



Why Develop 2050 Pathways?

July 2017





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The 2050 Pathways Platform is an initiative that was launched in Marrakech at COP22. The objective of the Platform is to support countries, states, regions, cities and companies seeking to devise long-term, net zero-greenhouse gas, climate-resilient and sustainable development pathways. For further detail on the Platform, please visit the [UNFCCC webpage](#). The 2050 Pathways Platform is supported by the French Ministry of Europe and Foreign Affairs and the European Climate Foundation.

This paper presents the possible motivations for countries, regions, cities, and other entities to develop 2050 pathways, as visions of their long-term low-greenhouse gas emissions development. It is intended to be read together with: ***2050 Pathways: A Handbook***. These papers are the first in a series of papers from the 2050 Pathways Platform and its partners. Other papers will follow on more specific issues related to the design and implementation of 2050 pathways. This paper is under the responsibility of the 2050 Pathways Platform secretariat and does not commit the Platform members or its partners.

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Why develop 2050 Pathways?

I. Overcoming the challenge at hand

There is unequivocal acceptance that climate change, caused by the increased concentration of greenhouse gases (GHGs) emitted by human activities, is a major threat to economic systems and livelihoods globally. In light of current and projected climate disruptions, governments across the world signed up to the Paris Agreement.¹ The Agreement gives an international framework for climate action with its core objective to minimize the global temperature increase to well below 2°C/1.5°C.² Countries also recognized that their greenhouse gas emissions need to peak and rapidly decline to achieve net zero emissions after 2050.³

The long-term climate change challenge, and the policies that are implemented now to address it, exists alongside many other, sometimes pressing, policy issues faced by national and local governments. Left to their own dynamics, these issues and their respective policy responses risk colliding. Countries and other entities concerned with climate change need to elaborate pathways to visualize their transition to low-GHG economic development. These transformative pathways should integrate the necessary institutional, economic, technological and social changes, as well as the steps to deliver them. The elaboration of these pathways should also generate insights into the development and implementation of nationally determined contributions (NDCs) plus milestones for key policies and infrastructure investment. This is the essence of the long-term low greenhouse gas emission development strategies included in the Paris Agreement. (See box: 2050 Pathways and the Paris Agreement).

Only a few countries have elaborated 2050 pathways along these lines. Some countries have already developed 2030 low-emission development strategies (LEDS) that could be used to build on for this purpose. Overall, a global mid-century vision of the response to climate change and of its adequacy with the Paris Agreement objective has yet to emerge from national and regional mid-century pathways. The proposed 2050 pathways are meant to progress towards closing this gap, to facilitate a discussion on global ambition and to allow individual governments to design policy responses to the climate challenge that are appropriate to their broader socio-economic objectives.

¹ The Paris Agreement entered into force on November 4, 2016.
unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.
See also treaties.un.org/doc/Publication/CN/2016/CN.735.2016-Eng.pdf

² (a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production and (c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

³ Article 4.1 – Paris Agreement

The 2050 pathways are meant as robust visions of the low-carbon futures of countries, regions or cities. The development of emission and economic scenarios will need to be socialized, debated and finally owned by relevant stakeholders.

2050 pathways and the Paris Agreement : Article 4.19 - All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

II. Pathways as robust visions of the future

All countries are economically, geographically and socially diverse. This diversity demands that countries chart their own path towards a desirable, prosperous and sustainable future. The Paris Agreement and Sustainable Development Goals⁴ (SDGs) set common expectations about the features of future global sustainability. The 2050 pathways will only be successful if they allow achieving multiple objectives. The resulting transformative changes (e.g. in infrastructure, mobility, energy systems, manufacturing and food production) should allow not just a reduction in greenhouse gas emissions but also encourage, as well as protect, economic growth and ensure inclusive development.

The elaboration of 2050 pathways is meant to turn qualitative aspirations into clear research questions and quantified scenarios, producing new and useful information. Doing so, they should identify risks (e.g. carbon lock-in, sectors in decline in the low-carbon economy), opportunities (e.g. new activities and growth prospects, improved energy access or better air quality, use of emerging technologies), potential (for near term action and adaptation) as well as any remaining uncertainties (e.g. low-carbon technology availability, future fossil fuel prices). Ideally, pathways could also shed light on impending risks from climate change impacts, recognizing that adaptation and mitigation analyses require different sets of scientific knowledge and expertise.

