Projecting Greenhouse Gas Emissions under Climate Policy Scenarios– Challenges and Solutions

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Abstract

Since 2009, the "Climate Action Tracker" evaluates emission reduction proposals against climate goals proposed by countries, and whether they are as a total consistent with the 2°C or 1.5°C international objectives.[1] This paper introduces the methods used to assess whether these countries will achieve their goals with currently implemented policies. It describes data availability and methodological challenges and presents solutions. The focus is on enabling robust analysis, even in situations of limited time and budget and includes good practice examples.

The Climate Action Tracker assessment of emission projections including implemented policies relies on two main pillars: external emission scenarios including climate policies and own calculations to quantify the impact of individual policies. Depending on country circumstances and data availability, the analysis favours one pillar or combines both to project future emission levels.

The approach provides sufficient flexibility even under limited data availability and accommodates individual country circumstances, yet allows comparability between countries. This flexibility demands a careful documentation and interpretation of the results. The method cannot replace in-depth modelling or in-country expertise on the complex effects of policies and interactions with other areas of society, yet is a powerful tool to give a quantitative indication of how emissions are developing. Also, the method may play an important role in quantifying and evaluating Intended Nationally Determined Contributions in the future.

Introduction

We are in the midst of a critical decade for climate policy. National GHG reduction pledges made in Copenhagen will not achieve the needed reductions even if fully implemented. Less than half of major economies surveyed in the 2013 UNEP Emissions Gap Report were on track to reach these pledges (UNEP 2013). The Climate Action Tracker (CAT) analysis shows a similar picture (Fekete et al. 2013).

Beyond 2020, currently implemented policies are highly inconsistent with the emissions reductions required for the international objective of 1.5-2°C pathways. This situation ignores major opportunities already identified, e.g. energy efficiency and renewable energy continue to boom globally and regionally.

[1] The analysis addresses 30 developed and developing countries, with the European Union counted as one country.

International climate change negotiators are currently preparing a new climate agreement, expected to contain mitigation objectives for all countries. The level of ambition of the target, as well as the ambitiousness of actions taken to comply with the target will be crucial for the future development of emissions globally.

Detailed analysis is necessary to monitor what countries and sectors (e.g. international aviation and marine) are actually doing to reduce emissions. The Climate Action Tracker provides up-to-date policy emissions projections of individual countries by examining what policies individual countries are implementing to reduce GHG emissions.

Project Context and Objectives

This paper introduces one part of the analysis of the Climate Action Tracker. Since 2009, the project evaluates emission reduction proposals against climate goals proposed by countries, and whether they are, in aggregate, consistent with the 2°C or 1.5°C international objectives. Authors use interpretations of equity principles to evaluate the proposed goals for each country against its fair share of effort to reduce global emissions. Probabilistic climate modelling of emission projections enables rigorous assessment of proposed aggregate emission actions against global climate goals.

The objective of the analysis presented here is to assess whether currently implemented domestic policies or policy packages will be sufficient to meet the pledged greenhouse gas emission reductions. To do so, the analysis determines current policy emissions projections - scenarios including most recent economic development, as well as up-to-date policy impacts.

This paper presents the methodology used for and the lessons learned from estimating future emissions considering the implementation of policies designed to reduce emissions. It will provide insights on how to conduct this analysis for multiple countries in real time on limited budgets, and demonstrate flexibility in situations of limited data availability (Section 2). To illustrate the approach further, results for a few exemplary countries follow (Section 3).

The Approach to Determining 'Current Policy Emissions Projections'

General Principles and Approach

The Climate Action Tracker uses the current emission trends within a framework of various elements. It is part of an integrated analysis that compares estimates of policy impacts with the quantification of pledges, reference scenarios, and emission allowances according to effort sharing approaches[2]. Furthermore, it aggregates the current policy emissions projections of individual countries to global emission trajectories and determines the resulting temperature increase. This framework leads to a number of requirements:

- *Compatibility of data:* The links to the other elements of the analysis require compatibility of the results and underlying data.
- *Comparability of results:* To be able to compare different countries, the approach, underlying data and illustration of results must be similar.
- *Transparency and Robustness*: To allow the results to be used broadly and accepted by national stakeholders and science, the analysis aims to be as transparent and robust as possible.
- *Simplicity*: Producing results in real time and in situations with limited budgets make a simple approach necessary. This links to transparency of the analysis.

