challenge for the technical team of the INDC Council was to aggregate the sectoral information into economy-wide information. To achieve this it needed to work closely with the Universidad de los Andes who had produced the sector work and the National Planning Department, an organisation with credibility and legitimacy with ministries, which is responsible for running the macroeconomic models that underpin the whole Colombian economy.

In late 2014, a preliminary 2010 inventory was developed in the context of the Biennial Update Report (BUR) to the UNFCCC. In February 2015, the Ministry of Environment and Sustainable Development and Universidad de Los Andes decided
to use both the BUR and the data and assumptions of the CLCDS to directly draw the INDC options. A direct link was now alive.

The research team revisited all input data and some models, especially for the AFOLU sector, updated the BAU, extended the analysis to the 2050 timeframe and generated new scenarios and some fresh mitigation options. In the meantime a participatory process was held with representatives of the different ministries and other governmental agencies. A first workshop to validate the BAU and RBS was held in March 2015. Much of the discussion was about the integration of the Sectoral Mitigation Action Plans in the model-based analysis led by the research team.

Another challenge was to engage the private sector and civil society in this process. Consultations started in June and included many meetings and workshops, not only in Bogotá but in several other cities such as Medellin, Cali and Barranquilla. Many were very difficult, in particular, with industries. By July most of the job was done, after frantic behind-the-scenes work.

In Bogotá on 21 July 2015, the press reported that President Juan Manuel Santos had announced in his speech to congress on the national day, that Colombia would reduce 20 per cent of its projected GHG emissions by 2030 under the UNFCCC. The Minister of Environment and Sustainable Development, Gabriel Vallejo López, explained the details of Colombia’s commitment to the world. He said:

> This year, Colombia’s commitment will be added to the commitment from all the other countries. Colombia expects to see the global ambition bring us closer to the objective of halting climate change ... Colombia’s commitment will be submitted to the UNFCCC in the coming weeks, well before the 21st Conference of the Parties that will take place in Paris in December.

> This commitment that Colombia takes on, implies a transformation of our national economy towards an efficient resource and energy use model. It is a decision that promotes innovation and technological development in line with a new climate economy.

Colombia’s INDC could be increased to 25 or 30 per cent, depending on international support received in the years to come.
The minister pointed out that the formulation of this target was the result of meticulous work done through the CLCDS, led by the Ministry of Environment through a technical, political and participative process with sectoral ministries, the National Planning Department and representatives from different sectors of the economy, based on the research done by the University of Los Andes. Colombia had also received important support from international partners in this process, which the minister recognised and praised in the press conference. He said: ‘This is a scenario that is aligned with the Green Growth Strategy that is an overarching theme in our National Development Plan 2014–2018. It also recognizes the impending challenges the country faces in terms of development, post-conflict and adaptation to climate change impacts.’ He added that all economic sectors in the country would contribute to this national effort: agriculture, forestry, other land uses, electricity generation, transport, industry, housing, waste, hydrocarbons and mining.

The INDC is now published and ready for public scrutiny. Various workshops to explain and disseminate the contribution will now follow, and a consultation period will be concluded by end of August 2015.

There have already been reactions: the fact that President Santos himself had made the announcement has helped discussions with the ministries and within the government. There have been some voices contesting the scope and even certain mitigation measures (there are 84 measures listed in the supporting technical document). Angela Cadena, one of the Research Leads, accompanied the minister to several meetings and press conferences to explain the technical issues. There has, of course, been some hot debate.

