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D6.3 REPORT CONTAINING AN ECONOMIC ANALYSIS OF A SET OF SUPPORTIVE POLICIES

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[1] The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission

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6.3.1 – Introduction

The scope of this exercise is to demonstrate the improved suitability of the models that participate in ADVANCE project for the assessment of climate and energy policies. The selected set of WP6 scenarios are highly relevant to the current policy debate and are a direct follow-up of the Paris COP21 agreement by providing a first multi-model assessment of the implications of the recent agreement. Moreover, the scenarios will attempt to highlight the relevant area of application and the value added of each improved model by assessing a variety of policy impacts. In order to achieve utmost efficiency, the policy scenarios to be analyzed under WP6 and Task1.4 will be combined.

Pre-COP21 international climate framework

Climate change is one of the most critical challenges humanity has to face, affecting all aspects of our planetary life. The United Nations Framework Convention on Climate Change (UNFCCC) Treaty initiated in Rio in 1992 in order to achieve a collective agreement for global action against climate change. Although this collective effort for common action started as early as 1995 with the first Conference of the Parties (COP), progress towards global action has been slow and the results mixed for the following two decades. The publication of integrated analyses of the costs of climate change and inaction (e.g. Ciscar et al. (2014), Stern (2006), OECD (2015), Burke et al. (2015), IPCC (2007), World Bank (2012) and more) highlighted profoundly the need to find common solutions to combat climate change among the global community.

Article 2 of the (UNFCCC 1992[2]) states the objective of "*stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner*". This level was for the first time included in a political declaration which was made by the European Council of environment ministers in 1996, stating that 2°C is the target ceiling for the EU, as the risk of severe climate change impacts would increase markedly beyond a global average temperature rise of 2°C above pre-industrial levels. Although the origins of this long-term target are under debate (for example see Cointe et al. (2011), Tol (2007), Knutti et al. (2016), Smith et al. (2009), Jaeger and Jaeger (2010), Knopf et al. (2012)), the target is conceived for decades by the majority of the scientific and political community as the common direction of climate policy, and is linked with the scientific consensus stated in the second Assessment Report from the Intergovernmental Panel on Climate Change (IPCC 1995[3]). However, UNFCCC parties succeeded in agreeing to this long-term goal only years later in Copenhagen and Cancun in 2009 and 2010, respectively.

The world's first greenhouse gas emission reduction Treaty was agreed in COP3 in December 1997 in Kyoto, while COP7, which agreed on the Marrakesh Accords in 2001, puts the foundations for the ratification of the Kyoto protocol in 2005. A critical point of the Kyoto Protocol was the separation of countries into Annex I Parties (mainly industrialized economies and economies in transition) and non-Annex I Parties (low- and middle-income countries). In the following decades the share of Annex I emissions declined, while those of non-Annex I Parties

[2] https://unfccc.int/resource/docs/convkp/conveng.pdf
[3] https://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf

increased, with China becoming the largest emitter by 2007. Efforts to intensify global action and to include all major emitters in the international agreement were unsuccessful in COP15 in Copenhagen in 2009, but resulted in the Copenhagen Accords, i.e. in country-level emission reductions pledges for 2020. Later in COP17 in Durban in 2011, governments committed to relaunch efforts and reach a new climate change agreement by 2015 for the period beyond Kyoto, i.e. post-2020. This aim was reaffirmed in COP18 in Doha, 2012, where the life of the Kyoto protocol was also officially extended to 2020. COP19 in Warsaw and COP20 in Lima, in 2013 and 2014, respectively, did not result in much progress but in December 2015, just at the end of the timeframe set in Durban, COP21 in Paris produced the next climate treaty to be ratified by April 2016 once 55 parties have signed.

The COP21 Paris Agreement

The Paris Agreement is a milestone in global and international climate policy. Compared to previous COP agreements, such as the Kyoto Protocol in 1997, the bottom-up approach to climate change mitigation (originally introduced in Durban) was a fundamental shift in the nature of the policy process. In the run-up to COP21, a large majority of countries have submitted climate action plans labelled Intended Nationally Determined Contributions (INDCs)[4]. The greenhouse gas emissions of the countries that have communicated INDCs represent over 95% of global emissions in 2010, a much broader coverage compared to the earlier Kyoto Protocol. Similarly, the emitting sectors covered by the submitted INDCs are broad, largely including the emissions attributed to Land Use, Land Use Change and Forestry. Thus most INDCs are economy-wide and cover the most important greenhouse gases.

An important element of the Paris Agreement is that it sets a transparent and common framework for the monitoring of targets and the reporting and verification of greenhouse gas (GHG) emissions. It further states the continuation of support for climate action and adaptation from developed to developing countries, and specifically reaffirms the collective, non-legally binding, quantified goal of mobilizing at least USD 100 billion per year from 2020 to 2025 for this aim, and sees the establishment of a new collective quantified goal of financing by 2025. The Agreement acknowledges policy tools for capacity building, accountability, loss and damage and allows for a voluntary trade of emission reductions between parties. Additionally, the Agreement foresees a facilitative dialogue, starting in 2018 and repeating every five years, in order to take stock of the collective efforts and progress of the parties in relation to the long-term goal.

Furthermore, the outcome of COP21 supersedes the long-term target agreed in Copenhagen and Cancun by setting the global aim to limit the increase in global average temperature to 1.5°C by the end of the century. As mentioned in the previous section, the 2°C target has been subject to debate but remained the benchmark in the policy context for decades. To this end, the Paris Agreement sets more ambitious targets to sustain safe planetary boundaries, while the 2°C is seen in the Agreement as the minimum safety long-term goal for planetary stability. This achievement poses new challenges for the scientific community and the society as a whole.

The Paris Agreement, however, fails to introduce concrete steps for the transformation towards a low-carbon economy and a zero-carbon energy system that could ensure the achievement of the long-term mitigation goal of 1.5-2°C. While the long-term target is acknowledged and accepted, emission trajectories resulting from the Agreement will only be assessed in relation to

[4] http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx

the target in later years (2018 and 2023). Concrete measures are foreseen only to the extent that they are included in the submitted INDCs; hence an early assessment of the effectiveness of the INDCs is a key scientific contribution to the global mitigation effort. Aggregating all regional mitigation efforts as described in the INDCs may result in a range of emission trajectories up to 2030 that will determine GHG concentrations of the century. Among other factors, the range of emission trajectories resulting from the INDCs depends highly on the attainment of adequate and safe financing flows that will determine the level of emission reductions undertaken by low-income countries. Similarly the level of implementation of INDCs is not mandated by the Paris Agreement but by national policies, allowing for uncertainties over the overall global emission reductions. Although the Paris Agreement sets the legal requirement to the Parties to legislate sufficient national measures, the INDCs are not themselves legally binding as international law. As is stated in Averchenkova and Bassi (2016), the Paris Agreement does not foresee penalties or sanctions for non-compliance, "without credible policy implementation, the collective trust needed to support the Paris Agreement's system of reporting and review will not be built".

Prior to COP21, a number of analyses have been published in order to facilitate an informative dialogue among the parties. Labat et al. (2015) provide an early quantified scientific input for the COP21 procedures on the costs of a 2°C-compliant global fragmented action. Spencer et al. 2015, provide a country-level assessment of the implementation of INDCs for major emitters and the corresponding impacts on the energy by utilizing region-specific models. IEA (2015) describes the evolution of the energy system as a consequence of the implementation of the INDCs that were submitted up to May 2015 and provides a suggested emission path and course of action in order to bridge the gap and reach the long-term 2°C target as well as the cost-optimal 2°C emission path from 2020 to 2100. UNEP (2015) combines early-published global analyses of INDCs and assesses the emission gap from a cost-efficient 2°C scenario, while providing policy suggestions on how to bridge this gap. The UNFCCC (2015) itself published a Synthesis Report in October 2015, assessing the emission trajectories resulting from the submitted INDCs and concludes that the commitments are not sufficient for the achievement of the 2°C target. Following the Paris Agreement, the UNFCCC (2016) updated the Synthesis report on the effect of the intended nationally determined contributions published in May 2016, including more INDC submissions. The report projects that GHG emission levels resulting from the implementation of INDCs in 2030 will be 24-60% higher than the optimal 2°C emission trajectories and thus urges for more ambitious commitments in the forthcoming submissions of intended reductions.

The current report attempts a first multi-model analysis of the Paris Agreement by assessing the global emission trajectories and energy system impacts from the implementation of INDCs and comparing them with the cost-efficient 2 and 1.5 °C pathways.

6.3.2 - Methodology

Literature Review

This report attempts a first multi-model assessment of the impacts of the COP21 Paris Agreement by deploying state-of-the-art integrated assessment, bottom-up energy system and general equilibrium models. More specifically, it is a model-based analysis of the implications of INDCs on emission trajectories, energy system and the economy, focusing in year 2030, which is the most commonly shared target year[5]. The assessment is based on emission pathways that are linked to the Paris Agreement along with cost-efficient 2°C and 1.5°C pathways, and thus examines the gap between INDC-related emission levels and the levels consistent with the abovementioned temperature limits. Comparability and equity considerations of the suggested burden sharing of the global mitigation effort are out of the scope of this analysis, as well as the legal implications of the agreement.

The assessment of global climate policy agreements and the parallel development of the scientific community of Integrated Assessment Models (IAMs) has been a key tool for policy support and an important field of analysis in contemporary environmental sciences.

A first comprehensive report including a set of analyses of the economic and energy sector impacts of the Kyoto protocol was published in the special issue of the Energy Journal (Weyant et al (1999)). The set-up is to some extent similar to this report as different model types and methodologies contribute to the special issue, e.g. computable general equilibrium models and energy-economy hybrid or macroeconometric models. However, each paper is a stand-alone analysis that uses a single model (e.g. MERGE, MIT-EPPA, RICE, SGM, FUND, WorldScan, AIM, Oxford and others) and although the subject of the analysis is common, basic assumptions, methodologies and output categories are not harmonized.

Similarly the emission reduction pledges of the Copenhagen Accord have been assessed for their environmental effectiveness in many reports and academic papers. Examples of single model analyses include UNEP (2010), UNFCCC (2010) and Stern and Taylor (2010), all of which assess the level of compatibility of the Copenhagen global GHG emission paths with a 2°C path. Economic and energy-system impacts have also been assessed explicitly for the Copenhagen Pledges. For example, Ricci and Selosse (2013) assess energy system costs and other abatement costs with a partial equilibrium energy-system bottom-up model while van Vliet et al. (2012) and den Elzen et al. (2010) utilize an integrated assessment model. Saveyn et al. (2011), Peterson et al. (2011) and Dellink et al. (2011) assess the overall economic impacts of the global climate policy with a general equilibrium model.

In Kriegler et al. (2013), the multi-model analysis provides input for the Durban platform negotiations by setting the Copenhagen pledges as a starting point for the exploration of cost-effective emission paths that are consistent with the 2°C goal. Their methodology deploys various integrated assessment models but instead of harmonizing key model assumptions, “a spread in GDP and population assumptions of participating models” is seen as desirable in order “to explore the effect of uncertainty about those assumptions”. However, this sensitivity-type of analysis is not conducted by one model as is the common approach but is the result of different

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[5] The USA, Brazil, Ecuador and other small emitters (e.g. Grenada, Marshall Islands) have indicated year 2025 as a target year for their emission reductions in the corresponding INDC.

assumptions across the participating models. Similarly and alongside the development of the IAMs scientific community, Riahi et al. (2015) give insight on the level of emission reductions that would be required following the Copenhagen pledges in order to keep track with the goal of 2°C by utilizing a set of IAMs. In this paper, however, all participating models share common key macroeconomic assumptions (GDP, population) as well as global energy intensity growth rates and analyze the same set of policy scenarios in order to enable a more robust description of varying results.