The steps to determine the current emission trends of individual countries are the following:

[2] Effort sharing approaches use indicators for equity principles or other parameters to quantitatively distribute the efforts of emission reductions amongst regions or countries in order to achieve the globally desired emission level.

1. Gather existing emission scenarios and assess quality of the data, consistency with historic data, as well as completeness with respect to sectors, gases, time frame and policies covered
2. Combine emission scenarios and/or own assumptions to complement sectors, gases or time frames and ensure consistency with historic data
3. Quantify impacts of additional policies where those are not included in the existing scenarios or where there are no scenarios yet to obtain emission projections including all relevant policies (="current policy emissions projections"). This third step is based on an approach first applied in (Höhne et al. 2012a; Roelfsema et al. 2013a) to quantify the top three policies of major emitters.

The analysis focuses on the year 2020 because of the project's scope to evaluate countries' emission reduction pledges for that year, as is consistent with one aspect of the international climate debate. Where data is available, the scenarios extend further.

Depending on whether external scenarios are available and include relevant policies, the approach foresees using existing scenarios, own quantification of policies or a combination of both. Using only existing scenarios is usually the most time efficient approach and has the advantage of including modelling of more complex behaviour, such as feedback and overlaps. On the other hand, this may be too intransparent and the scenarios may include unwanted elements or assumptions. Doing own quantification allows an analyst to decide on the scope oneself, however only limited level of detail is possible and data availability still determines the approach significantly.

For most of the 30 countries assessed (representing roughly 75% of global emissions in 2012) appropriate scenarios exist, but in many cases additional analysis was necessary to include most recent developments of policies.[3]

Collection and Processing of External Data

The starting point for analysis for all countries is an existing emissions dataset, e.g. at a minimum, historic emissions from inventories. The correct choice of data and transparent processing is thus of great importance. The following paragraphs describe data needs and availability as well as solutions applied in the Climate Action Tracker analysis of current trends in case of data gaps..

Data requirements. Depending on the approach, the targeted level of detail, and country specific circumstances, data requirements vary. Data useful to determine current policy emissions projections are:

- Historic data on emissions, energy and activity level (economy wide)
- Projections on emissions, energy and activity level (economy wide)
- Breakdown of data by sector/sub-sector or gas
- Information on assumptions, scope and currentness of data
- Up to date information on current policies and their effectiveness.

When choosing data sources, a broad set reflecting both government positions as well as independent national research is desirable to illustrate the full range of the national discussion. Additionally, international models or data gathering exercises such as the International Energy Agency's Energy Balances or the World Energy Outlook are of use. Those sources are widely accepted and approach all countries similarly, allowing easy comparability of countries. Ideally, all of these types of data sources are used in the analysis, nevertheless in most cases, there are only few data sets available.

[3] Countries included: Australia, Belarus, Brazil, Canada, Chile, China, Costa Rica, Croatia, EU, Iceland, India, Indonesia, Japan, Kazakhstan Mexico, New Zealand, Norway, Russia, Switzerland, and USA. For four countries, no external scenarios are available but an analysis was still possible based on own quantification (Argentina, South Africa, South Korea, and Ukraine). For six countries with low emissions (Bhutan, Israel, Maldives, Moldova, Papua New Guinea, and Singapore), no quantitative analysis was possible due to lack of data (Compare (Fekete et al. 2013), pg. 3).

Differences in data availability. Data availability varies significantly between countries and regions. For most developed countries, data availability is generally high. Annex I countries of the UN Framework Convention on Climate Change (UNFCCC) have specific reporting requirements, obliging them to submit yearly emission inventories of historic years and publish emission projections in their National Communications or Biennial Reports to the UNFCCC (UNFCCC 2012). These requirements lead to a minimum amount of publicly available data. Additionally, developed countries in many cases have more in-country modelling capacities provided through institutions, universities or other research centres, such as for example the European Environment Agency (EEA) or the Energy Information Agency (EIA) of the USA. Furthermore, many of these developing countries are sufficiently large to be included as individual regions in international scenarios, like the World Energy Outlook. Much of the modelling work for developed countries also provides activity data underlying the scenarios.