Some sectors and people involved in the Sectoral Mitigation Action Plans have experienced what happened in other MAPS countries: the ‘feeling of betrayal’ once their participation in the MAPS process started to turn into the ‘imposition’ of a mitigation goal. These stakeholders feel concerned about how the economy-wide target will be distributed, allocated to the sectors or individual companies. Government has a job on its hands to manage these concerns. Jose Manuel Sandoval of the Ministry of Environment and Sustainable Development reports that there seems to be a balance between concern and support, and nobody has explicitly contested the 20 per cent reduction goal.
Brazil

At the time of writing, the INDC process in Brazil was still under wraps, but there is much activity in that country. So far, some commitments have emerged from two bilateral meetings, between President Dilma Roussef and President Obama in June, and with Chancellor Angela Merkel in August 2015. It is expected that these commitments will be part of Brazilian INDC. According to these announcements, Brazil will commit to the following by the 2030 horizon:

- to reduce to zero all illegal deforestation in the country;
- to restore 12 million hectares of degraded land;
- to keep the non-hydro renewables share of the energy mix between 28 and 33 per cent;
- to reach a 20 per cent share of the non-hydro renewables in the power generation mix.

Enforcement of laws and regulations is key to keeping GHG emissions from deforestation at a low level, as has been the case since 2005. In the Amazon region, the Forest Code requires landowners to preserve 80 per cent of the forest surface in their private properties. They are entitled to clear only 20 per cent of the land for productive use. IES-Brasil scenarios included this key assumption.

Forest restoration is also important, given the huge surface of degraded land in Brazil (estimates are at 60 million hectares, roughly). In the IES-Brasil scenarios, forest restoration would reach 15.5 million hectares by 2030 in the Governmental Plan scenario and 20 million hectares in the additional mitigation scenarios.

Brazilian energy supply has traditionally been quite clean: the share of renewables in the overall energy supply was 49 per cent in 1990. The Energy Reform in the 1990s bought this figure down to 41 per cent in 2000, and the ‘Reform of the Reform’ of the sector took it back to 45 per cent in 2010. In recent years, the trend has been downwards again: 40.4 per cent in 2013, and 39.4 per cent in 2014, mainly due to the crisis in the production. Without hydropower, renewables accounted for 28 per cent in the overall energy mix of 2014. Therefore, the commitment to keep renewables in the range between 28 and 33 per cent in 2030 is important, sending a signal that the government will act in order to reverse recent trends. In IES-Brasil scenarios, this indicator would reach 28.5 per cent in 2030 in the governmental plan scenario, and would increase to 33 per cent in the AMS1, and reach 36.5 per cent in the AMS2.
Renewables have a dominant role in power generation in Brazil, mainly thanks to hydropower. In recent years, however, the lack of investment in large hydropower dams (mainly due to local environmental concerns, as the potential to be tapped is mostly located in the Amazon) as well as severe droughts have decreased the hydropower share in power generation from 70 per cent in 2013 to 65 per cent in 2014. However, non-hydro renewable power has increased its share from 8 to 9.5 per cent from 2013 to 2014. Wind power has more than doubled its installed capacity, reaching 5 GW in 2014, and biomass-fired thermopower (mainly from sugar-cane bagasse) is also increasing rapidly. Therefore, the governmental announcement of a 20 per cent target in 2030 seems doable, even if more than doubling this figure by 2030 might sound ambitious. In comparison, in IES-Brasil scenarios non-hydro renewable power generation in 2030 would reach a share of 24 per cent in the governmental plan scenario, and 29 per cent in both additional mitigation scenarios.

Summing up, at this point in time it seems that the Brazilian Government announcements indicate a commitment to include some additional mitigation targets in its INDC to the COP 21, in alignment with some of the outcomes of IES-Brasil.²

² The percentages and other figures in this section are from COPPE, Brazil.
Conclusion

MAPS’s main contribution was through thorough mandated processes in countries, informed by best available research, which built ownership domestically. Internationally, MAPS had some influence on equity, through its own thinking on EASD and Equity Reference Framework (ERF), and through the BASIC group of experts. A huge part of the extended MAPS exercise in 2014 and 2015 was the help it offered countries to build their INDCs. It’s important to note how the countries tried to balance the need to mitigate with other development objectives and challenges, and faced real trade-offs here. The interesting process elements were how the studies and the INDC determinations articulated with one another, and how stakeholders reacted as they were drawn from the open-ended, scenario-based study to a real policy-making process that would impact interest holders.