The methodology followed in this paper features a thorough harmonization of the scenario assumptions that can provide a common ground for the assessment of impacts of the examined policies by different models. Assumptions are harmonized not only for the main socio-economic indicators (GDP, population) but also for a bottom-up set of regional climate and energy policies for the short to medium-term as well as for regional emission intensity growth rates for the longer term. This demanding harmonization process among such a large group of different models goes beyond the practice followed among else in the studies referred in this section, and contrary to the argument that "such a harmonization might bring only limited benefits but could be time-intensive and absorb substantial capacities" (Loeschel et al. 2012). It is deemed pivotal in order to allow for a consistent discussion and comparison of different model results with the aim to contribute to the decision-making process. Results can further be assimilated robustly and depict the underlying uncertainties that are both inherent to modelling methods and to the real-world implementation of policies.

This harmonization process is a step for an ever-deepening integration when multiple models are used to analyze international climate policies in the context of policy support. Furthermore, this study does not only report common variables from all participating models but also allows the assessment of additional, model-specific variables and impacts. This approach combines the model comparison literature with institutional publications such as the European Commission's Impact Assessments that typically deal with a wide range of economic, social and environmental impacts. Impact Assessments have been published both for international climate negotiations, as for COP15 (EC 2009, 2010) and COP21 (EC, 2015), as well as for domestic policy support such as for the 2020 Climate and Energy Package (EC, 2008), the 2030 Climate and Energy Framework (EC, 2014) and the 2050 Low-Carbon Roadmap (EC, 2011). All these Impact Assessments use state-of-the-art scientific models that feature highly harmonized socioeconomic and technology assumptions. A similar approach is also followed by the US Environmental Protection Agency, like for example in EPA (2013) and EPA (2009).

Lastly, a further distinctive feature of this report is the assessment of the emissions gap in 2030 for the 1.5°C long-term target along with the customary assessment of the consistency with the 2°C pathway, which is mandated by the outcome of the Paris Agreement and forms the current challenge for the scientific community.

Overall, the break-through type of analysis of this report lies in the combination of different models that have fully harmonized their socioeconomic assumptions and other key variables, and assess the same real-world scenarios having fully implemented the pre-COP21 policies and taking as a starting point of analysis the Paris Agreement on a regional basis.

Scenario design

A consolidated set of policy scenarios enables the assessment of the Paris Agreement in terms of mitigation effectiveness and system transition. A brief description of the 4 scenarios presented in this analysis is found in Table 6.3.1 and the sections below.

Table 6.3.1: Brief description of scenarios

Scenario name	Description	Long-term Temperature target
Reference	2020 Cancun pledges / low ambition post-2020 reductions	No
INDC	2020 Cancun pledges / 2030 INDCs / post-2030 fragmented emission reductions of the 2020-2030 intensity	No
2°C	2020 Cancun pledges / post-2020 global action to a 1000 Gt CO_2 carbon budget	2°C
1.5°C	2020 Cancun pledges / post-2020 global action to a 400 Gt CO_2 carbon budget	1.5°C

Reference scenario

The Reference scenario describes the trajectory of key economic, environmental and energy figures under existing, pre-COP21 climate policies. It follows a low ambition mitigation effort that is highly diverse and fragmented across countries. In the post-2020 period it further assumes a continuation of low ambition climate policies, taking stock of the Reference trajectories in Labat et al. (2015).

The building process of a current policies Reference scenario is based on deriving data from many different sources (e.g. UN, OECD, EIA, European Commission, and UNFCCC) and aims for maximum consistency with related projections of international and national institutions. The socioeconomic assumptions of this scenario build upon two main sources in terms of economic growth rates and population assumptions, namely the global Reference scenario as described in Labat et al. (2015) and the SSP2[6] scenario. Harmonization with the above assumptions ensures consistency with the EU28's energy and GHG emissions trends as described in EC (2013) and with international publications like the UN (2013).

[6] http://www.iiasa.ac.at/web/home/research/researchPrograms/Energy/SSP_Scenario_Database.html

INDC scenario

The **INDC** scenario increases efforts after 2020 so as to achieve full implementation of the conditional (high) pledges submitted in COP21 in Paris. This scenario further assumes that the regional mitigation effort in the period beyond the Paris Agreement time-frame will continue equal to the effort of moving from the Cancun to Paris emission levels, i.e. regional emission intensity reduction rates in the post-2030 period are equal to those of the 2020-2030 period. In line with the assumed fragmented mitigation action, it is further ensured that carbon prices of low/lower-middle income[7] countries do not exceed 25%/40% of the average OECD carbon price. This model restriction ensures that emission reductions will come as a result of plausible policy instruments that by also consider the developmental angle, but restricts the cost-effectiveness of results.

As regions have chosen to submit their INDCs in different formats (e.g. relative to different base years, relative to a baseline scenario or as carbon intensity improvements), a key feature of our analysis is the harmonized quantification of INDCs. For each country that represents more than 0.1% of global emissions in 2010, INDCs have been expressed as emission reductions relative to 2010 levels (see Table 6.3.5).

[7]According to the World Bank for the current 2016 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the *World Bank Atlas* method, of $1,045 or less in 2014; middle-income economies are those with a GNI per capita of more than $1,045 but less than $12,736; high-income economies are those with a GNI per capita of $12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4,125. No change of this classification is assumed until 2050.

2°C and 1.5°C scenarios

A set of stylized carbon-budget scenarios enables the comparison of INDC and climate stabilization scenarios. These emission pathways ensure a high probability (above 66%) of achieving a maximum global average temperature increase of 2°C (**2°C scenario**) and 1.5°C (**1.5°C scenario**) by 2100. Cost-effective, global, deep-decarbonization action is enabled through immediate reductions (from 2020) and a single carbon price in all countries that limit cumulative CO_2 emissions to 1000 $GtCO_2$ and 400 $GtCO_2$ respectively in the period 2011-2100.

Scenario Protocol

A summary of the general specifications is given below:

- Time horizon: 2005-2050, 10 year intervals and optional 5 year intervals (the analysis will focus on 2030 and 2005-2050, but models with longer time horizons are encouraged to submit data out to 2100)

- Regions: There are two sets of common comparison regions for the WP6 scenarios:
  - an indicative mapping with the 5 RCP regions and the 10 key regions as defined for the LIMITS project (AFRICA, CHINA+, EUROPE, INDIA+, LATIN_AM, MIDDLE_EAST, NORTH_AM, PAC_OECD, REF_ECON, REST_ASIA, REST_WORLD)
  - In addition, major economies are reported separately and in particular:
    - World, EU28, Brazil, Japan, Russia, China, India, USA, Indonesia, Canada, Mexico, Australia, South Korea (Republic of Korea), Middle_East and Africa
- Population projections according to SSP2
- GDP projections according to SSP2 or according to GECO+[8].

Carbon price ceiling: If the carbon value of low-income and lower-middle income[9] countries exceeds 25% of the GDP-weighted carbon price average of the OECD countries then the emission reduction constraint should be relaxed so as to get a carbon value of around 25% of the carbon price average of the OECD countries in lower-income country, or 40% in the case of lower-middle income countries. For macro-regions grouping countries of different income levels, this rule should be applied based on the majority of the population represented. Teams may exclude outlier OECD countries from the calculation of the average carbon price.

[8] https://ec.europa.eu/jrc/en/news/geco-road-paris-study-published

[9] According to the World Bank for the current 2016 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the *World Bank Atlas* method, of $1,045 or less in 2014; middle-income economies are those with a GNI per capita of more than $1,045 but less than $12,736; high-income economies are those with a GNI per capita of $12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4,125. ADVANCE WP6 does not use GNI but GDP levels, hence teams can identify low-income and lower-middle income countries in the relevant table of World Bank and assume no change of this classification until 2050.

Detailed specification of the Reference policy scenario

Implementation of Policies to 2020:

- Teams implement the technology and emissions targets described in Table 6.3.2 and Table 6.3.3. Higher priority is given to the emission targets.
- No emissions constraints should be implemented for regions that do not have any specific target on emissions.

Table 6.3.2: Emission reduction targets in 2020 for all scenarios

Country	Metric	Sectoral coverage	Base Year	2020 target
Antigua & Barbuda	All GHGs	All	1990	-25%
Australia	All GHGs	All	2000	-5%
Belarus	All GHGs	All	1990	-5%
Brazil	All GHGs	All	BAU 2020	-36%
Canada	All GHGs	All	2005	-17%
China	CO2 intensity of GDP	All excl LULUCF	2005	-40%
EU	All GHGs	All excl LULUCF	1990	-20%
EU	All GHGs	ETS	2005	-21%
Iceland	All GHGs	All	1990	-30%
India	GHG intensity of GDP	All	2005	-20%
Indonesia	All GHGs	All	BAU 2020	-26%
Israel	All GHGs	All	BAU 2020	-20%
Japan	All GHGs	All	1990	-25%
Kazakhstan	All GHGs	All	1992	-15%
Liechtenstein	All GHGs	All	1990	-20%
Maldives	All GHGs	All	2010	-100%
Marshall Islands	All GHGs	All	2009	-40%
Mexico	All GHGs	All	BAU 2020	-30%
Moldova	All GHGs	All	1990	-25%
Monaco	All GHGs	All	1990	-30%
New Zealand	All GHGs	All	1990	-10%
Norway	All GHGs	All	1990	-30%
Russia	All GHGs	All	1990	-15%
Singapore	All GHGs	All	BAU 2020	-5%
South Africa	All GHGs	All	BAU 2020	-34%
South Korea	All GHGs	All	BAU 2020	-30%
Switzerland	All GHGs	All	1990	-20%
Ukraine	All GHGs	All	1990	-20%
USA	All GHGs	All	2005	-17%

Table 6.3.3: Energy related policies and targets in 2020 for all scenarios

Country	Technology	objective	target year
Australia	Renewable energy in electricity	Share in power generation 20%	2020
Brazil	Capacity targets per technology	Installed capacity targets for renewable energies have been fixed as follows: Hydro: from 83.1 GW in 2010 to 116.7 GW by 2019. Small hydro: from 4 GW in 2010 to 7 GW by 2019. Biomass: from 5.4 GW bin 2010 to 8.5 GW by 2019. Wind: 1.4 in 2010 to 6 GW by 2019	2019
China	Non-fossil	Share in primary demand 15%	2020
China	Capacity targets per technology	Wind: 100 GW capacity (grid connected, 5GW off shore) Solar PV: 10GW Hydro: 270 GW	2015
China	Capacity targets per technology	200 GW wind 80-86 GW nuclear	2020
EU	Renewables	Share of gross final demand 20%	2020
EU	Renewable fuels	Share in transport demand 10%	2020
EU	Private vehicles emissions	Emissions, in g/km 95	2020
Egypt	Renewables	Share in power generation 20% (12% wind, 6% hydro, 2 % other RE in electricity)	2020
India	Renewable generation	Share in total capacity 9%	2018
India	Capacity targets per technology	Total grid interactive renewable 74 GW corresponding to 5% in electricity 40 GW wind, 6.5 GW small hydro, 7.5 GW bio-power, 20 GW solar	2022
Indonesia	Renewables	Share in power generation 15%	2025
Japan	Renewables	Share in total national energy supply 10%	2020
Japan	Capacity targets per technology	Wind (38 GW), Solar (20 GW), Solar thermal (14 GW)	2022
S.Korea	Renewables	Share in primary demand 6%	2020
S.Korea	Capacity targets per technology	Cumulative wind capacity 15.7 GW	2022
S.Korea	Renewables	Share in primary demand	2030
Morocco	Renewables	Share in total electricity capacity 42%	2020
Libya	Renewables	Share in power generation 10%	2020
Algeria	Renewables	Share in power generation 20%	2030
Mexico	Non-fossil	Share in power generation 35%	2026
Russia	Renewables	Share in power generation 5%	2020
South Africa	Renewables	Share in power generation 10%	2030
SubSaharan Africa	Renewables	Share in primary demand 20%	2020
Turkey	Renewables	Share in power generation 30%	2023-2030
Turkey	Capacity targets per technology	20 GW Wind, 10 GW nuclear 20% saving of national energy bill	2023
USA	Renewables	Share in power generation 14%	2020
USA	Private vehicles emissions	Consumption, miles/gal 55	2020

Implementation of Policies Post-2020:

- Models implement the emission intensity improvements that appear in Table 6.3.4 for the periods of 2020-2030 and 2030-2050.
  - In case the region provided is a sub-region of a model region, aggregation of targets is calculated by summing the GDP of all sub-regions and the emissions of all sub-regions' post-2020, so as to calculate the emission intensity of the model region.
  - In case the region provided is an aggregate of model regions, then each model region should implement the emission intensity reduction rate of the bigger aggregate region.
- Harmonization of emission intensity growth rates has different tiers:
  - Average growth rates of Emissions intensity|Kyoto excl. Land Use for the two specified periods (2020-2030, 2030-2050) are of high priority and should not deviate more than ±5% of the specified values,
  - Average growth rates of Emissions intensity|CO2|Fossil Fuels and Industry for the two specified periods (2020-2030, 2030-2050) should not deviate more than ±10% of the specified values,
  - Emissions intensity|Kyoto gases may differ depending on the model coverage on Land use emissions.
- If the carbon value that corresponds to the prescribed Reference emission reduction of low-income and lower-middle income[10] countries exceeds 25% of the EU carbon price then the emission reduction constraint should be relaxed so as to lower the carbon value to the prescribed level of 25% of the EU price.