For developing countries, the picture is more mixed. Many countries have only submitted emission inventories for two years to the UNFCCC, and many have no, or no up-to-date, information on emission projections. It depends highly on the country whether energy and emission scenarios are commonly used and available. A good practice example is Mexico, which has already submitted five National Communications and emission inventories for 16 years (SEMARNAT 2012) and has produced and updated emission scenarios for the future, the most recent one being the Special Programme on Climate Change (Federal Government of Mexico 2014). Some large developing countries like, for example, China and India have only limited information available publicly, in spite of recent improvements (China has for the first time published emission projections in its most recent National Communication (The People's Republic of China 2012)).

For many developing countries, energy planning is a crucial point to meet growing energy demand of the population. As a result, energy supply scenarios are more likely to be available. Activity data usually does not exist in developing country's national data. For least developed countries (LDCs), data availability is very low in most cases, given a lack of resources for data collection and modelling. Most LDCs do not have commitments to reduce emissions in 2020, further their share of global emissions is small, so that there is less focus on these countries in this analysis. The Maldives however did set a target of carbon neutrality in 2020, but given the data availability and uncertainty around current policies, no analysis of current trends is possible at this point in time.

Managing limited, conflicting and uncertain data. In case of limited data availability, the Climate Action Tracker applies the following solutions:

Extrapolation/interpolation of years: For historic years and projections, this method serves to bridge a number of years for a number of countries in this analysis. The danger here is to miss peaking years or other disruptive behaviour of emissions.

Downscaling from regions to countries via growth rates: This method assumes, that growth rates of emissions or other data are similar within one region. This analysis for example uses growth rates from the region "Latin America without Brazil" as defined in the WEO to project emissions in Argentina, where there is no national data available.

Assuming similar growth rates for different sectors: Where emission projections are available for most sectors but missing for a smaller part, the available growth rates can be extended to the missing sector. This means that one assumes that this sector grows similarly to the rest of the economy in terms of emissions. As there may be very specific sector behaviour, it is helpful to investigate whether historically there has been such a correlation. Only if this is the case, this method should apply.

Fixing specific indicators in the last available year for projections: Where there is no projection available for specific indicators or sectors, one can fix the indicator at a specific year, e.g. the share of renewable energies of energy supply or the electric capacity of renewable energy. These assumptions ideally are supported by information on this specific country.

All of these solutions may include a combination of various data sources. In this case, it is especially important to assess where inconsistencies between the datasets may hinder the analysis.

In several cases, different sources or updates of sources lead to variations in the emission projections and even historic emissions. The CAT analysis generally follows a hierarchy of sources, starting with submissions of inventories to the UNFCCC, followed by official national data, then international acknowledged source such as IEA. This means that data deviating from the preferred source should be harmonised to that. Where this is not possible, another solution can be to illustrate an average range, using either the mean average or median. Special cases may need additional means to solve conflicting data, leaving room to consider country specific circumstances. Clear documentation is key in those cases.

Some examples for conflicting data sources and chosen solutions are:

Canada's Emission Projections do not match historic emission data submitted to the UNFCCC. To solve this, the CAT used the most recent GHG inventory for historic data (submitted via the Common Reporting Format 2013) and applied growth rates from projections from Environment Canada for projections of the current trends.

Mexico has updated its business as usual: The National Climate Change Strategy includes a new BAU scenario, which replaces the one from the Special Programme for Climate Change (PECC) from 2009, to which the emission reduction pledge previously referred. The new scenario is higher than before, so the emission level resulting from the pledge was corrected upwards to 672 MtCO2e in 2020, up from 618 MtCO2e under the previous projections. This does not have a direct effect on the level of remaining emissions after current policies are implemented, but influences how close Mexico is to achieving the pledge. The CAT uses the new scenario because it is the official representation of the pledge.[4]

In Brazil and Indonesia, Land Use, Land Use Change and Forestry contribute with a high share of emissions. Given the problems to account these emissions, even historic emissions from this sector are partially unclear, let alone projections. For Indonesia, for example, values for emissions from peat fires vary significantly according to different studies named in the National Communication. The CAT used the mean average of all these studies for the years 2000 to 2005.