The MAPS International team remained in the background, helping constantly as the INDCs took shape. MAPS continued to facilitate the collaboration, and helped countries with comparisons as other INDCs were released and provided technical support where needed. At the same time, the Energy Research team was involved in the South African INDC process (which we have not explored here) and so could share challenges with our Latin American counterparts.

At the time of writing, the processes have not yet been completed, and Brazil, in particular, has some way to go. Paris is up ahead. But the MAPS countries will be ready.

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When one door is closed, don’t you know, another is open.

Bob Marley
09
Final thoughts

Tulahuen, Chile: Blanco.

This is a book of stories. Our stories come from the Global South, where we live with particular problems, mainly centred on the ‘need for further development’. You can cut it many ways, but, in simple terms, our countries need buildings and infrastructure, we have electricity shortages, our education systems are behind the curve, people are hungry and many live precarious lives. We still have poverty, and our societies are very unequal. This is, of course, a materialistic view: mitigation actions are projects that you finance; their impacts are economic and societal. These actions alone will not, of course, create new, better societies. Human societies are frail and fraught with problems – a purely materialistic approach will not change
this. Perhaps we need to start incorporating issues of culture, art and history to help people to prosper at the non-material level. Perhaps this will be key to a zero-carbon world.

Our challenge is that we will have to achieve this progression to a better, equitable and stronger society, wiping out our deficit in development, in a new world characterised by binding constraints. Specific to our work is the constraint of limited space to emit carbon. The Global North developed without this constraint over the last two centuries. We in the South are going to have to do it differently, and so we are going to have to innovate. We will have to follow a different path to ‘development’, and perhaps even redefine what development means. Our Mitigation, Action Plans and Scenarios (MAPS) country stories are, of course, each very different, but this is the common thread, this idea of achieving societal development with low emissions.

The storytellers who contributed to this book are also very different. We speak different languages and live in places far from each other. Some of us are engineers, some are social scientists, some are facilitators, and more. We all have something in common: a passion to contribute to the development of our countries, and particularly, to ensure that this development is sustainable both nationally and globally. We are passionate realists; we understand the compromises and trade-offs involved. But we know where we need to head.
We have tried to present our stories in a way that is not academic or unduly difficult to digest, in the hope that our work can be helpful to anyone involved in a similar endeavour. Sure, there are technical bits, but we hope these are not too arcane. For others, who have the desire to look more deeply at what we did, there are many MAPS products and publications (and some complex technical reports) publicly available on the MAPS website at www.mapsprogramme.org. Additionally, our stories do not pretend to be an equal analysis of everything that has happened in each of the countries in which we have worked, or an equally deep consideration of all the elements of our work. Rather, in the organic way stories are told, they provide us with both glimpses and deeper contemplation of the various challenges we encountered along the way.

In closing, we return to our opening problem.

So where has our endeavour brought us?

The main objective of this book was to unpack a central question that lies at the heart of the MAPS endeavour: how can we change our societies’ reliance on technologies and practices of production and consumption that emit greenhouse gases (GHGs)? How can each of our societies make a contribution to this global effort?