The development of the pathways should also identify actionable policy options, as well as generate useful knowledge for investors and indicate challenges around implementation at different action levels (national, regional, local, sectoral or corporate). They should open a process to expose significant political economy issues for the entity undertaking the analysis (who wins, who loses, and what can be done about it). This will encourage collective problem solving allowing a two-way conversation between a wide range of stakeholders (e.g. cities, businesses, civil society), greater ownership of proposed actions and a common understanding of required technology solutions, business models and behavioral changes.

⁴ www.un.org/sustainabledevelopment/sustainable-development-goals/

The 2050 Pathways Platform intends to support national, local governments and other entities in the elaboration of mid-century low-carbon strategies that are coherent with other socio-economic objectives and can also guide them on short-term policy decisions and actions.

The 2050 Pathways Platform: Recognizing the overwhelming interest from countries, regions, cities and businesses to formulate long-term climate strategies, the 2050 Pathways Platform was established at COP 22. The platform intends to support actors seeking to develop long-term, deep decarbonization strategies, including through the sharing of resources (finance, capacity building), knowledge and experiences. The platform has been established to provide the space for collective problem solving.

Source: newsroom.unfccc.int/media/791675/2050-pathway-announcement-finalclean-3.pdf

The Platform developed a *Handbook* to guide Platform members in the elaboration of their pathways, with basic principles and building blocks that can facilitate a collective discussion among members (see box below). This will allow comparing future expectations on key elements of the pathways (e.g. future technology availability and needs, evolution of business models, future land-based food and fuel production, or the response of fossil fuel markets). It is also intended to foster an exchange on the increase of future ambition while assisting and guiding them on their near term action.

Principles and Building Blocks of 2050 Pathways

Principles: A general approach to 2050 pathways analysis, based on the principles below, is recommended for producing pathways that meet the criteria of clarity, relevance, practicality, and credibility.

- *Socio-economic* and *emissions objectives* are incorporated side by side as integral parts of the analysis.
- *Backcasting*: starting with the desired end state and working backward to the present. This is used to make the analysis consistent with ambition.
- Analysis focuses on the *physical transformations* required to meet long-term emissions and socio-economic goals.
- Pathways development is embedded in a process that engages stakeholders in the analysis and promotes *communications* about the findings.
- *Research questions, objectives* and *boundary conditions* of the analysis are defined at the outset, and the *analytical* toolkit is selected accordingly.

Building blocks. The principles of 2050 pathways are embodied in three building blocks of the pathways design process.

- Creation of *narratives* describing possible futures.
- Analysis and *modelling* of scenarios based on those narratives.
- Use of *dashboards* for communicating modelling assumptions and results.

Source: 2050 Pathways: a Handbook

III. Pathways to reveal opportunities, risks and needs

The long-term shift to a net-zero GHG economy cannot be achieved without important institutional, infrastructural, technological, market, and social changes. The challenge can be very daunting for national and local policy makers and business leaders who wish to instigate change. There is also a need to avoid a purely technocratic debate: this should eventually be meaningful to the public and enable participation of important stakeholders. Pathways must also be presented as understandable, tangible pictures of the required transformation to help form a strategy.

2050 pathways ought to encourage various governments and other entities to start elaborating ambitious climate mitigation strategies early and, as such, can avoid unnecessary adjustment costs related to unwanted carbon lock-in. To achieve this goal, they can first help identify risks and opportunities that the low-carbon transition represents and trigger a collective reflection on solutions.

Identifying key infrastructure decisions for the transition: Long-term planning allows taking better decisions in the present, by allowing a comparison of alternative solutions against their long-term implications. This is particularly important in the case of infrastructure where the life span of the projects extends for a long time. In the case of power plants as well as transportation infrastructure, invested capital may not be easily replaced or retrofitted. There is a high risk that emissions associated with these investments can be locked in for decades as early retirement would prove costly. (See below how Portugal is transitioning towards energy independence). The pathway's long-term outlook will show the major transformative changes required. As such, it is meant to ensure that decision-makers are well informed about the risks associated with projects that may be unviable in the long run – i.e. stranded assets – as the country, region, city or corporation seeks to decarbonize its activity.

Portugal's transition to energy independence : In 2005, Portugal published the new national energy strategy. This strategy set out a series of measures to achieve the government's principle objective of securing its energy supply and protecting the environment. The strategy was prepared with a firm intention of reducing the country's dependence on imported energy sources. This resulted in a series of structural reforms across the electricity sector, with now observable effects: in April 2016, 95.5% of total electricity demand was met through renewable energy.