In South Africa, projections published in 2010 (Government of South Africa 2011) do not match historic data from latest inventories. The inventory data is higher for the last available year than the projections in that year, which start earlier on. In this case, the CAT assumes that the provided BAU range is achieved with current policies, although the current trend scenario starts with the year of the last available inventory data with that value.

Quantification of Additional Climate Policies

The following paragraphs provide some examples on how the CAT approaches the quantification of individual policies and the interaction between individual policies. The methods rely on (Roelfsema et al. 2013a), first applied in (Höhne et al. 2012b), and were enhanced further by the CAT team.

Tools to quickly assess potential mitigation impacts of policies. To determine the impact of individual policies in a fast but robust and transparent way, the CAT uses standardised tools to quantify emission reductions or remaining emissions. These are simple Excel modules and can be combined and easily adapted to national circumstances or data availability. This section introduces the tools for vehicle standards, feed-in tariffs and renewable energy targets, Emission Trading Schemes (ETS), and biofuel quotas. (Roelfsema et al. 2013b) include descriptions of additional tools, which the CAT did not apply.

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[4] Note that in spring 2014, Mexico published its new PECC, with yet another (higher) BAU. As the General Law on Climate Change, which anchors Mexico's pledge in the national legislation still refers to the BAU from the National Climate Change Strategy, we still consider that as the reference for the pledge.

Vehicle efficiency standard: Based on the natural exchange rate of the stock, vehicles complying with new standards replace existing vehicles every year. With time, the new vehicles take over higher shares of distance driven. Assuming that the distance driven remains the same as under business as usual, the tool determines the emissions of new vehicles and old vehicles. Other assumptions are the life expectancy of vehicles, which determines how fast vehicles are exchanged, whether the vehicle stock is homogeneous in the starting year of the standard, and in the case of efficiency standards whether the emission intensity of fuels changes or not. In the case of emission intensity standards, the last point can be skipped. This method was used for the USA and Canada.

Feed-in tariff and renewable energy target: This tool quantifies the impact of feed-in tariffs on the capacity increase of renewable energy technologies. It builds upon the assumption that the renewable energy capacity growth rates are related to the ratio of feed-in tariffs and levelised costs of different technologies. This means that the expected growth is higher where the feed-in tariff covers a higher share of the costs per kWh. Inputs influencing the results are:

- The relationship of the tariffs to country specific generation costs;
- Indicators for barriers to renewable energy technologies, such as:
  - Lack of grid access;
  - Long term insecurity (e.g. caused by unclear political situations);
  - Lack of clear regulations for guaranteed purchase requirements;
- The initial capacity installed

The barriers decrease the effectiveness of the feed in tariffs, authors use simply “barrier factors” of 0 to -4 on a 5-point scale. If all barriers are -4, the effectiveness of the tariff is zero. Furthermore, the tool considers capacity caps, if any.

The resulting installed capacity then serves as an input to the renewable energy target tool, which converts the capacity to emission reductions. A major question here is which conventional energy carriers the renewable energy replaces. Depending on the country, the CAT treats this question separately, however the default approach is to keep nuclear capacity stable and reduce other electricity generation of fossil fuels equally. Where countries provide targets for other fuels besides renewables, the tool can incorporate these here. The CAT applied this tool to South Korea, Japan, China, Brazil and India.

Emission trading schemes: This tool considers the absolute emission cap given by the scheme, the share of national emissions which the scheme covers and an effectiveness factor. As the emissions cap does not necessarily include all emissions of the country, the tool first splits up total emissions into covered and non-covered sectors. The cap then applies to the covered sectors, and the remaining sectors are assumed to develop as under BAU. The effectiveness factor depends on the framework of the policy, e.g. if there is a comprehensive monitoring, reporting and verification system and adequate enforcement of the emission limits. If this is not a given, the tool discounts a part of the reductions below BAU, assuming that the emission cap will not be achieved. The CAT applied this tool to South Korea.