The endeavour we describe is not easy – ‘Even though we collectively recognise the need to act now to avoid future catastrophic impacts, the immediate implications of required behavioural changes overwhelm the ability of the political and policy systems at multiple levels to respond’ (Levin et al., 2012: 129). We characterise this as a ‘super-wicked’ problem comprising four key features: time is running out; those who cause the problem also seek to provide a solution; the central authority needed to address it is weak or non-existent; and, partly as a result, policy responses discount the future irrationally (Levin, Cashore, Bernstein & Auld, 2012: 123). These four features combine to create a policy-making ‘tragedy’ where traditional analytical techniques are ill-equipped to identify solutions, even when it is well recognised that actions must take place soon to avoid catastrophic future impacts. To overcome this tragedy, greater attention must be given to the generation of path-dependent policy interventions that can ‘constrain our future collective selves.’ Three diagnostic questions result that orient policy analysis
toward understanding how to trigger sticky interventions that, through progressive incremental trajectories, entrench support over time while expanding the populations they cover. Drawing especially from the literature on path dependency, but inverting it to develop policy responses going forward, we illustrate the plausibility of our framework for identifying new areas of research and new ways to think about policy interventions to address super-wicked problems (Levin et al., 2012: 129). We know what we have to do, but we risk feeling paralysed, not least by the complexity and scale of the action required [Levin, Cashore, Bernstein & Auld, 2012: 123]. We set out to change the pathways of entire countries, knowing that we were over-reaching – but determined to try anyway. A lot of the time, members of the MAPS teams also felt overwhelmed. This work is humbling and difficult.

Throughout the process, evidence of progress has been palpable and nourishing to the teams. The impacts described in Chapter 7 are not insignificant, to say the least. No scenario, vision or high-level policy (such as an Intended Nationally Determined Contribution [INDC]) will bring us, on its own, the emissions reductions we need. We can see this clearly over decades of studying how implementation works. The MAPS processes invested in building capacity, driving coalitions, respecting context, creating good content and forging commitments, and, by doing this, they will help to push systems closer to actual implementation. MAPS was rigorous and avoided doing a superficial job. We did not ignore the complexity of the challenge.
A friend once told Stefan a story about a young student in a martial arts class, who asked the instructor what went on behind a mostly closed door on one side of the dojo. The instructor replied, ‘That is the black-belt room – it takes years before you can go in there’. MAPS strove to get into the black-belt room of the political economy: we brought into the discussion leaders in the sectors from the technical level to the CEOs; we brought in the top academics and consultants; MAPS worked in the black-belt room with ministers and leaders who informed presidents. It took a while to get into that room, but there was no compromise. We were determined to take the best co-produced knowledge we could into that room for the final dialogue.

As a key team member of the Colombian process said: ‘we are serious about mitigating, and we want to make sure that our proposals are realistic, strategic and attainable’. Ratcheting up ambition is not solely an invention of the international negotiations – it has to start at home, from a platform of confidence and certainty. Ambition is not an empty statement in this tough challenge.

_Tome, Chile: Blanco._
Looking at the long term

The future is uncertain (and sometimes, so is the past!). The assumptions used in models that predict trajectories about the future are dreamt up in the present. The problem with our economic systems is that they possess a great deal of near-term inertia: it takes about 20 years, for example, for an entire national vehicle fleet to be replaced, if the market is left to its own devices. Power stations, buildings, and just about everything that is linked to GHG emissions, have shelf lives. For this reason there is a relatively high degree of predictability for the next 20 or so years. In this medium timeframe, the future of ‘things’ is perhaps more predictable than the future of ‘forces’ on them (for example, the prices of copper and oil, or gross domestic product [GDP growth rates]), but at least some of the many factors in the model of the system are relatively stable. This, of course, equates to a degree of rigidity, and means that for this first period (when the shelf life of things is active, so sticky), it is difficult to reduce emissions all that much. We found this to be the case in MAPS: up to 2030, the best we can hope for seems to be to stop the endless growth of emissions. This implies decoupling emissions from growth that is critically needed to reduce the development deficit.

For a while to come, the carbon juggernaut in our economies will still have momentum. It takes time to turn a ship. But within this time it is crucial that we put down the markers for a ‘new’ kind of development: the climate-appropriate one; the human one too. During this time, we will delink our development with emissions and start to build a society that is better for all people, not just for some; a society in which poverty becomes history. At some point, hopefully as soon as possible, each country’s absolute emissions will peak. And then comes the harder part – the period in which we shall slowly, and perhaps with gathering ease, phase out GHG emissions. At the end of this period, all our countries will emit hardly any carbon. We will reach zero.