Source: www.iea.org/publications/freepublications/publication/Portugal2009.pdf
energytransition.org/2016/06/portugal-moving-to-100-renewables/

Identifying regulatory and policy interventions: Long term planning also gives cues on policy interventions needed for the transition. (See below Calgary's regulatory journey to 100% renewable energy). It helps in identifying technology trends as well as highlighting the regulatory gaps where interventions could be made. This is particularly important in the case of ambitious plans for the penetration of variable renewables in electricity markets that have been designed to match the cost profiles of conventional thermal plants. Policy-makers can rely on long-term pathways to stage regulatory reforms needed to

remove barriers to investment in renewable technologies and integrate the need for flexible supply and demand response.

Calgary's regulatory journey to 100 % renewable energy: For 2012, the City of Calgary set itself a 100% renewable energy (RE) electricity target for its municipal operations. Ambitious targets and long term strategy have been broken down into several shorter, achievable plans. These have been key to realising the goal. In 2002 the local government launched its first RE project *Ride the Wind* program, with Calgary's Light Rail Transit powered 100% by RE. In 2004, the council approved the *Corporate Climate Change Action Plan*, setting the targets to promote RE and reduce emissions. In March 2005, the council recommended a staged approach towards a target of at least 75% green electricity by 2007 and greater than 90% green electricity by 2012. In July 2005, the City and ENMAX Energy executed the electricity service supply agreement so that, effective January 2007, a full 75% of the City of Calgary's electricity supply each year would come from renewable sources. In January 2009, the city council approved a motion to amend the Electricity Retail Contract between the City of Calgary and ENMAX Energy to purchase additional renewable electricity. In 2012, the local government purchased 100% of its electricity from renewable sources.

Source: *City of Calgary (accessed Nov 2012), 100% renewable in 2012, www.calgary.ca/*

Identifying technology priorities and anticipating deployment: The pathways can also help identify existing technology and business model innovations that can thrive in the transition. Collectively, pathways may also indicate critical technologies that have yet to reach the commercial stage and encourage joint research development and deployment portfolios across cities, regions, countries or companies. They can also show a path to market deployment and the timing of the introduction of lead markets (e.g. through public procurement of innovative low-carbon practices). The pathways can also help understand changes required in the market structures and how adequate and efficient support mechanisms can be built, allowing for an orderly deployment.

Sending signals to investors: In spite of numerous financial sector initiatives to take better account of the exposure of assets to climate-related risks, investment decisions are largely conditioned by local policies and priorities. The ongoing implementation of NDCs should start to shape those decisions but may only affect medium-term and operational choices, not long-term investment decisions, with the above-mentioned risk of emission lock-in and stranded assets. A quantified long-term emission and development pathway with visible government participation will provide indications on future policy, as well as on its quantified impact on climate-exposed sectors and activities. Such common expectations should guide investors in their decisions and possibly encourage them to work with governments at all levels on a pipeline of infrastructure projects that is coherent with the jurisdiction's pathway. This will also ensure that low-GHG technology choices are given the necessary encouragement for accelerated deployment and that high-carbon practices are flagged as exposing investors to future regulatory risks.

Pathways can also help multilateral and bilateral development banks in the identification of near-term infrastructure investments that are important for a country's future transition to low carbon, but are difficult to finance domestically and could benefit from MDBs support.

Anticipating social transitions, making the workforce ‘future fit’: The eminent transformation of the global economy will create new jobs but will also lead to fewer jobs in the high-carbon economy, over and above job losses from productivity gains. It is this that looms large in the politics of climate policy of many countries. The pathways will allow the governments to identify much more clearly the skill sets that need to be developed to accompany the low-carbon transition, as well as retraining needs in exposed sectors (see the box below on how Saudi Arabia is developing an energy efficiency workforce). The just transition of the workforce particularly from the high-carbon economy will be extremely important and the pathways ought to be able to pre-empt the related medium- to long-term social and economic problems. At the very least, they should give exposure to the most sensitive transition issues and allow the opening of a discussion about solutions. The elaboration of the 2050 pathways can also be an occasion to engage the general public in the debate around a desirable future, the opportunities it presents, the ways to get there including overcoming the challenges and fears that such a transformation triggers.