Biofuel quotas: This tool quantifies the impact of a minimum of biofuels in the gasoline mix. This can either be a share of total fuels or a minimum total amount. To determine the remaining emissions, the tool uses the fuel mix of a reference scenario in the target year, and replaces a part of the fossil fuels by the additional biofuels. Thereby, a distinction between biodiesel (replacing diesel) and ethanol (replacing gasoline) is necessary. Then, the tool calculates the emissions resulting from the fuel mix including the policy using emission factors. As the emission factor for biofuels may vary significantly depending on the supply chain, the tool gives the option to vary the factor for biofuels. The CAT applied this tool to Argentina.

Accounting for interactions between policies. In most cases, policies do not stand alone, but interact with other legislation:

Policies supporting each other: Examples are feed-in tariffs and renewable energy targets, or energy audits accompanying emission regulations in the industrial sector, or ETS and any other activity reducing emissions. The CAT considers these effects by first identifying these relations, and then assessing which policy leads to the stronger effect. Only this one is then included in the quantitative assessment.

Overlaps between energy demand and supply: If first the emission intensity of the supply is decreased, measures on the demand side have less impact on the emissions. In contrast, if first the demand for energy is decreased, then measures to reduce emission intensity of the energy supply have less impact. One can define which measure comes first and then attribute the emission reductions to the specific policies. The CAT usually focuses on the overall emissions, so that the attribution to individual policies is not as relevant. It is crucial however to account for the overlap, for example by adapting the electricity demand after demand-side policies are accounted for before calculating remaining emissions from the energy supply sector.

Selected Country Results

This section provides results for selected countries with different circumstances regarding data availability and policies implemented. These examples highlight specific methods and assumptions explained above. The results described focus on current policy emissions projections. For the description of the methods for quantification of other elements and results for additional countries, see (Fekete et al. 2013). The following sections build on that report.

Argentina

The CAT expects the impact of climate policies in Argentina to result in only a small deviation from a scenario excluding recent policies (See Figure 1). One policy included in the current policy emissions projections is the support of renewable energy through the programme "Generación Eléctrica a partir de Fuentes Renovables" (renewable energy based electricity generation). This includes a tendering system for renewable production capacities (excluding large hydro), and aims to achieve an 8% renewable share of electricity generation in 2016 (Secretaría de Energía, Argentina no year). Furthermore, Argentina has a biofuel quota and various support mechanisms for biofuels producers.

GHG inventories are available for the years 1990, 1994, 1997 and 2000. For the years 2001-2010, we use growth rates of a combination of IEA CO2 emissions from combustion (IEA 2012a), CDIAC (CO2 process emissions) (CDIAC 2012) and US EPA (non-CO2 emissions) until 2010 (United States Environmental Protection Agency (EPA) 2012).