The process of really cutting away emissions – let’s say all the way to zero – is a job that will happen after 2030, towards the middle of the century, but it will depend deeply on the steps that are taken now. Locking in high carbon now will compromise that task. Fully eradicating poverty is also a long-term challenge. But we are committed to both zero poverty and zero emissions, as Harald put it to the scientific conference in Paris. We don’t quite know how, but we are determined to keep trying.
As we have seen, MAPS teams have only just started to closely interrogate the period beyond 2030, although our models can run projections out to 2050. The teams in Chile and Brazil, in particular, were keen to experiment a bit deeper with the 2030–2050 period. At a Scenario Building Team (SBT) in Santiago, the MAPS Chile team, together with the Deputy Minister of Environment, continued to discuss the idea of doing some scenarios linking the 2030 results with 2050. The first scenario set had been run until 2050, but stakeholders were concerned about credibility of results in the longer term. They agitated for more work, more interrogation. The MAPS Chile team told stakeholders that what science was telling us (in the recently published *Fifth Assessment Report* of the IPCC) was that the world would have to be more or less zero carbon (Fay *et al.*, 2015) in the second half of the century, meaning that Chile would, by 2050 or thereabouts, already have to be ‘deeply decarbonised’. To most business leaders in the room, this was breaking news. Some expressed shock, despite having been part of a process for the past two years in which they had explored mitigation. Despite all efforts to push the envelope, the MAPS processes were still shaving off emissions from their current and future actions, making things more efficient by introducing new low-carbon technologies. The business leaders could not believe that a society, or an industry, without carbon was even vaguely possible. It was, in fact, a threatening idea, a world they could not yet imagine. At the same time they knew that what they had already asked the research team to model was just the beginning. There was a feeling of cautious curiosity in the room.
The Vision Building Team (VBT) in Chile had four meetings in 2014 and 2015, convened a space to talk about the future with world-renowned visionaries and thought leaders, and had a number of additional technical meetings. The research team was amplified and two new social scientists were added.

The original idea was to consider a goal (for instance, ‘zero carbon’) or a set of goals and then back cast from 2050 to 2030 and then to the present. This idea shifted, as we saw in Chapter 7, to an effort to identify new mitigation options (actions and strategies additional to Phase II results) that would be relevant to the long-term, and with an ‘out of the box’ emphasis. This emphasis means, among other things, that we were not necessarily constrained by the need for information and rigour for modelling purposes. And so ‘Vision 2050’ eventually evolved into ‘Long-term Mitigation’.

Two more VBT meetings will be held before the end of 2015. Almost 50 experts will be invited to participate in five sectoral groups (land use, electricity, transportation, residential, and industry and mining). The idea is also to incorporate non-traditional actors into the debate, such as individuals from the cultural world, to establish a different conversation around the future and the kind of changes that need to be considered.
We will see what comes of this innovative exploration of the future in Chile. Brazil is also thinking of an approach to the 2030–2050 timeframe, as requested by some of IES-Brasil stakeholders. Perhaps the other MAPS countries will be able to start looking closer at the longer term as well.

*Dancing in the street, Santiago, Chile: Blanco.*
Societal transformation is central

It is ambitious to think that processes of creating and internalising knowledge can influence a development path of an entire country, its economy and its entire people. Large forces – world trade, domestic politics or a particularly bad El Niño year – will all compete for impact. Transforming societies (which is perhaps a preferable term to the phrase ‘development path’, implying as it does a linearity that is limiting) is an effort requiring a huge array of approaches, entry points, disciplines, scales of actors, and so on. It is crucial to be clear who determines ‘transformational change’, lest it feel like an imposition, as intrusive as colonial or structural adjustment (Winkler & Dubash, 2015). It is a nonlinear enterprise – the ‘change tipping point’ can come suddenly and from a surprising angle. We can think of systems, such as countries, as a sleeping tiger: we have no perfect knowledge about what will wake it up and how it will behave. The best we can do is to ‘poke the tiger’ and see what it does, and continue to poke the tiger into action, hoping to find some points of contact that have the desired results.