[10] According to the World Bank for the current 2016 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the *World Bank Atlas* method, of $1,045 or less in 2014; middle-income economies are those with a GNI per capita of more than $1,045 but less than $12,736; high-income economies are those with a GNI per capita of $12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4,125. ADVANCE WP6 does not use GNI but GDP levels, hence teams can identify low-income and lower-middle income countries in the relevant table of World Bank and assume no change of this classification until 2050.

Table 6.3.4: Post-2020 emission and emission intensity growth rates for Reference scenario

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
EU-28	Emissions|Kyoto gases	Mt CO2	-0.8%	-1.3%	-1.2%	-0.5%
EU-28	Emissions|CO2	Mt CO2	-0.7%	-1.3%	-1.1%	-0.6%
EU-28	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.3%	-2.3%	-2.6%	-2.0%
EU-28	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-2.1%	-2.3%	-2.5%	-2.2%
EU-28	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.2%	-2.4%	-2.6%	-2.1%
Argentina	Emissions|Kyoto gases	Mt CO2	0.9%	-0.5%	-0.5%	0.2%
Argentina	Emissions|CO2	Mt CO2	1.3%	-0.7%	-1.0%	0.1%
Argentina	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.8%	-1.8%	-2.2%	-2.1%
Argentina	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.4%	-1.7%	-2.4%	-1.7%
Argentina	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.4%	-1.6%	-1.9%	-1.8%
Australia	Emissions|Kyoto gases	Mt CO2	1.2%	0.1%	0.4%	0.1%
Australia	Emissions|CO2	Mt CO2	1.5%	0.4%	0.5%	0.0%
Australia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.8%	-2.7%	-2.2%	-2.0%
Australia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.5%	-2.9%	-2.5%	-1.7%
Australia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.9%	-3.1%	-2.4%	-1.7%
Brazil	Emissions|Kyoto gases	Mt CO2	-4.7%	-0.5%	0.5%	0.4%
Brazil	Emissions|CO2	Mt CO2	-7.4%	-1.4%	0.1%	0.5%
Brazil	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-8.1%	-2.0%	-2.3%	-2.0%
Brazil	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-0.3%	-1.6%	-0.9%
Brazil	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.9%	-0.6%	-1.8%	-1.4%
Canada	Emissions|Kyoto gases	Mt CO2	1.3%	0.4%	-0.9%	0.4%
Canada	Emissions|CO2	Mt CO2	1.8%	0.9%	-1.2%	0.4%
Canada	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-0.6%	-1.5%	-2.8%	-1.5%
Canada	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-2.1%	-1.3%	-1.9%	-1.3%
Canada	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.2%	-1.8%	-1.9%	-1.3%
Chile	Emissions|Kyoto gases	Mt CO2	3.1%	2.4%	1.7%	0.3%
Chile	Emissions|CO2	Mt CO2	4.1%	2.9%	1.8%	0.3%
Chile	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-0.7%	-1.4%	-1.3%	-1.4%
Chile	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.1%	-0.6%	-1.0%	-1.1%
Chile	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.6%	-1.1%	-1.1%	-1.1%
China	Emissions|Kyoto gases	Mt CO2	8.9%	3.0%	1.3%	-0.1%
China	Emissions|CO2	Mt CO2	10.3%	3.7%	1.5%	-0.2%
China	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.2%	-3.7%	-3.6%	-2.8%
China	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.5%	-3.1%	-3.6%	-2.8%
China	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.6%	-3.7%	-3.7%	-2.7%
Egypt	Emissions|Kyoto gases	Mt CO2	5.0%	1.5%	1.8%	2.4%
Egypt	Emissions|CO2	Mt CO2	5.8%	1.8%	1.8%	2.7%
Egypt	Emissions intensity|Kyoto gases	t CO2/MUS$2005	0.1%	-2.0%	-3.3%	-2.0%
Egypt	Emissions intensity|CO2|Fossil Fuels and	billion US$2005	0.9%	-1.7%	-3.3%	-1.7%

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
	Industry					
Egypt	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.1%	-2.0%	-3.4%	-2.0%
Indonesia	Emissions|Kyoto gases	Mt CO2	3.8%	0.8%	0.6%	0.4%
Indonesia	Emissions|CO2	Mt CO2	4.1%	0.7%	0.5%	0.4%
Indonesia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.3%	-4.8%	-4.4%	-3.3%
Indonesia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-3.4%	-3.5%	-2.7%
Indonesia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.7%	-3.7%	-3.7%	-2.8%
India	Emissions|Kyoto gases	Mt CO2	4.0%	3.9%	3.8%	1.5%
India	Emissions|CO2	Mt CO2	5.7%	5.0%	4.5%	1.7%
India	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-3.3%	-2.7%	-2.7%	-2.9%
India	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.5%	-2.0%	-2.2%	-2.8%
India	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-3.1%	-2.9%	-2.8%	-2.9%
Iran	Emissions|Kyoto gases	Mt CO2	4.1%	0.6%	1.4%	1.1%
Iran	Emissions|CO2	Mt CO2	4.4%	1.0%	1.1%	1.1%
Iran	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.1%	0.0%	-2.0%	-2.3%
Iran	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.8%	0.4%	-2.2%	-2.2%
Iran	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.1%	0.0%	-2.0%	-2.2%
Japan	Emissions|Kyoto gases	Mt CO2	-0.6%	-0.7%	0.0%	-0.7%
Japan	Emissions|CO2	Mt CO2	-0.3%	-0.8%	0.0%	-0.7%
Japan	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.3%	-1.5%	-0.8%	-1.6%
Japan	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-1.8%	-1.4%	-1.6%
Japan	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.4%	-1.7%	-1.4%	-1.6%
South Korea	Emissions|Kyoto gases	Mt CO2	2.0%	0.8%	0.4%	-0.6%
South Korea	Emissions|CO2	Mt CO2	2.4%	0.9%	0.4%	-0.7%
South Korea	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.0%	-2.4%	-2.4%	-1.7%
South Korea	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.7%	-2.5%	-2.6%	-1.7%
South Korea	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.0%	-2.5%	-2.6%	-1.7%
Mexico	Emissions|Kyoto gases	Mt CO2	2.2%	1.0%	1.3%	0.5%
Mexico	Emissions|CO2	Mt CO2	1.8%	1.7%	1.2%	0.4%
Mexico	Emissions intensity|Kyoto gases	t CO2/MUS$2005	0.4%	-2.4%	-2.2%	-2.4%
Mexico	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	0.2%	-1.9%	-2.1%	-2.1%
Mexico	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.5%	-2.5%	-2.1%	-2.1%
Norway	Emissions|Kyoto gases	Mt CO2	-0.7%	2.2%	0.7%	-0.1%
Norway	Emissions|CO2	Mt CO2	1.6%	3.8%	1.4%	-0.4%
Norway	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.1%	0.3%	-1.2%	-1.7%
Norway	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.2%	-1.1%	-0.9%	-1.3%
Norway	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.2%	-1.3%	-1.2%	-1.3%
New Zealand	Emissions|Kyoto gases	Mt CO2	0.6%	1.7%	0.7%	0.6%

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
New Zealand	Emissions|CO2	Mt CO2		19.6%	1.8%	1.0%
New Zealand	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.7%	-0.8%	-1.5%	-1.3%
New Zealand	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.9%	-2.7%	-2.0%	-1.3%
New Zealand	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.0%	-2.4%	-1.8%	-1.4%
Russia	Emissions|Kyoto gases	Mt CO2	0.2%	-0.1%	2.1%	0.6%
Russia	Emissions|CO2	Mt CO2	-0.3%	0.8%	2.2%	0.7%
Russia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-4.4%	-1.3%	0.1%	-0.1%
Russia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-3.8%	-1.7%	-1.5%	-1.0%
Russia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-3.8%	-2.1%	-1.1%	-0.8%
Saudi Arabia	Emissions|Kyoto gases	Mt CO2	5.6%	1.9%	1.5%	0.4%
Saudi Arabia	Emissions|CO2	Mt CO2	5.9%	2.2%	1.3%	0.4%
Saudi Arabia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	0.2%	-1.8%	-1.8%	-1.8%
Saudi Arabia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	0.5%	-1.6%	-1.9%	-1.8%
Saudi Arabia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.2%	-1.8%	-1.7%	-1.7%
Thailand	Emissions|Kyoto gases	Mt CO2	2.6%	2.0%	1.5%	0.7%
Thailand	Emissions|CO2	Mt CO2	3.0%	2.7%	1.6%	0.7%
Thailand	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.7%	-1.3%	-2.4%	-2.1%
Thailand	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.6%	-0.7%	-2.3%	-2.1%
Thailand	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.2%	-1.3%	-2.5%	-2.1%
Turkey	Emissions|Kyoto gases	Mt CO2	2.8%	3.0%	1.7%	0.6%
Turkey	Emissions|CO2	Mt CO2	3.7%	3.5%	2.1%	0.5%
Turkey	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.0%	-0.8%	-1.7%	-1.7%
Turkey	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.6%	-1.2%	-1.7%	-1.7%
Turkey	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.2%	-1.4%	-2.0%	-1.7%
Ukraine	Emissions|Kyoto gases	Mt CO2	-0.7%	-0.1%	-0.6%	0.7%
Ukraine	Emissions|CO2	Mt CO2	-0.1%	0.3%	-0.8%	1.0%
Ukraine	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-4.8%	-1.4%	-3.9%	-2.1%
Ukraine	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-4.6%	-1.5%	-4.2%	-2.0%
Ukraine	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-5.0%	-1.7%	-4.0%	-2.2%
United States	Emissions|Kyoto gases	Mt CO2	-0.8%	-0.5%	-0.9%	0.4%
United States	Emissions|CO2	Mt CO2	-1.0%	-0.4%	-1.0%	0.4%
United States	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.4%	-2.8%	-2.8%	-1.2%
United States	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-2.0%	-2.8%	-3.1%	-1.4%
United States	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.9%	-2.9%	-3.0%	-1.3%
Vietnam	Emissions|Kyoto gases	Mt CO2	10.7%	3.2%	2.0%	1.3%

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
Vietnam	Emissions|CO2	Mt CO2	33.6%	4.9%	2.8%	1.6%
Vietnam	Emissions intensity|Kyoto gases	t CO2/MUS$2005	3.9%	-2.5%	-3.3%	-2.6%
Vietnam	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	4.4%	-1.4%	-2.8%	-2.4%
Vietnam	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.7%	-2.8%	-3.4%	-2.7%
South Africa	Emissions|Kyoto gases	Mt CO2	2.0%	0.3%	1.2%	0.1%
South Africa	Emissions|CO2	Mt CO2	2.2%	0.2%	1.1%	0.0%
South Africa	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.5%	-2.2%	-2.3%	-2.6%
South Africa	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-2.6%	-2.3%	-3.0%
South Africa	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.5%	-2.5%	-2.3%	-2.8%

Further harmonization rules consist of:

- Harmonization of the rate of growth of emissions intensity should be implemented for all model regions according to the instructions above.
- As described above, population data should be taken from the SSP2 projections or from GECO2016, in line with the data source used for GDP projections.
- Aggregation/disaggregation of regions for the implementation of emission reduction targets should be applied as described above and be based on historical 2005 emission levels.