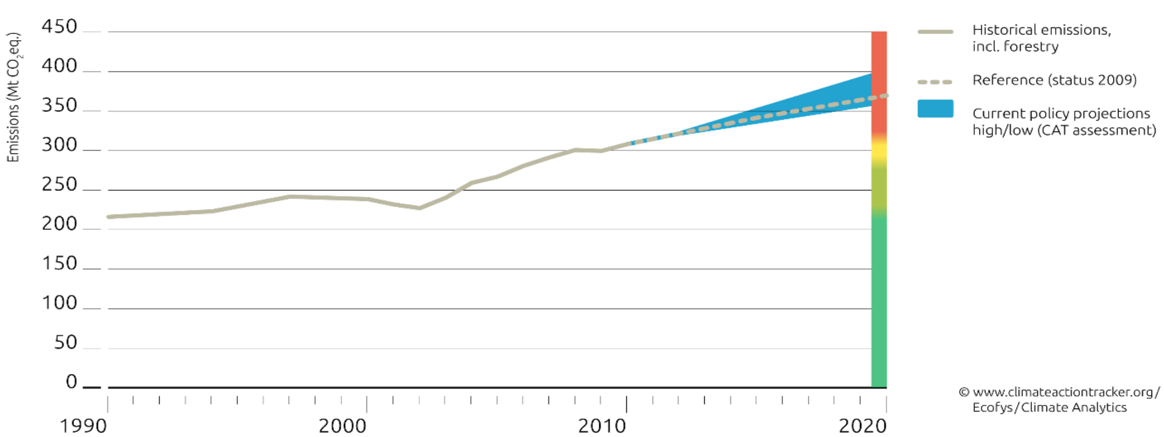

Figure 1. Emission projections for Argentina. Source: Climate Action Tracker (Fekete et al. 2013)

Argentina is one of the countries where no national emission projections exist. For reference projections, we use the WEO 2009 growth rates for Latin America without Brazil (IEA 2009) to determine the expected emission development at the time the pledges were made, excluding recent policies. For the current trend projections, we calculate emissions reductions using the standardised calculation tools for renewable energy targets and biofuels and subtract these from the BAU. As an alternative current trends scenario, we use growth rates from WEO 2012 for Latin America without Brazil (IEA 2012b), with latest policies included.

European Union (EU)

The future projections of currently implemented policies continue the past downward trend, although with much lower reduction rates per year for the European Union (EU) (See Figure 2). Until 2020, emissions are projected to decrease around 0.3% per year, after that by 0.1% per year until 2030. Emissions in 2020 are estimated to be around 4,200 MtCO2e. In 2030, they are projected to be around 4,000 MtCO2e. Emissions in the EU27 have been on a decreasing trend since 1990. In 2011, emissions were 18.3% below 1990 levels. After a steep decline in 2009, due to the recession and a spike upward following the recovery in 2010, they dropped again in 2011.

Current trend projections include all major EU policies implemented, including the EU ETS, the Effort Sharing Directive and a wide range of other EU-wide regulations influencing GHG emissions. It also includes the most important national policies for member states.

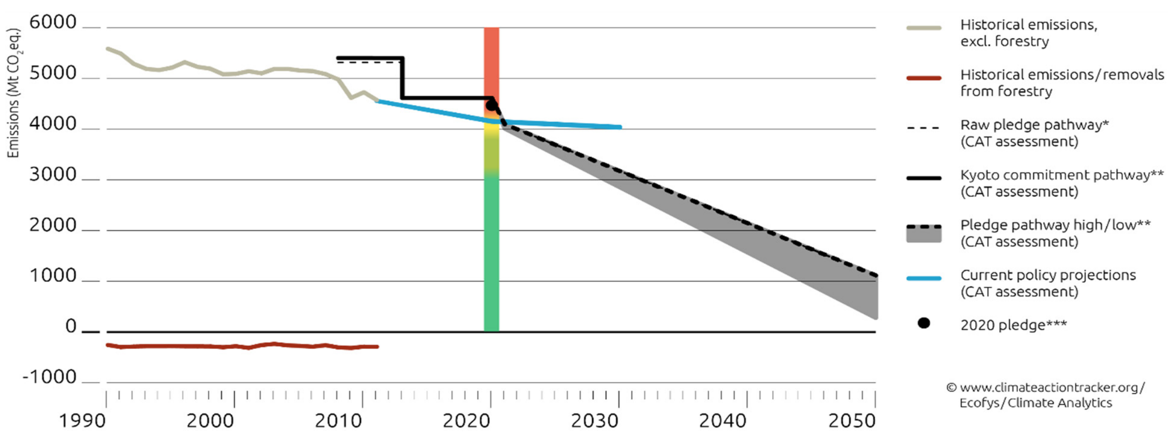

Figure 2. Emission projections for the EU. Source: Climate Action Tracker (Fekete et al. 2013)

The current trend projections are based on the EEA projections published in October 2012 (European Environment Agency 2012). The assumption is that the EU policies covered in the Energy Roadmap scenarios are covered in the respective projection scenarios (with existing / additional measures). Neither the Energy Roadmap scenarios nor the EEA projections include estimates for the Energy Efficiency Directive as adopted in 2012. The effects were estimated based on the 2011 Impact Assessment (European Commission 2011). The options quantified in the impact assessment that most closely matched the measures finally included in the Directive were identified with their respective impact. This was assessed in relation to expected overlap with other measures/policies included in the underlying policy scenario and with other measures within the package, and towards the expected effectiveness of measures. This assessment is reflected in a correction factor per measure. The adjusted minimum and maximum values are then added to reach the overall effect.