A future MAPS that could be more effective as a change agent would perhaps have to consider exploring new areas: leverage points, interconnectedness, ‘networked causality’, and many more, when approaching the highly complex systems it intends to influence. It will have to poke our tiger in many places!

We will have to pay attention to the changes needed in human behaviour and practice. Grubb, Hourcade and Neuhoff write of ‘satisficing’, the tendency of individuals and organisations to make many decisions based on habits, routines and inbuilt assumptions (Grubb, Hourcade, & Neuhoff, 2014). The insights of psychologists and management sciences are required to shift these decisions. We will have to consider, they say, alternative approaches to traditional economics and assumptions about market behaviour, such as economic optimisation. We will need to interrogate consumption more than production. We will have to engage with complex systems, with, as Grubb and his team point out, particular reference to the way in which our societies interact with large corporations and financial institutions. ‘We must shift to a view where the exception is stability, and the norm is dynamics and change’ (Wells, 2013), and to do this, we will need to revisit the tool sets and assumptions that go into them.

We in the MAPS community believe we can add to the robust evidence base – of the kind we have built with much success in MAPS so far – with better understanding of society, production, consumption and the political economy. We will need to enhance our cross-disciplinary methods and approaches. In doing so, we should aim to rely less on classical/modern thinking (aspects include linearity, stability,
equilibrium, reductionism, measurement, control, progress, separatism, etc.). We will take care to add more and different information, without risking the credibility and relevance of the outcomes and findings to date.

Today, our MAPS practitioners are exploring and responding to many questions. Have we understood how to achieve political and/or policy durability? Who have been our guides and teachers? And crucially, how do we create policy irreversibility? Is it even possible? How is path dependency (in a low carbon, low poverty direction) created? Who are the experts on this? How can we study positive examples of this? What is our motivation in domestic politics, and does this have sufficient weight and durability to endure political and economic pressures? Perhaps we have entered the system through policy intervention, but to build irreversibility, action, influence and intervention is needed across the system: have we done this? Who are our partners in this and how can we support them and learn from them? What is our particular role as MAPS and how does it positively interact with all the other pressures on systemic transformation?

Tomorrow, we may find ourselves facing questions such as: what will our society actually want to look like in the future? How will we want to govern ourselves? Make and exchange money? Relate to nature? Balance free-time with work? Own the means of production? Relate to technology? And so forth.

Valparaiso, Chile: Blanco.
What would a development-driven process look like?

The MAPS team has innovated around the interface between development and mitigation. In doing so, we have realised that, even today, we often view development as being something separate from climate mitigation. This common practice in the mitigation field has restricted our vision and our agency for years. The answer is perhaps to frame the challenge differently. The current framings are too dualistic – either mitigation or development-centred – and the complexity of the problem requires integral thinking and integral solutions. Harald, Marta, Anya and Stefan have written about ‘reconsidering development by reflecting on climate change’, trying to bring some of these shifts together conceptually. Our understanding of development itself is also being challenged. In a future world, our assumptions may change about many things: the way we trade, manufacture, finance and govern – all is up for grabs.