Detailed specification of the INDC policy scenario

Implementation of Policies to 2020:

The policy framework that was set in COP21 is only relevant to the post-2020 period. Up to 2020 results should be identical to those of the WP6 Reference scenario for all regions and sectors.

Implementation of Policies 2020-2030:

Teams implement the emission reduction targets as those are described in the INDCs which were submitted by each party. In addition to emission reduction targets, teams implement any other quantifiable energy or sector-related targets as those are presented in the INDCs. For those countries that have submitted two levels of INDCs, an unconditional and a conditional one, teams should introduce the conditional levels, i.e. the more ambitious, so as to provide the upper end of INDC impacts on the economy and the energy system.

All relevant policies included in the INDCs have been collected and are shown in Table 6.3.5 and Table 6.3.6 including the targets that refer to countries with >0.1% of global 2010 emissions and some countries with <0.1% of global 2010 emissions that have submitted quantifiable targets.

- For convenience and consistency among all teams, all INDC targets have been expressed in relation to 2010 emissions.
- INDCs that have a target year different from 2030 have been projected to 2030 with POLES model and have been provided both for the INDC target year and for 2030 as a target year.
- INDCs that are expressed in relation to a BAU scenario which is not explicitly provided in the INDC document have been calculated in relation to the Reference emission levels.
- No emissions constraints should be implemented for regions that do not have any specific target on emissions.
- To aggregate country-level INDC emission targets from model-specific macro-regions, teams should calculate the combined emissions index as

$$\overline{\boldsymbol{EI}}^{\boldsymbol{INDC}} = \frac{\overline{\boldsymbol{E}}_{\mathbf{2030}}^{\boldsymbol{INDC}}}{\overline{\boldsymbol{E}}_{\mathbf{2010}}} = \frac{\mathbf{1}}{\overline{\boldsymbol{E}}_{\mathbf{2010}}}\left(\sum_{\boldsymbol{i\,w/\,target}} \boldsymbol{E}_{\boldsymbol{i},\mathbf{2010}}\ \boldsymbol{EI}_{\boldsymbol{i}}^{\boldsymbol{INDC}} + \sum_{\boldsymbol{i\,w/o\,target}} \boldsymbol{E}_{\boldsymbol{i},\mathbf{2010}}\ \overline{\boldsymbol{EI}}_{\mathbf{2030}}^{\boldsymbol{BAU}}\right)$$

  where the sums run over countries *i* with and without an INCD emissions target, respectively, and $\overline{\boldsymbol{EI}}_{\mathbf{2030}}^{\boldsymbol{BAU}}$ refers to the emissions index of the macro-region observed in a no-policy baseline or in WP6 Reference scenario.

Table 6.3.5: Quantification of INDC emission reductions

Party	2010 emissions	GHG coverage	Sectoral coverage	INDC emission reduction %	INDC Refrence point	INDC rel.to 2010
Europe						
Albania	8,0	CO2	Energy, industrial processes	-12%	Emissions 2030 below BAU	-35%
EU	4421	All GHGs	All sectors	-40%	Emissions by 2030 below 1990	-28%
Iceland	5,4			-40%	Emissions 2030 below 1990	-48%
Macedonia (FYROM)	9,0	CO2	FF combustion	-36%	Emissions 2030 below BAU	26%
Norway	27,6			-40%	Emissions 2030 below 1990	-12%
Serbia	-12,8			-10%	Emissions 2030 below 1990	-10%
Switzerland	53,2	All GHGs	All sectors	-50%	Emissions 2030 below 1990	-50%
North America						
Canada	750	All GHGs	All sectors excl LULUCF	-30%	Emissions 2030 below 2005	-26%
Mexico	746	All GHGs	All sectors	-36%	Emissions 2030 below BAU	-5%
USA	5906,7	All GHGs	All sectors	-28%	Emissions 2025 below 2005	-24%
Central&South America						
Argentina	389,4	All GHGs	All sectors	-30%	Emissions 2030 below BAU	20%
Brazil	1285	All GHGs	All sectors	-37%	Emissions 2025 below 2005	-1%
Chile	84,9	All GHGs	All sectors	-45%	GHG intensity 2030 below 2007	11%
Colombia	224,0	All GHGs	All sectors	-30%	Emissions 2030 below BAU	5%
Costa Rica	5,2			-25%	Emissions 2030 below 2012	-28%
Dominican Republic	31,7			-25%	Emissions 2030 below 2010	-25%
Ecuador	136,8		Energy	45.8%	Emissions 2025 below BAU	
Grenada	1,8			-30%	Emissions 2025 below 2010	-30%
Peru	170,6	CO2, CH4, N2O	All sectors	-30%	Emissions 2030 below BAU	22%
Venezuela	200			-20%	Emissions 2030 below BAU	36%
Pacific						
Australia	574	All GHGs	All sectors	-28%	Emissions 2030 below 2005	-31%
Japan	1234,9	All GHGs	All sectors excl sinks	-26%	Emissions 2030 below 2013	-16%
Korea (Republic)	659,0	All GHGs	All sectors excl LULUCF	-37%	Emissions 2030 below BAU	-19%
Marshall Islands	7,8			-32%	Emissions 2025 below 2010	-32%

Party	2010 emissions	GHG coverage	Sectoral coverage	INDC emission reduction %	INDC Refrence point	INDC rel.to 2010
New Zealand	41,7			-30%	Emissions 2030 below 2005	-19%
Asia						
Afghanistan	30,6	CO2, CH4, N2O		-14%	Emissions 2030 below BAU	37%
Bangladesh	64,0		power, transport and industry	-15%	Emissions 2030 below BAU	209%
Cambodia	4,2		Energy related	-27%	Emissions 2030 below BAU	102%
China	9009,1	CO2		-65%	CO2 intensity 2030 vs 2005	40%
India	2647,9	All GHGs	All sectors	-35%	GHG intensity 2030 vs 2005	160%
Indonesia	1928,0	All GHGs	All sectors	-41%	Emissions 2030 below BAU	-12%
Malaysia	425,3	CO2, CH4, N2O	All sectors	-45%	GHG intensity 2030 below 2005	73%
Philippines	152,0	All GHGs	All sectors	-70%	Emissions 2030 below BAU	
Singapore	54,6			-36%	GHG intensity 2030 below 2005	39%
Thailand	355,8	All GHGs	All sectors	-25%	Emissions 2030 below BAU	17%
Vietnam	274	All GHGs	All sectors	-25%	Emissions 2030 below BAU	115%
Commonwealth of Independent States						
Azerbaijan	60,8			-35%	Emissions 2030 below 1990	-35%
Belarus	59,2			-28%	Emissions 2030 below 1990	34%
Kazakhstan	266,7	All GHGs	All sectors	-25%	Emissions 2030 below 1990	-20%
Moldova	11,6			-67%	Emissions 2030 below 1990	-67%
Russian Federation	1656,3	All GHGs	All sectors	-30%	Emissions 2030 below 1990	49%
Tajikistan	8,3			-35%	Emissions 2030 below 1990	-35%
Ukraine	350,1	All GHGs	All sectors excl LULUCF	-40%	Emissions 2030 below 1990	50%
Middle East						
Iran	683,7	All GHGs	All sectors	-12%	Emissions 2030 below BAU	6%
Iraq	227,2			-14%	Emissions 2030 below BAU	15%
Israel	86,7			26%	Emissions per capita 2030 below 2005	-6%
Lebanon	23,9			-30%	Emissions 2030 below BAU	25%
Saudi Arabia	478,3				Emissions reductions 2030 from BAU	40%
Turkey	345,6	All GHGs	All sectors	-21%	Emissions 2030 below BAU	169%
Africa						

Party	2010 emissions	GHG coverage	Sectoral coverage	INDC emission reduction %	INDC Refrence point	INDC rel.to 2010
Algeria	169,3			-22%	Emissions 2030 below BAU	
Burkina Faso	33,5	CO_2, CH_4, N_2O	All sectors	-18%	Emissions 2030 below BAU	190%
Cameroon	39,0	CO_2, CH_4, N_2O		-32%	Emissions 2035 below BAU	81%
Central African Republic	62,1			-5%	Emissions 2030 below BAU	
Congo (Dem. Rep.)	207,2	CO_2, CH_4, N_2O		-17%	Emissions 2030 below BAU	72%
Côte d'Ivoire	33,5			-28%	Emissions 2030 below BAU	54%
Equatorial Guinea	25,6			-20%	Emissions 2030 below 2010	-20%
Ethiopia	141,4			-64%	Emissions 2030 below BAU	2%
Gambia	6,9			-45%	Emissions 2035 below 2010	-45%
Ghana	56,9			-45%	Emissions 2030 below BAU	-28%
Guinea	28,4			-13%	Emissions 2030 below BAU	65%
Kenya	67,9			-30%	Emissions 2030 below BAU	48%
Madagascar	117,2			-14%	Emissions 2030 below BAU	57%
Morocco	73,2			-32%	Emissions 2030 below BAU	58%
Niger	25,2	CO_2, CH_4, N_2O	All sectors	-35%	Emissions 2030 below BAU	148%
Nigeria	350	CO_2, CH_4, N_2O	All sectors	-45%	Emissions 2030 below BAU	34%
Sao Tome and Principe	0,2			-24%	Emissions 2030 below 2005	-37%
South Africa	460,7	All GHGs	All sectors		Emissions 2030	-14%
Tanzania	100,0			-20%	Emissions 2030 below BAU	16%
Tunisia	34,8	All GHGs	All sectors	-41%	GHG intensity 2030 below 2010	22%
Zambia	121,7	CO_2, CH_4, N_2O		-47%	Emissions 2030 below 2010	-47%

Table 6.3.6: Other policies included in INDCs

Country	Target year	Policy
EU	2030	at least a 27% share of renewable energy consumption
EU	2030	at least 27% energy savings compared with the business-as-usual scenario
Brazil	2030	18% sustainable biofuels in energy mix
	2030	45% of renewables in the energy mix
	2030	use of renewable energy sources other than hydropower in the total energy mix to between 28% and 33%
	2030	share of renewables (other than hydropower) in the power supply to at least 23%
	2030	restoring and reforesting 12 million hectares of forests
	2030	restoring an additional 15 million hectares of degraded pasturelands
	2030	enhancing 5 million hectares of integrated cropland-livestock-forestry systems (ICLFS)
Chile	2030	Will recover and sustainable manage 100.000 hectares of forest, and reforest additional 100.000 hectares
Ecuador		Restore 500,000 hectares of forest by 2017 and increase this by 100,000 hectares per year until 2025
	2025	increase hydro energy capacity to 2.2GW (conditional 4.3 GW)
Japan	2030	Continuation of equivalent of KP LULUCF accounting, expected to contribute 2.6% of the 26% target
	2030	20-22% nuclear
	2030	2-24% renewables
Papua New Guinea	2030	100% Renewables in electricity
Bangladesh	2030	reduce energy intensity relative to 2013
		400MW wind
		1000MW solar
		70% of landfill gas captured and used for electricity generation
Cambodia		increase forest cover up to 60 %
China	2030	20% non-fossil fuels in primary energy consumption
	2030	increase the forest stock volume by around 4.5 billion cubic meters on the 2005 level
India	2030	40% cumulative electric power installed capacity from non-fossil fuel based energy sources
	2030	create additional carbon sink of 2.5 to 3 bn tCO2eq through additional forest and tree cover
Indonesia	2025	minimum 23% energy from renewable sources
Jordan	2025	11% renewables in "total energy mix"
Turkey	2030	Increasing capacity of production of electricity from solar power to 10 GW
Turkey	2030	Increasing capacity of production of electricity from wind power to 16 GW
Turkey	2030	Tapping the full hydroelectric potential
Turkey	2030	Commissioning of a nuclear power plant

Country	Target year	Policy
Turkey	2030	Reducing electricity transmission and distribution losses to 15 percent
Algeria	2030	27% electricity from RES
Cameroon	2035	25% of renewable energy in the electricity mix
South Africa	2050	Decarbonised electricity by 2050 - estimated total of US$349 billion from 2010
	2050	CCS: 23 Mt CO2 from the coal-to-liquid plant - US$0.45 billion
	2050	Electric vehicles - US$513 billion from 2010 till 2050
	2030	Hybrid electric vehicles: 20% by 2030 - US$488 billion

Implementation of Policies 2030-2050:

As described above, INDC scenario is a low ambition scenario of fragmented mitigation action thus for the period beyond 2030, teams are requested to implement an emission intensity reduction rate equal to that of the period 2020-2030 for all regions, as shown in Table 6.3.7. Regarding the energy and sector related policies, the 2020-2030 trends are sustained for the post-2030 period.