Indonesia

In Indonesia, currently implemented policies are expected to decrease 2020 emissions by around 11% compared to a scenario excluding recent policies. Emission levels including LULUCF are expected to reach 2,519 MtCO2e in 2020, with 56% of these coming from the land use sector. The key policy is the Green Energy Policy, which sets up plans for future energy supply. This legislation covers renewable electricity generation, and also includes biofuel quotas, which may significantly reduce emissions in the transport sector, if sustainable production is guaranteed. Furthermore, measures in the LULUCF sector are of relevance, such as the Forest Law Enforcement and Governance and Trade Programmes to ban illegal logging.

The CAT used data on historic emissions and projections from the 2nd National Communication, submitted in January 2011 and updated in January 2012 (Ministry of Environment, 2010, 2012). The data includes emissions from peat fires. As values for emissions from peat fires vary significantly according to different studies named in the National Communication, we used the average of all studies for the years 2000 to 2005. **Error! Reference source not found.** Figure 3 shows the variation of LULUCF emissions and the impact those have on total emissions. The future trends ignore these disruptive changes.

To generate the policy scenario, the CAT subtracted emission reductions from existing scenarios from the BAU provided in the National Communication: For the energy related policies, the Indonesian Energy Outlook provides emission reduction estimates (Government and Ministry of Energy and Mineral Resources 2011), for the LULUCF sector data calculated for (Höhne et al. 2012a) were used. Data for 1990 to 1994 is available in Indonesia's Initial National Communication, however the document states various issues related to lack of data and methodology, topics which have been significantly improved in the 2nd National Communication. We therefore do not show data for the first years.

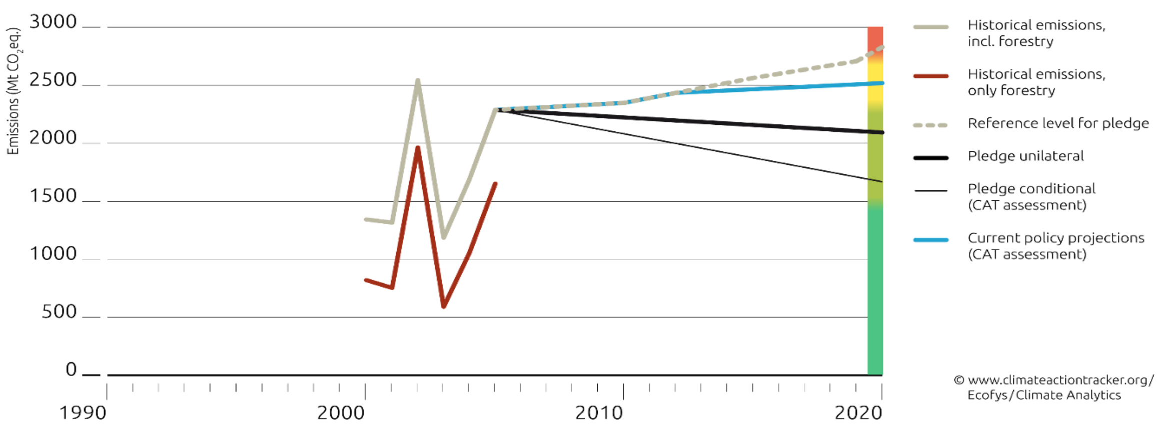

Figure 3. Emission projections for Indonesia. Source: Climate Action Tracker (Fekete et al. 2013)

South Korea

Currently implemented policies are expected to lead to emission levels of 589 to 603 MtCO2e in 2020 including emissions from LULUCF in South Korea (See Figure 4). The main policies included in the current trend for South Korea are policies under the Green Growth Strategy, such as the Target Management Scheme, a preparation for a national ETS, a Renewable Portfolio Standard, and a programme to support renewable energy installations in the residential sector.