Engaging with the broad and contested concept of ‘development’ as the defining challenge of advancing domestic climate mitigation action in ‘developing’ countries is perhaps unproductive. Similar challenges were found when interrogating the framings of low carbon, green growth, sustainable development, poverty reduction and inequality. Though this might at first appear perverse, developing countries often seem to hide behind the term ‘development’ and ‘development objectives’, and are prevented from understanding the ideal shape of the future society. In our MAPS countries, we found two constraints to this boldness. First, our societies are characterised by a less well-resourced public sector, with less capacity for policy making, less space for rational, evidence-based policy initiatives to be considered, and a less mature democracy. Our politics are often a mess, and public officials are often isolated with huge portfolios and tiny budgets. Second, there are unmet physical infrastructure needs – the ‘development deficit’. While developed countries, for example, have most of their built environment in place, developing countries have huge amounts of building to do. It’s uncertain what that infrastructure will look like. Much of this will be resolved within two decades and will determine global carbon lock-in, the development pattern, and economic competitiveness going forward.
What this implies is that ‘development’, or building a flourishing society, is also a present challenge, not only a future one. It raises the question: how do we help to identify and unleash virtuous cycles in the direction of a flourishing low-carbon future? ‘The point is not about planning utopias, the point is about practising them.... It’s a matter [of] survival. The future will be utopian or there will be none’ (Slavoj Zizek in Wells, 2013: 283).

Closing the capacity deficit is a matter of survival too. The MAPS approach has been to fully rely on local teams, and then facilitate peer collaboration. We are convinced that the long-lasting benefits of the new capacity generated in-country, across public, private and academic sectors, will have a huge long-lasting impact. We have learnt a development-driven process will always start with people, building on their existing capacity.

The future

The stories in our five countries have certainly not ended, and all the practitioners, officials, experts and decision-makers who were part of MAPS (certainly hundreds in all) will still be as active as ever in this field of climate compatible development in years to come. And many of them will surely work in cooperation, and continue learning from each other, as a consequence of the many strong relationships that have been forged over the MAPS years. While this phase of our MAPS community comes to an end in Paris at the Conference of the Parties (COP), with some luck we will continue to innovate as a group going forward, beyond 2015, in new and different capacities.
We as the MAPS community of practice will become more aware of what we do and how we do it on an on-going basis. We will foster a culture of collaboration and partnership with others with the same aim, based on learning and humility. We will combine knowledge with levers of change, focusing especially on values and ethics. We will develop competence in new disciplines and conjoin scientific evidence with values, ethics, technologies, organisation and environments (Wells, 2013). We will practise with an understanding of complex systems, where interconnectedness is central.

The point is, we will go on, and we will go on learning, experimenting and innovating as we go on, as this task is far from done.

So while all stories start at a certain point, they may not end so neatly. We won’t know whether our effort of the last 10 years has really worked, because this challenge is a multigenerational one.

But our children will know.

Hopefully they will read these stories as a history of the efforts of their parents and friends in approaching a challenge they will consider happily resolved in their time on this Earth.

Swing on a lavender farm, Peurto Varas, Chile: Blanco.
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We want our children to live in a world without the destructive power of a warming planet.

Barack Obama
As Mitigation, Action Plans and Scenarios (MAPS) entered the last phase of its six-year programme, Kate Hampton from the Children’s Investment Fund Foundation (CIFF) asked the MAPS team to consider a link with children, given the mission of CIFF. After consultation with experts, a project with scholars and teachers was agreed upon, and for some months in the second part of 2015, MAPS left the world of grown-ups to their scenarios, and asked youths to give their versions of the world.

The project was originally conceived as an opportunity to give young people the space to think about, and build, an idea of how a low-carbon future would look. At the same time, the MAPS team was hoping to learn how the future might look from the perspective of the people who will actually live in that future. We started the process by working the themes with teachers, looking at the complexity of climate change issues and how both interesting and difficult it is to think and act within this realm. We shared reflections on the multiple dimensions of climate change, highlighting the ethical standpoints behind consumption and mass production, and

*The meeting of the youth in southern Bogotá: MAPS Archive.*
the link between climate change and development challenges. We thought about how to put people and the environment first. Teachers, together with LOF (the organisation in Chile that we asked to help design and run the project), and the MAPS teams then built the methodology for each country process. It was amazing to plan a process of future examination with 100 youths between the ages of 12 and 16 years. Teachers had never done this, and were deeply excited. They also loved the opportunity to co-design! And they were feeling relevant in the climate challenge, of which they were all too aware. They were given this special opportunity to dream together with their students.