Table 6.3.7: Post-2030 emission and emission intensity growth rates for INDC scenario

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
EU-28	Emissions|Kyoto gases	Mt CO2	-0.8%	-1.6%	-2.3%	-1.8%
EU-28	Emissions|CO2	Mt CO2	-0.7%	-1.4%	-2.2%	-2.1%
EU-28	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.3%	-2.5%	-3.6%	-3.3%
EU-28	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-2.1%	-2.5%	-3.3%	-3.6%
EU-28	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.2%	-2.6%	-3.4%	-3.4%
Argentina	Emissions|Kyoto gases	Mt CO2	0.9%	-0.5%	-0.4%	-0.2%
Argentina	Emissions|CO2	Mt CO2	1.3%	-0.7%	-0.9%	-0.4%
Argentina	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.8%	-1.8%	-2.1%	-2.5%
Argentina	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.4%	-1.7%	-2.3%	-1.7%
Argentina	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.4%	-1.6%	-1.8%	-1.9%
Australia	Emissions|Kyoto gases	Mt CO2	1.2%	-0.3%	-3.3%	-3.2%
Australia	Emissions|CO2	Mt CO2	1.5%	0.0%	-3.9%	-4.9%
Australia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.8%	-3.1%	-5.9%	-5.4%
Australia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.5%	-3.1%	-3.4%	-3.7%
Australia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.9%	-3.4%	-3.5%	-3.4%
Brazil	Emissions|Kyoto gases	Mt CO2	-4.7%	-0.5%	-0.5%	-1.5%
Brazil	Emissions|CO2	Mt CO2	-7.4%	-1.5%	-1.0%	-2.6%
Brazil	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-8.1%	-2.1%	-3.3%	-3.9%
Brazil	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-0.4%	-1.5%	-1.3%
Brazil	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.9%	-0.7%	-2.2%	-2.1%
Canada	Emissions|Kyoto gases	Mt CO2	1.3%	0.2%	-3.2%	-2.3%
Canada	Emissions|CO2	Mt CO2	1.8%	0.7%	-3.7%	-3.1%
Canada	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-0.6%	-1.8%	-5.0%	-4.2%
Canada	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-2.1%	-1.4%	-3.2%	-3.6%
Canada	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.2%	-1.9%	-3.2%	-3.3%
Chile	Emissions|Kyoto gases	Mt CO2	3.1%	2.4%	-6.4%	
Chile	Emissions|CO2	Mt CO2	4.1%	2.9%	-8.1%	
Chile	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-0.7%	-1.4%	-9.2%	

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
Chile	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.1%	-0.6%	-4.0%	-5.1%
Chile	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.6%	-1.1%	-4.3%	-4.4%
China	Emissions|Kyoto gases	Mt CO2	8.9%	2.8%	-0.5%	-3.0%
China	Emissions|CO2	Mt CO2	10.3%	3.5%	-0.3%	-3.4%
China	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.2%	-3.9%	-5.3%	-5.6%
China	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.5%	-3.3%	-5.2%	-5.7%
China	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.6%	-4.0%	-5.3%	-5.4%
Egypt	Emissions|Kyoto gases	Mt CO2	5.0%	1.5%	1.9%	1.1%
Egypt	Emissions|CO2	Mt CO2	5.8%	1.8%	1.9%	1.5%
Egypt	Emissions intensity|Kyoto gases	t CO2/MUS$2005	0.1%	-2.0%	-3.3%	-3.3%
Egypt	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	0.9%	-1.7%	-3.2%	-2.9%
Egypt	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.1%	-2.0%	-3.3%	-3.3%
Indonesia	Emissions|Kyoto gases	Mt CO2	4.3%	0.2%	-2.2%	-0.5%
Indonesia	Emissions|CO2	Mt CO2	4.6%	0.0%	-3.0%	-0.4%
Indonesia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-0.9%	-5.3%	-7.1%	-4.1%
Indonesia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-3.4%	-3.5%	-3.3%
Indonesia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.7%	-3.7%	-3.7%	-3.7%
India	Emissions|Kyoto gases	Mt CO2	4.0%	3.9%	4.0%	1.7%
India	Emissions|CO2	Mt CO2	5.7%	5.0%	4.7%	1.9%
India	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-3.3%	-2.7%	-2.6%	-2.7%
India	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.5%	-2.1%	-2.1%	-2.5%
India	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-3.1%	-2.9%	-2.7%	-2.7%
Iran	Emissions|Kyoto gases	Mt CO2	4.1%	0.6%	1.4%	1.2%
Iran	Emissions|CO2	Mt CO2	4.4%	1.0%	1.2%	1.2%
Iran	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.1%	0.0%	-2.0%	-2.2%
Iran	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.8%	0.4%	-2.2%	-2.1%
Iran	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.1%	0.0%	-2.0%	-2.2%
Japan	Emissions|Kyoto gases	Mt CO2	-0.6%	-0.7%	-0.8%	-1.1%
Japan	Emissions|CO2	Mt CO2	-0.3%	-0.8%	-0.7%	-1.1%
Japan	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.3%	-1.5%	-1.6%	-2.0%
Japan	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-1.8%	-2.1%	-2.0%
Japan	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.4%	-1.7%	-2.1%	-2.0%
South Korea	Emissions|Kyoto gases	Mt CO2	2.0%	0.3%	-2.3%	-4.6%
South Korea	Emissions|CO2	Mt CO2	2.4%	0.4%	-2.4%	-5.0%

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
South Korea	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.0%	-2.9%	-5.1%	-5.7%
South Korea	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.7%	-2.9%	-5.3%	-5.5%
South Korea	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.0%	-3.0%	-5.2%	-5.2%
Mexico	Emissions|Kyoto gases	Mt CO2	2.2%	0.0%	-1.8%	-1.4%
Mexico	Emissions|CO2	Mt CO2	1.8%	0.6%	-1.9%	-1.6%
Mexico	Emissions intensity|Kyoto gases	t CO2/MUS$2005	0.4%	-3.3%	-5.1%	-4.2%
Mexico	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	0.2%	-2.5%	-3.1%	-3.4%
Mexico	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.5%	-3.1%	-3.5%	-3.5%
Norway	Emissions|Kyoto gases	Mt CO2	-0.7%	1.8%	-1.4%	-2.2%
Norway	Emissions|CO2	Mt CO2	1.6%	3.4%	-1.0%	-3.3%
Norway	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.1%	-0.1%	-3.3%	-3.7%
Norway	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.2%	-1.3%	-1.6%	-2.1%
Norway	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.2%	-1.6%	-2.0%	-2.1%
New Zealand	Emissions|Kyoto gases	Mt CO2	0.6%	1.7%	-3.6%	-5.4%
New Zealand	Emissions|CO2	Mt CO2		19.6%		14.4%
New Zealand	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.7%	-0.8%	-5.7%	-7.2%
New Zealand	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.9%	-2.7%	-3.2%	-4.1%
New Zealand	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-2.0%	-2.4%	-3.5%	-3.5%
Russia	Emissions|Kyoto gases	Mt CO2	0.2%	-0.3%	2.4%	0.6%
Russia	Emissions|CO2	Mt CO2	-0.3%	0.6%	2.5%	1.0%
Russia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-4.4%	-1.5%	0.3%	-0.1%
Russia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-3.8%	-1.9%	-1.2%	-0.7%
Russia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-3.8%	-2.2%	-0.9%	-0.8%
Saudi Arabia	Emissions|Kyoto gases	Mt CO2	5.6%	1.9%	1.5%	0.5%
Saudi Arabia	Emissions|CO2	Mt CO2	5.9%	2.2%	1.3%	0.5%
Saudi Arabia	Emissions intensity|Kyoto gases	t CO2/MUS$2005	0.2%	-1.8%	-1.7%	-1.7%
Saudi Arabia	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	0.5%	-1.6%	-1.9%	-1.7%
Saudi Arabia	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.2%	-1.8%	-1.7%	-1.7%
Thailand	Emissions|Kyoto gases	Mt CO2	2.6%	2.0%	-1.0%	-1.6%
Thailand	Emissions|CO2	Mt CO2	3.0%	2.7%	-0.5%	-1.8%
Thailand	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.7%	-1.3%	-4.8%	-4.4%
Thailand	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.6%	-0.7%	-3.4%	-4.5%
Thailand	Emissions intensity|Kyoto excl.	Mt CO2e	-1.2%	-1.3%	-4.1%	-4.3%

Region	Variable	Unit	2000-2010	2010-2020	2020-2030	2030-2050
	Land Use					
Turkey	Emissions|Kyoto gases	Mt CO2	2.8%	3.0%	2.0%	0.5%
Turkey	Emissions|CO2	Mt CO2	3.7%	3.5%	2.4%	0.6%
Turkey	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.0%	-0.8%	-1.4%	-1.8%
Turkey	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-0.6%	-1.2%	-1.4%	-1.5%
Turkey	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.2%	-1.4%	-1.7%	-1.6%
Ukraine	Emissions|Kyoto gases	Mt CO2	-0.7%	-0.1%	-0.4%	-1.2%
Ukraine	Emissions|CO2	Mt CO2	-0.1%	0.3%	-0.5%	-1.0%
Ukraine	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-4.8%	-1.4%	-3.7%	-4.0%
Ukraine	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-4.6%	-1.5%	-3.9%	-3.8%
Ukraine	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-5.0%	-1.7%	-3.8%	-4.0%
United States	Emissions|Kyoto gases	Mt CO2	-0.8%	-1.0%	-4.2%	-4.8%
United States	Emissions|CO2	Mt CO2	-1.0%	-0.9%	-4.5%	-7.4%
United States	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-2.4%	-3.4%	-6.0%	-6.4%
United States	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-2.0%	-3.3%	-5.7%	-6.7%
United States	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.9%	-3.4%	-5.5%	-5.4%
Vietnam	Emissions|Kyoto gases	Mt CO2	10.7%	3.2%	2.1%	0.7%
Vietnam	Emissions|CO2	Mt CO2	33.6%	4.9%	2.8%	1.1%
Vietnam	Emissions intensity|Kyoto gases	t CO2/MUS$2005	3.9%	-2.5%	-3.2%	-3.3%
Vietnam	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	4.4%	-1.4%	-2.7%	-2.8%
Vietnam	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	0.7%	-2.8%	-3.3%	-3.2%
South Africa	Emissions|Kyoto gases	Mt CO2	2.0%	-0.1%	0.1%	-0.3%
South Africa	Emissions|CO2	Mt CO2	2.2%	-0.2%	0.5%	-0.3%
South Africa	Emissions intensity|Kyoto gases	t CO2/MUS$2005	-1.5%	-2.5%	-3.4%	-3.0%
South Africa	Emissions intensity|CO2|Fossil Fuels and Industry	billion US$2005	-1.2%	-3.0%	-2.9%	-3.3%
South Africa	Emissions intensity|Kyoto excl. Land Use	Mt CO2e	-1.5%	-2.8%	-3.3%	-3.2%

6.3.3 – Results

The "emissions gap" to 1.5-2°C

The Reference scenario projects a world where economic growth and GHG emissions have not decoupled. A yearly increase of global emissions at 0.7%[11] [0.4-1.1%] annual rate continues for the 2010-2050 period, reaching 56 [52-62] $GtCO_2eq$ in 2030, 20% [11-34%] above 2010 levels (see Figure 6.3.1). Along such trajectories, the projected global mean temperature increase is 3.3°C [3.0°-3.6°] putting global livelihoods at risk of experiencing sizeable impacts and jeopardizing the overall sustainability of future development.