The calculation of current policy emissions projections starts with the reference scenario and then applies the tools introduced in section "**Tools to quickly assess potential mitigation impacts of policies**" for the trading scheme (using the ETS tool) and the Renewable Portfolio Standard (for both using renewable energy targets tool). For the renewable energy programme in the residential sector, a different approach is taken: The CAT assumes that the use of renewable energy in households will lead to a reduction of electricity demand. The policy thus goes into the calculations similarly to an efficiency improvement, reducing emissions in the power sector. This way it is completely additional to the Renewable Portfolio Standard.

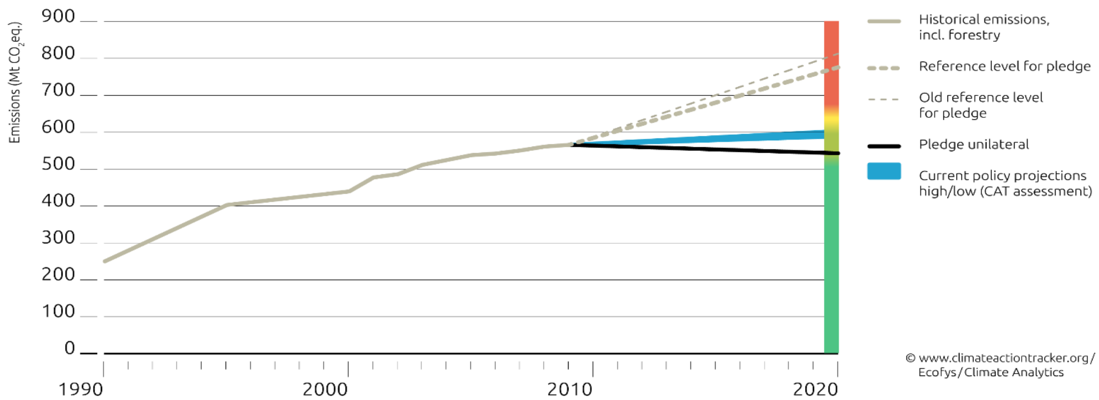

Figure 4. Emission projections for South Korea. Source: Climate Action Tracker (Fekete et al. 2013)

Conclusions

Strengths and Weaknesses of the Approach

The methods introduced here include various advantages and challenges: On the one hand, they provide sufficient flexibility to achieve a result even under limited data availability and time pressure. Depending on time, data and budgets available, approaches can be more or less detailed, while still providing a robust and transparent framework for the analysis. The flexibility of the approach also accommodates individual country circumstances. The similar approach to all countries still allows comparability. Furthermore, the calculations are simple and can easily be traced back. As the analysis focuses on remaining emissions rather than emission reductions from individual policies, it provides a bigger picture of most likely emission developments. Besides the most recent policies, this considers other factors, such as recent economic developments.

On the other hand, the approaches are no replacement for in-depth modelling or in-country expertise on the complex effects of policies and interactions with other areas of society. Also, limited data availability is a reoccurring methodological challenge. It is not necessarily visible at first sight: one solid line in the country figure may imply a robust result in comparison to a range, but may as well result from limited or flawed data sources. Clear documentation and careful interpretation of results is thus necessary to draw solid conclusions.

Opportunities for Application of the Approach

The CAT, and similarly (Roelfsema et al. 2013a) as one part of their analysis, use the approach to compare current trends to 2020 emission reduction pledges. An extension beyond 2020 to future contributions under the new climate agreement is possible. In this context, the approach could be relevant also to quantify the contributions in the first place: It is possible that those contributions will include or consist of individual actions rather than economy-wide emission reduction targets in many cases (Höhne et al. 2014).

Other areas to use this approach are situations requiring an ad-hoc evaluation of individual policies' impact on emissions. Also, the adaption of the approach to match other types of institutions is possible, for example, groups of countries, international sectors, or companies.

The approach thus provides very flexible tools to project emissions in situations with limited time and/or budget. A transparent illustration of the methods and limitations of those is essential to produce credible results.

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