On 26 August 2015, in a hall on the gritty outskirts of southern Bogotá, a group of teenagers, interspersed with a smattering of pre-teens, is gathering. They have come together as part of the MAPS Youth initiative: a tangible foray into the society of the future. The children are building a vision of the city of their future. As they enter the hall, they are given name cards on which to write their desired occupation as adults. They then enter a portal that separates the future from the present. From then on, each becomes the architect, engineer or teacher that they see themselves being in the future.

Once inside they are divided into groups and asked to identify the needs, activities and challenges of their respective sectors in 2050. Each group elects an ambassador, whose role it is to move between the other groups to find synergies and avoid areas of potential conflict – such as the construction of a water-purification plant on the site of a waste dump. Each group then goes ahead with designing and building models of the infrastructure, factories and institutions their sectors would need. Eventually, all the models are joined together to build an impression of Bogotá in 2050, from the eyes of its future population.

The groups finish up their models and place them on a large, hand-drawn plan of Bogotá – complete with its rivers and those impressive, verdant mountains on the northern boundary of the city. It is striking to see how these young people, despite a real awareness that climate change will impact their lives in the future in ways that they do not yet comprehend (and despite some feelings of despondency), confront their challenge with energy, deep thought and creativity. They look at society as a whole and factor into their plans how income from urban gardens could potentially impact the income of farmers. From diverse outlooks, they arrive at solutions to address the challenges of the future. Some of these solutions are viable and practical, while others are fanciful, wonderfully innovative and totally out-of-the-box.
Similar groups are meeting in Chile and Peru. They will now embark on an action-research workshop programme that seeks to further educate them on climate change. They will deepen their understanding of this complex field. They will discover what their governments and other organisations from the current generation are doing. Each of the groups will return three months after this programme to revisit their first model.

We wait in eager anticipation for Bogotá 2050, version 2.¹

¹ The programme for children was designed by LOF for MAPS. For more information see their website: www.lofsur.cl.
MEET THE TEAM

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Standing (L to R): Neilton Fidelis da Silva, Emilio La Rovere, William Wills

Seated (left to right): Manuel Díaz, Hernán Blanco, Carlos Benavides, Rodrigo Palma

Not in the photo, but part of the team: Francisco Molina, Anahí Urquiza, Andrea Rudnick

Standing (L to R): Manuel Díaz, Hernán Blanco, Carlos Benavides, Rodrigo Palma

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Not in the photo, but part of the team: Fernando Farias (Ministry of Environment), Paulina Calfucoy, Gonzalo García, Rodrigo Fuentes, Marcia Montedonico, Bernardita Garreaud, Mónica Infante, Tanya Orellana, Nicolás Levy

Colombia

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THE MAPS PROGRAMME TOOK PLACE OVER SIX YEARS, FROM 2010 TO 2015.

It sought to build national scenarios to inform action towards a lower emissions future in four Latin American countries, thus helping to combat climate change while fostering development. An example of collaboration in the Global South, a team from South Africa worked with country teams in Brazil, Chile, Colombia and Peru to co-develop, with country stakeholders, an extensive body of knowledge. Mandated at government level, the results have impacted domestic and international policy in these four countries, not least it has translated into the contributions these countries will submit at the crucial UN climate meeting in Paris in December 2015.

But MAPS also had other impacts. Most significantly, it had an impact on people, and will leave a legacy of capacity and leadership that will be lasting. Stakeholders in these countries worked with the best indigenous researchers and government leaders to shape future action – and, in the process, created a new community of practice. At the heart of this was a core group of climate practitioners who built deep friendships and learnt compelling insights about the transition to prosperous low-carbon societies. These are the stories from the South, as seen from their perspective.