The INDC scenario registers global emission levels equal to 52 [46-57] $GtCO_2eq$ in 2030 (see Figure 6.3.2). This corresponds to an emission level which is 11% [5-19%] lower than the Reference one. These findings are in line with UNFCCC (2016), which finds a global emission level equal to 54 [51-56] $GtCO_2eq$ in 2030 and with Rogelj et al. (2016), who assess 10 earlier-published single-model studies, and find a level of 53 [51-53] $GtCO_2eq$ in 2030.

Emission levels in 2030 for the 2°C and 1.5°C scenarios are found equal to 39 [25-43] $GtCO_2eq$ and 24 [19-34] $GtCO_2eq$ or 33% [19-56%] and 57% [44-69%] below Reference levels. Comparing our results with the literature, we find that our 2050 emission levels in the 2°C scenario (65% [59-69%] below 2010 levels) are consistent with the IPCC(2014) range of 41-72% below 2010 levels and our 2030 levels are close to the UNEP(2015) findings of 42[31-44] $GtCO_2eq$. Similarly, and although IPCC (2014) states that only a limited number of model studies have explored emission trajectories that are consistent with a high probability of achieving the 1.5°C target, our 1.5°C scenario emission levels are consistent with the findings in the literature. In particular, 2050 emissions are equal to 88% [62-102%] of 2010 levels, putting our median estimation in line with the IPCC (2014) range, i.e. 70-95% below 2010 levels but with a wider range of results across models. Notably, our 2030 emission levels are substantially lower than the UNEP(2015) 39 [37-40] $GtCO_2eq$ range. The resulting "emissions gap"[12] in 2030 is equal to 14[4-25] $GtCO_2eq$ and 25 [13-30] $GtCO_2eq$ for the 2 °C and 1.5°C targets respectively. Both the latest UNEP Gap Report (2015) and Rogelj et al. (2016) reach similar conclusions with an 2°C emissions gap in 2030 equal to 12 [10-15] $GtCO_2eq$ and 11 [10.5-16] $GtCO_2eq$ respectively. Figure 6.3.1 shows the global GHG emission trajectories from 2005 to 2050 along with the average global mean temperature of each scenario, while Figure 6.3.2[13] zooms in year 2030 depicting also the emissions gap. Apart from an intrinsic uncertainty found in GHG emission projections, the uncertainty in historical emissions[14] is a key factor of the INDC emission range, as the targets are expressed in relation to historical base years.

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[11] Results are expressed in terms of Median [minimum-maximum] values of all model results.

[12] According to the UNEP definition, an emissions gap is "the difference between the GHG emission levels consistent with having a likely chance (>66 per cent) of limiting the mean global temperature rise to below 2°C or 1.5°C in 2100 above pre-industrial levels and the GHG emission levels consistent with the global effect of the INDCs, assuming full implementation from 2020".

[13] The top of the rectangle indicates the third quartile, the horizontal line near the middle of the rectangle indicates the median, while the bottom of the rectangle indicates the first quartile. Error bars indicate the maximum and minimum values. All boxplot figures are constructed as described above.

[14] Modelling teams use different databases for their analysis (e.g. EDGAR, UNFCCC, National statistic, CAIT, EUROSTAT) and a harmonization of these sources is beyond the scope of this analysis hence remains a challenge for future model ensemble analyses.

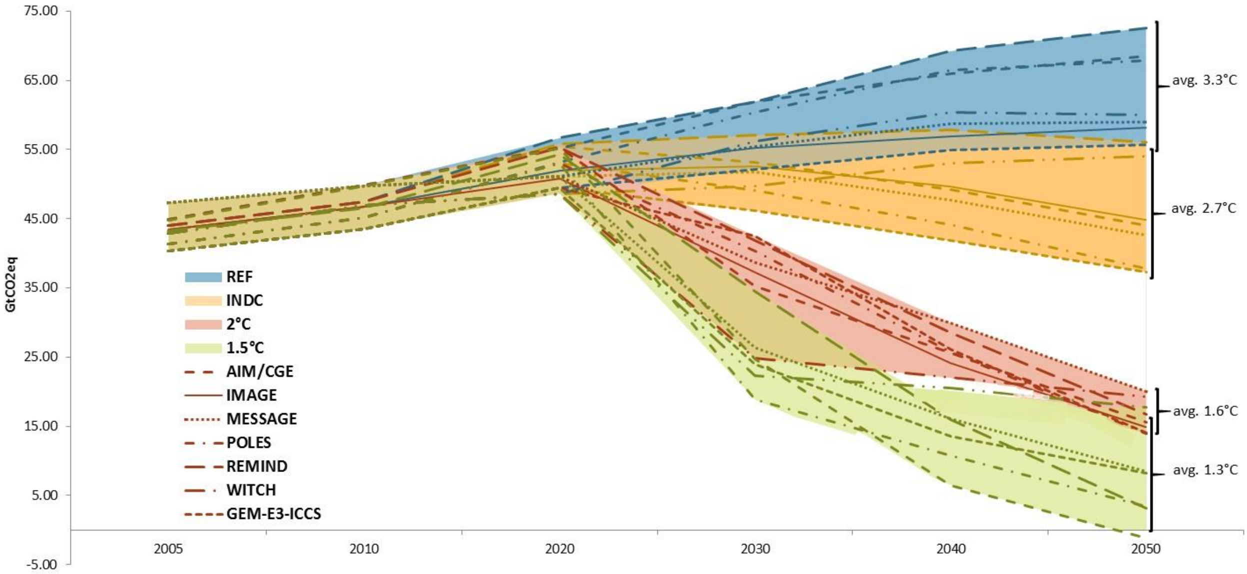

Figure 6.3.1: Global emission trajectories for 2010-2050

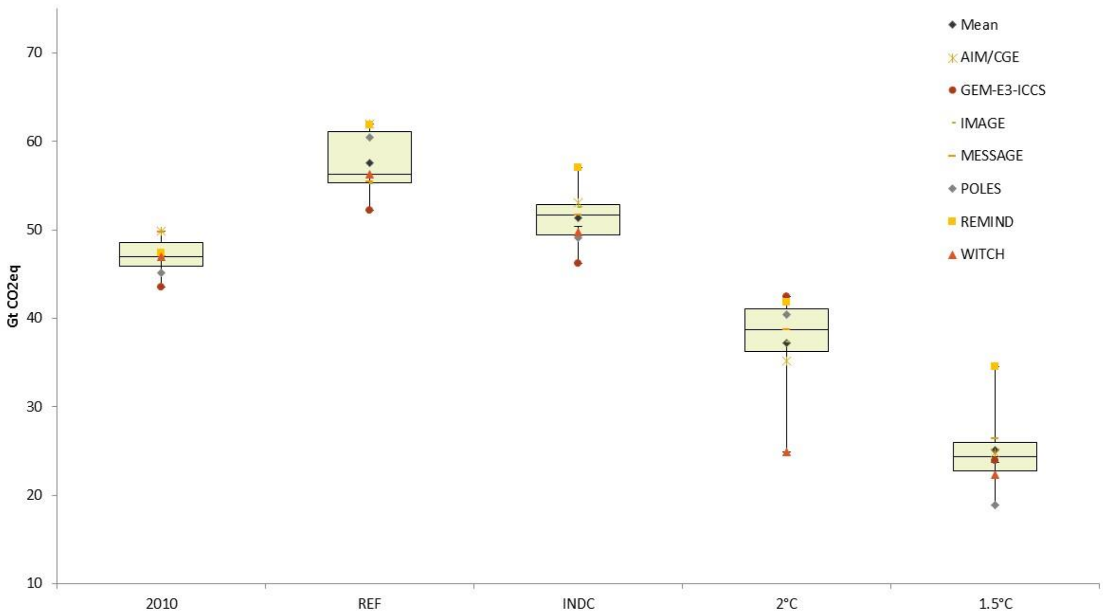

Figure 6.3.2: Global GHG emissions in 2030

Policy costs and investments

Hybrid general equilibrium models are used to assess the INDC, 2C and 1.5C scenarios. Moving to a low carbon system is capital intensive and requires a reallocation of resources that is likely to result in economy-wide policy costs. In general, costs rise with more ambitious climate mitigation policies. However, the allocation of efforts is also an important driver of costs, as those are minimized in a global mitigation framework where reductions are undertaken by sectors and countries with the lowest marginal abatement cost. On the contrary, a fragmented action, like under the INDC scenario, may results in sub-optimal burden sharing. We assess the costs of implementing the INDCs and find a global policy cost in 2030 in terms of loss of GDP equal to 0.4% [0.1-0.8%] of Reference GDP. Closing the "emissions gap", i.e. moving from INDC to deep-decarbonization pathways, reduces further GDP by 1% [0-4%] and 3% [2-7%] from INDC levels for the 2°C and 1.5°C scenarios respectively. This analysis does not take into account the eventual avoided damage costs from pollution (e.g. air quality) and climate change impacts, or other positive feedback effects of the mitigation policies. Hence, the (negative) GDP impacts are high-end estimates and can be considered as conservative.

To put these numbers into context, we note that in the 2°C and 1.5°C scenarios, the global annual GDP growth rate for the 2010-2030 period remains in sustainable levels (around 3%), showing a reduction from Reference levels of only 0.08% [0.03-0.26%] and 0.19% [0.11-0.38%] respectively, while in the INDC scenario the GDP growth rates are almost unchanged from Reference, reducing only by 0.03% [0.01-0.04%]. In Figure 6.3.3 we provide the GDP costs in relation to total GHG reductions of each respective scenario and model, so as to highlight the different abatement costs and the differentiated responsiveness of each model. The graph illustrates that, among else, costs also differ due the different abatement efforts in 2030 in relation to the Reference, as both Reference emission trajectories and cost-efficient pathways for the 1.5-2°C targets differ across models. We find that the average abatement cost, i.e. the ratio of GDP losses to GHG reductions relative to Reference, differs across models and across scenarios but most models stay within the range of 0.07 bl$2005/Mt$CO_2$eq. Results indicate that in all models marginal costs increase with the intensity of reductions, showing that average costs in the 1.5°C scenario are higher than in the 2°C scenario. However, average abatement costs of the fragmented action in INDC scenario may be higher than those of common deep-decarbonization action.