Saudi Arabia’s endeavour towards an energy efficiency workforce: Saudi Arabia started the development of its energy efficiency policy in 2010, leading to the Saudi Energy Efficiency Program (SEEP) in 2012, focusing on three sectors (buildings, transport and industry) totalling 90% of the country’s energy consumption. Human capital development is an important component of the programme, with the introduction of energy efficiency curricula in five engineering schools, the development of an energy efficiency technician degree and professional training for energy managers.

Source: See OECD (2017), Investing in Climate, Investing in Growth, [Chapter 6, p.254, [oe.cd/g20climate](https://www.oecd.org/g20climate)]

Addressing policy coherence: The pathways can deliver a comprehensive overview of the transition issues and the required policy changes. This can be an opportunity to indicate where existing policies may be misaligned and openly, or inadvertently, hinder the low-GHG transformation. Such a discussion requires gathering different departments to reflect on competing and synergistic policy goals - such a ‘whole-of-government’ approach may already have been developed in the elaboration of NDCs. Ideally, this can lead to the formulation of realistic timelines of climate-related measures combined with reforms to reduce misalignments.

Combine multiple policy goals and build institutional synergies: Long-term planning not only helps in understanding decisions that have an impact in the future but allows different policy objectives and implementation measures to be aligned. The development of 2050 pathways can provide the space to discuss multiple socio-economic objectives (e.g. urban development, access to jobs, poverty alleviation, low-carbon mobility). This is important as governments will need efficient policy tools to achieve multiple objectives (climate and other SDGs) and to align different institutions. While the broad coherence of climate solutions with SDGs facilitate this seemingly complex task, there may be policy trade-offs, which the pathway process should help reveal. *(See the box on the city of Rio’s approach to development and climate change).*

Cities planning for the future: Rio's 500 Vision Plan

In March 2016, the city of Rio announced the Rio 500 vision plan, which sets the goal of carbon neutrality for Rio de Janeiro by 2065. This goal makes Rio the first city in the developing world to commit to carbon neutrality and to monitor as well as implement this long-term goal. In 2016, Rio also developed a Rio Resilience Strategy underpinned by 6 goals: understand and mitigate the impacts of severe weather; cultivate green, cool, safe urban space; provide high quality basic services to all citizens; promote a circular and low carbon economy; and increase the overall resilience and cohesion of the city and its people.

Cities across the world are forging ahead by taking strong initiatives on climate change and planning their long term development.

Source: www.c40.org/case_studies/city_adviser_rio

Confronting political economy issues: The long-term nature of 2050 pathways can also facilitate a climate policy discussion with stakeholders who otherwise see few near-term options for decarbonization. Various countries (see the box below) have used long-term scenarios as a means to initiate a climate policy debate with incumbent activities concerned about the implications of climate policy.

Unlocking potential and managing the transition: South Africa

There are now several countries that have undertaken development of long-term strategies in order to better understand the potential of action that exists within the country as well as to articulate choices that present themselves while undergoing the transition.

South Africa undertook development of Long Term Mitigation Scenarios with the realisation that South Africa would need to contribute its fair share to reducing the greenhouse gas emissions. This exercise was a unique blend of facilitated stakeholder process and rigorous research. The exercise engaged strategic thinkers from government, business and civil society and resulted in informing future south african commitments to UNFCCC in 2009 and 2015.

Source: www.environment.gov.za/HotIssues/2008/LTMS/A%20LTMS%20Scenarios%20for%20SA.pdf

Calibrating near-term climate action: The description of emissions and socio-economic pathways to 2050 will generate a clearer idea of achievable near/medium-term economic and emission objectives, including infrastructure decisions with long-term effects on decarbonization. This knowledge will allow optimizing and guiding implementation of existing and future NDCs while avoiding the trap of incremental mitigation action. This was seen in the case of NDCs prepared in the run up to Paris: countries like Chile, Colombia or Peru used their long-term planning exercises to determine the level of ambition to be articulated in their respective NDCs.⁵

Engaging stakeholders and creating greater buy in: The elaboration of the 2050 pathways can also be an occasion to engage the general public as well as a wider range of stakeholders in the debate around a desirable future, the opportunities

⁵ <http://www.nivela.org/flowli/file/2016-10-24-plans-2050-nivela/en>

it presents, the ways to get there including overcoming the challenges and fears that such a transformation triggers. The engagement as a consequence of development of these plans can help create non-partisan support for potentially difficult actions that might need to be undertaken. (See below an example from UK on their 2050 calculator).