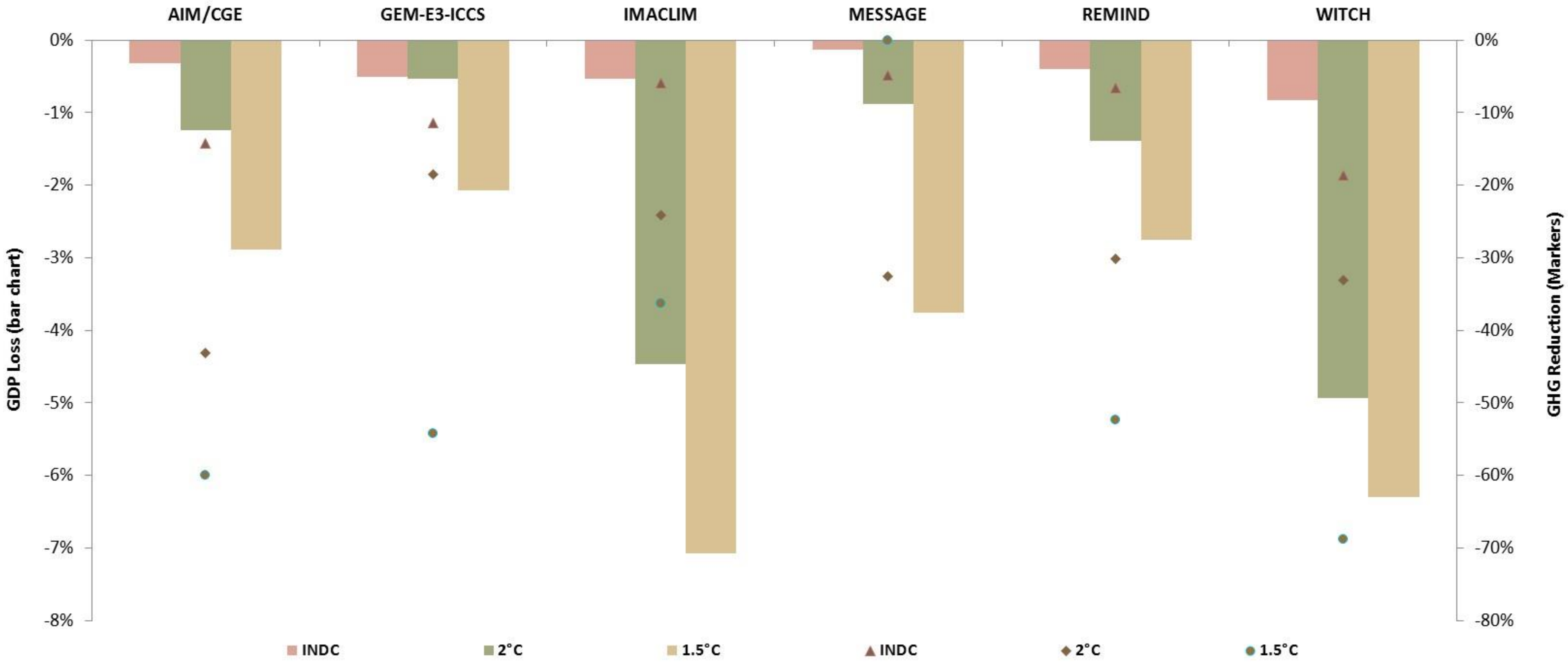

Figure 6.3.3: Total costs of mitigation in 2030: GDP loss (bar chart) in relation to GHG reductions (markers), all as % change from Reference.

6.3.4 – References

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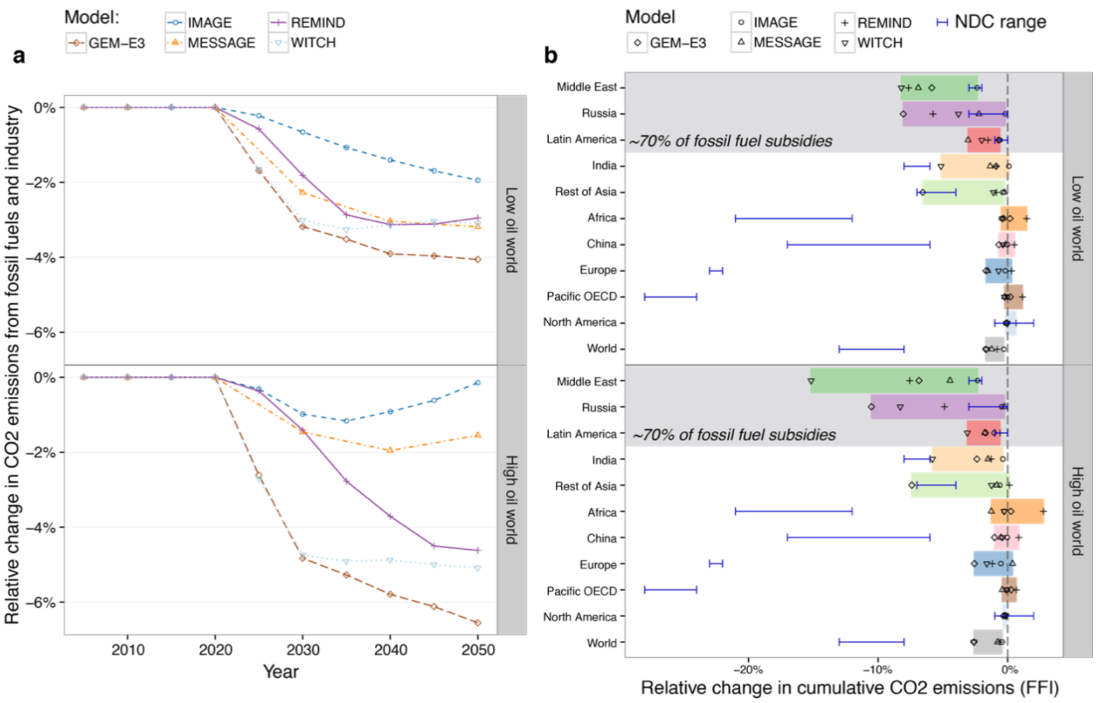
Appendix 6.3.1 – A look at fossil fuel subsidies and climate change

Author: Jessica Jewell

Fossil fuel subsidies are often blamed for thwarting efforts to address climate change. The International Energy Agency frequently features fossil fuel subsidy reform as a key pillar in their 2°C scenarios[1,2] and the IPCC fifth assessment report concluded that fossil fuel subsidy reform "can achieve significant emission reductions at negative social cost"[3]. However, most of the previous analysis of the emission impact of removing fossil fuel subsidies finds a relatively modest effect: 6% by 2035[4] and 6.4%[7] - 8% by 2050[8,9].

Figure 1: Impact of subsidy removal CO_2 emissions. (a) The impact of subsidy removal on global CO_2 emissions from fossil fuels and industry compared to the Baseline under high and low oil prices. (b) Cumulative change in CO_2 emissions from fossil fuels from 2020 to 2030 from subsidy removal. In panel (b), the Intended nationally-determined contribution (NDC) range includes unconditional commitments as modeled in the MESSAGE model under different uncertainties (Rogelj et al. under review).



The ADVANCE project makes two big contributions to this literature. First, we test the impacts of fossil fuel subsidy removal using five leading integrated assessment models which allow us to test the robustness of these findings related to structural model assumptions. Second, we test the impacts of subsidy removal under a low and high oil price scenario. This latter contribution is particularly important since, we know that subsidy levels typically follow the oil price[5]. To model fossil fuel subsidies, we compiled a comprehensive dataset based on IEA[5], OECD[12] and GIZ[13] on fossil fuel subsidies and retail prices of gasoline. Subsidy rates were scaled proportionally to the oil price. To depict fossil fuel subsidy removal phase-out started in 2020 and reached zero by 2030.

Under constant subsidy rates, under high oil prices, subsidy levels could grow to up to almost 900 billion-USD2005 by 2030 and 1.4 trillion-USD2005 by 2050. If oil prices stay low, phasing out fossil fuel subsidies would lead to at most a 4% reduction in CO2 emissions from energy and industry by 2050 (Figure 1). This is much lower not only in comparison with what is needed to stabilize the climate but even countries have pledged to in their Nationally Determined Contributions (NDCs). This small global effect masks two distinct regional effects. For the major oil and gas producing regions (the Middle East, Russia and Latin America), fossil fuel subsidy removal would lead to much greater CO_2 emission reductions than those regions' climate pledges. In almost all other regions, the emission reductions from subsidy removal are far lower than those pledged under the Paris climate deal.

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Appendix 6.3.2 – Energy Poverty Impacts of Climate Mitigation Policies

Authors: Shonali Pachauri, Narasimha D. Rao & David McCollum (IIASA), May 2016

A lack of access to clean fuels and stoves is a major policy concern globally, especially in South Asia where over 70% of the population relies primarily on solid fuels for cooking even today (IEA &WB 2015). This has far reaching effects on the health and wellbeing of populations using these fuels, in particular on the most marginalized including women and young children. Recent estimates suggest that exposure to household air pollution from solid fuels burnt in inefficient stoves are responsible for over 4 million premature deaths globally, with over 1.3 million deaths in India alone (WHO 2016). Yet large portions of the population continue to remain unable to access affordable and reliable clean fuel and stove supplies. The United Nations Sustainable Energy for All (SE4All) and the new Sustainable Development Goals (SDG) initiatives are a call to action for policymakers to accelerate access to clean cooking universally by 2030.

Problem Statement

Current trends and analysis suggest that without new policies and additional efforts, clean cooking fuels and stoves could remain unaffordable and inaccessible to over a third of the South Asian population even in 2030 (Pachauri et al, 2013; IEA 2015). Literature also suggests that in the future, expanding clean cooking may become more challenging if climate policies increase the cost of cleaner cooking fuels such as liquid petroleum gas (LPG), electricity or piped natural gas (van Ruijven et al., 2012; Calvin et al., 2013). Yet we lack a comprehensive understanding of the potential synergies and tradeoffs between climate mitigation and modern energy access objectives. In an innovative study carried out as part of the ADVANCE project we carry out new analysis for South Asia to answer the following questions. Do climate mitigation policies retard the transition to modern cooking energy services and if so, by how much? What are the distributional impacts of these policies particularly on the energy poor, and what are the impacts on human health? Can effective policy design help achieve both clean cooking access and climate mitigation goals simultaneously?

Methodological Innovations for Analysis of Energy Poverty Impacts of Climate Mitigation Policies

To answer these questions we employ the “MESSAGE-Access” model. The newly developed “Access” model is a stand-alone household fuel choice and demand model that incorporates heterogeneity in socio-economic characteristics and behaviors across the entire income spectrum (from rich to poor and for rural and urban sectors separately). The model is used to estimate fuel-technology specific demand curves for cooking (Cameron et al, 2016). To explore future effects of climate policies, we implement four greenhouse gas (GHG) mitigation scenarios of increasing stringency (C10, C20, C30 and C40, with our C40 scenario representing a 66% probability of achieving a 2°C temperature increase target relative to pre-industrial levels by 2100), and iterate the “Access” model with the multi-region, multi-sector MESSAGE model to incorporate the resulting price impacts on household cooking decisions. We also explore the effects of a wide range of energy access policies including price support policies on clean fuels (0-75%) and clean stoves (0-100%) to accelerate a transition to these. In order to estimate the health impacts of household air pollution from solid fuel use, we adopt the Global Burden of Disease 2010 methodology with non-linear dose-response relationships between exposure and disease (Lim et al, 2012).

Climate Policy Impacts on Emissions and Solid-Fuel Cooking

In a future with no new access or climate policies, we find that emissions rise rapidly in South Asia doubling roughly every twenty years (Figure 1). This trend is consistent with results from other scenario analysis that assume high (7-8%) GDP growth in a baseline (Dubash et al., 2015). Such growth and the accompanying urbanization enables over a billion people to transition to cleaner cooking by 2050, but could leave 35% of the population (727 million South Asians) still dependent on solid fuels in the near-to-mid-term (2030). This high continued dependence on solid fuels in 2030 could lead to between 0.45 and

1.31 million premature deaths per year due to exposure to household air pollution (Cameron et al., 2016).