UK 2050 Calculator

The UK was the first country to bring in legally binding emissions reduction targets, through the Climate Change Act 2008. The Act includes a long-term target to reduce emissions by at least 80% by 2050, relative to 1990 levels, and introduced a “carbon budget” framework to set interim five year targets along the way. Following the introduction of the Act, the UK Government developed an innovative, open-source and online energy model called the 2050 Calculator to allow everyone – policy makers, stakeholders and the public – to engage in the debate and explore the options available to reduce emissions. The 2050 Calculator was used to inform the 2011 *Carbon Plan*, which set out the UK’s emission reduction strategy and since then has over 30 other countries, regions and cities around the world have developed their own 2050 calculators.

Source: www.gov.uk/guidance/2050-pathways-analysis

Addressing uncertainties: The pathways can also indicate important uncertainties for the success of climate protection and other SDGs (e.g. the future of energy prices, the effectiveness of climate and accompanying policies, the availability of and access to critical technology solutions) and foster a discussion on how best to tackle them individually or collectively. Different scenarios can also be explored to identify solutions robust under different future outcomes. In this spirit, recognizing the uncertainty that climate change and related policies create for future markets and supply chains, some businesses are taking measures to minimize their vulnerability (see the box below).

Walmart – Project Gigaton

Many businesses are taking the lead on developing strategies for future proofing their business models recognizing the need to respond to climate change. Aware of the importance of being able to deliver consumer goods with lower carbon footprints and optimizing their value chain in the future, Walmart in 2017 announced Project Gigaton. This initiative will be seeking to eliminate one gigaton of emissions, focusing on areas such as manufacturing, materials and use of products by 2030. The project not only aims to reduce Walmart’s emissions but is engaging suppliers to cut their emissions.

Source: sciencebasedtargets.org/2017/04/28/project-gigaton-walmart-ceo-on-working-with-supply-chain/

Anticipating and addressing climate vulnerabilities: The 2050 Pathways Platform emerged from the need to envision future climate ambition, with a focus on mitigation. Virtually all economies will also face severe climate change impacts and any long-term climate response will need to inform adaptation needs. The pathways can also provide an opportunity to highlight present and future climate vulnerabilities and point out adaptation needs and policy interventions. This will, however, require the mobilization of scientific and policy expertise which differs from that involved in climate mitigation analysis.

Fostering best practice through collaboration and learning: The Pathways Platform intends to facilitate communication across teams engaged in various pathways analyses as well as exercises such as LEDS. This could consist of sharing of critical policy and technology assumptions or an exchange over identified opportunities and risks in different sectors. This could bring various governments ‘up to speed’ on best practice, whether it relates to technology solutions, policy instruments, or governance issues. Identified capacity gaps could be filled through targeted partnerships across jurisdictions.

IV. Conclusion

The previous section illustrated the many dimensions that countries and other entities need to explore to elaborate robust strategies in response to the climate change imperative. The pathways, as envisioned by the Platform, are meant as guiding lights for governments or corporations on the journey to a low-carbon, more inclusive and resilient future. They ought to achieve this ambition through a process which clarifies the key steps for a transformative climate and development strategy and generates robust solutions. The latter ought to come from combining stakeholders’ views with quantified projections and a shared understanding of necessary policy measures.

If some jurisdictions still rely on short-term planning for socio-economic development, these are meant as broad outlines to help individual actors forming common expectations based on shared policy orientations, more than as precise targets. With their longer-run orientation, the pathways will run into more significant uncertainties and should be considered processes as much as fixed projections, and certainly not as forecasts. The recent past has shown the possibility of unexpected technological breakthroughs (the competitiveness of solar PV and wind, the rapid penetration of LED lighting, etc.) and of economic disruptions with important effects on economic well-being, political stability, as well as global emission trends. These positive and negative uncertainties notwithstanding, the purpose of pathways is to provide a strong backbone for future countries’ climate and other socio-economic objectives – i.e. the future they want, echoing ‘the future we want’ of the Rio+20 declaration – and as such avoid the risks of an incremental, ‘stop and go’ management of the low-GHG transition.

The development of the pathways and its results will allow the exploration of the breadth of possible climate action faced by countries, local governments and other entities. The objective of the Platform is also to facilitate the sharing of knowledge accumulated in the process and identify where common solutions may enable higher development and climate ambition.

The accompanying document (*2050 Pathways: a Handbook*) describes more precisely how pathways should be elaborated to deliver on these multiple objectives.



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