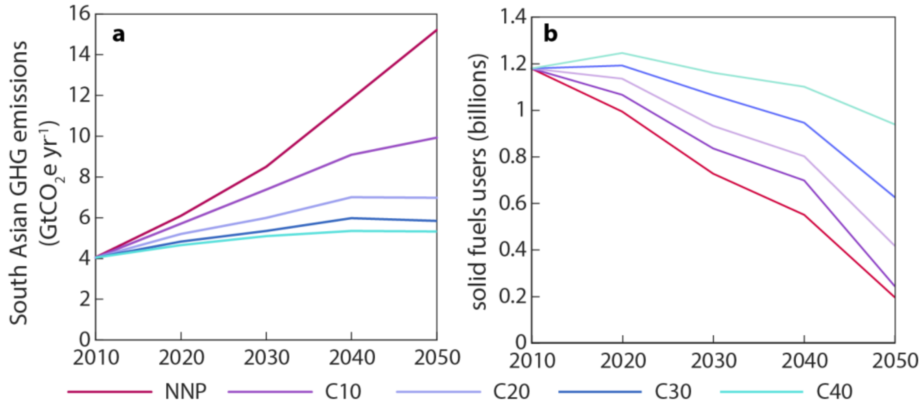

Figure 1. Emissions and solid fuel use outcomes for climate mitigation policy scenarios. a. GHG emissions from the MESSAGE South Asia region, and **b.** solid fuel users in billions from 2010-2050, for a baseline (NNP) and four increasingly stringent climate mitigation policy scenarios. Source: Cameron et al., 2016.

We find that global climate policy can achieve notable regional GHG emissions reduction but could also slow the transition to clean cooking fuels. In our C30 and C40 scenarios, South Asian GHG emissions remain within 132% and 148% of 2010 levels by 2050. However, if no compensatory access policy measures are implemented, these stringent mitigation scenarios would increase the perceived average cost to cook with LPG, making it unaffordable for an additional 336 to 433 million people in 2030 under the C30 and C40 scenarios respectively. We find that increasing the stringency of mitigation policy yields diminishing benefits for climate emissions reductions, but increasing setbacks for clean cooking uptake (see Fig 1).

Distributional Impacts of Climate Mitigation Policy

Our analysis suggests that the impacts of climate and access policies on the population reliant on solid fuels vary significantly among population subgroups. The poorest and richest households (R1 in rural areas and U2 in urban areas) are least impacted in terms of the percentage of the population affected, whereas the urban poor and wealthier rural households (U1 and R2) are likely to be the most affected by climate policy (see Fig 2).

In rural areas, most households have the ability to collect biomass (firewood, dung, or crop residues) at no monetary cost. Rural households at very low income levels (R1) are already so poor that they cannot afford to cook with clean fuels even in the absence of climate policy (NNP), so the imposition of mitigation policy has little impact on the number of solid fuel users in this group. This group therefore requires substantial fuel and stove support to reach even 50% clean cooking access in 2030 regardless of the stringency of the mitigation scenario.

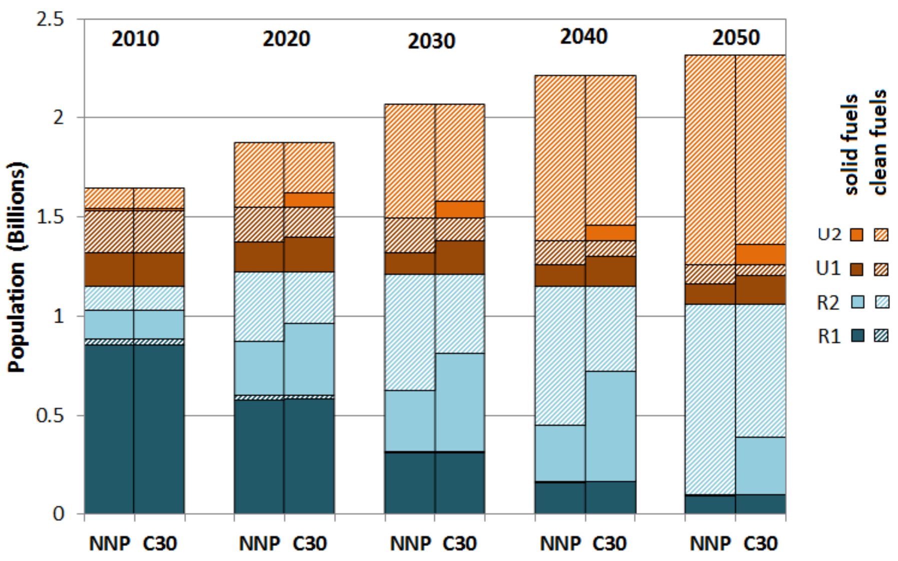

Figure 2. Solid and clean cooking in four population groups over time for the NNP and C30 scenarios. Groups R1 and R2 represent rural households spending <$2 and >$2 per day; U1 and U2 represent urban households spending <$5 and >$5 per day.

As a result of general economic growth, wealthier rural households (R2) become increasingly able to afford clean fuels with time in the NNP scenario, driving solid fuel use down to 0% by 2050. However, climate mitigation policy as modelled in the C30 scenario prompts a larger share of households in R2 to remain reliant on solid fuels (15-30% from 2020 to 2050). Stove cost support policies are sufficient to enable all of R2 to use clean fuels in 2030 in the NNP, but additional fuel price support is needed to achieve the same level of energy access for this group in the C30 scenario.

Households in urban areas are frequently unable to collect solid fuels from their environment and must instead purchase the solid fuels they use or rely on kerosene as a fuel of last resort. In the NNP scenario, the share of population reliant on solid fuels in U1 drops from 44% in 2010 to 39% in 2030, because of rising income. Under carbon mitigation (C30 scenario), however, an additional 60 million people in U1 rely on solid fuels in 2030 because kerosene and LPG prices exceed the cost of purchased biomass.

Finally, for the rich urban households (U2) we find they are least affected by climate policy, as they can afford to meet all cooking energy needs with clean fuels starting in 2020 in the NNP scenario and only 10% become unable to afford these in 2050 even in the C30 scenario. They therefore require no policy support in the NNP scenario and only moderate access policy (50% stove support) even under more stringent climate mitigation (C30) to achieve 100% clean cooking in 2030.

Access Policy Scenarios and Costs to Achieve Universal Clean Cooking by 2030

Households can be shielded from high energy prices using the same types of instruments that governments typically put in place to accelerate clean cooking uptake. However, our analysis reveals that the choice of access policy instrument has a significant impact on the cost of expanding clean cooking uptake (see Fig. 3). Policies that reduce stove costs shift more households to clean fuels per dollar invested than policies to reduce fuel costs. This is because although stoves represent only a small share of the actual cost of cooking with clean fuels (over the full lifetime that the stove is used), they represent a much larger barrier to clean cooking uptake for many poor households without adequate liquidity to make the large one-time purchase associated with switching to clean stoves. In other words, the perceived cost of cooking can be substantially reduced through stove support policies.

Even in the absence of any climate policy, we find that significant upscaling of the intervention policies in place today will be needed to achieve the universal clean cooking target by 2030. Current budget estimates from the Government of India earmark $3.5 billion for LPG subsidies for its new Direct Benefit Transfer (DBT) scheme for households in 2015-16. By our estimates, this level of annual subsidy will enable only 80% of the population to achieve clean cooking by 2030.

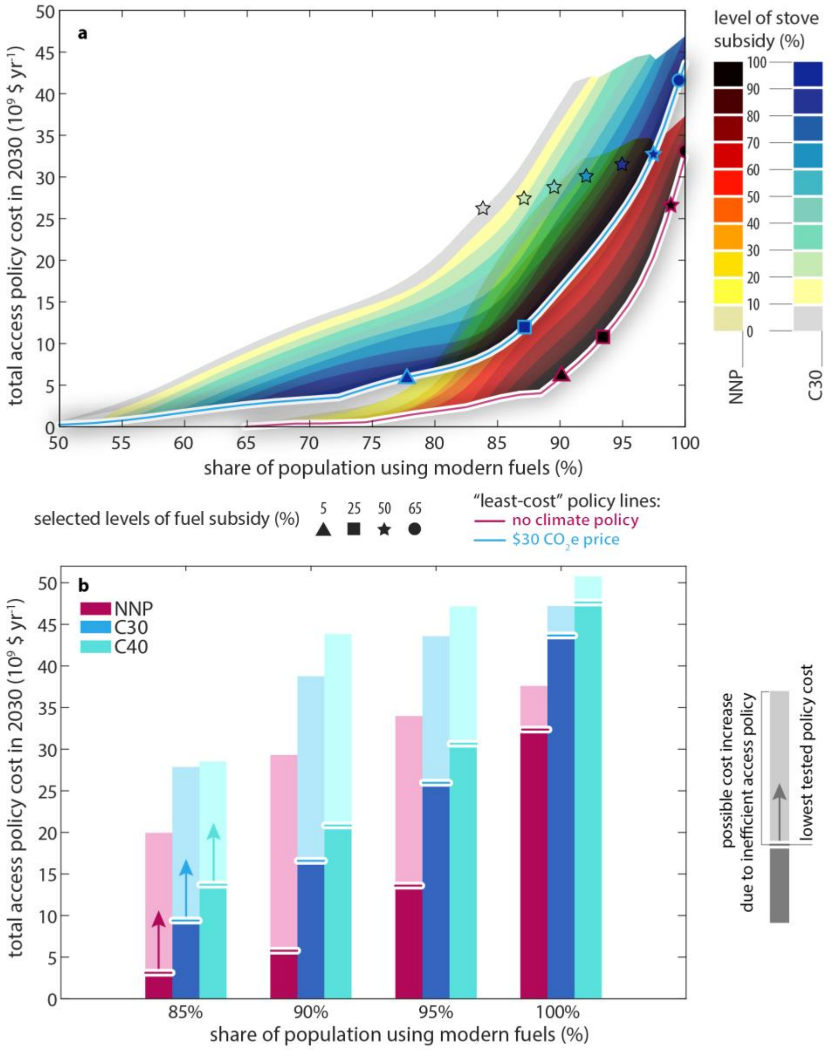

Figure 3. Access policy cost-effectiveness under a baseline and climate mitigation scenarios. a, Fuel and stove price support combinations for the no climate policy (NNP) and $30 CO2e price (C30) in 2030. "Least-cost" policy lines are highlighted at the lower end of each of the areas; **b**, Total access policy costs in 2030 for the achievement of an 85, 90, 95, and 100% share of population having access modern fuels, respectively. Dark shaded bars show the lowest policy costs for the respective level of modern fuel access (corresponding to the level indicated by the "least-cost" policy lines in panel a). Lighter shaded areas show the possible cost increase due to inefficient access policy (illustrated by the arrows). Results are shown for the NPP, C30 and C40 scenarios. Source: Cameron et al., 2016.

We find that to achieve a given level of access, the minimum required level of price support increases with the stringency of climate mitigation policy (Fig 3; top panel). In the NNP scenario, only 5% fuel price support is needed in combination with 100% stove rebate to enable over 90% of the South Asian population to afford clean fuels in 2030 at a cost of $6.34 billion per year. In the C30 scenario, fuel price support must be increased to 25% to achieve a similar level of access, increasing the total policy cost by $17.8 billion per year. Achieving 100% clean cooking in the C30 scenario in 2030 would require fuel price support to increase to 65%.

However, we find that the choice of access policy instruments has a bigger impact on the costs of achieving a given access target than the stringency of mitigation policy. For example, to achieve 90%

clean cooking uptake by 2030 in the absence of climate policy (NNP), access policy costs can range from \$6.34 to \$30.01 billion per year depending on the chosen access policy mechanism (Fig 3; bottom panel). Meanwhile, the minimum policy cost necessary to maintain the same access uptake even under the stringent C40 climate policy scenario is \$21.5 billion per year i.e. an additional \$15.16 billion per year relative to the NNP scenario. Moreover, we find that a well-designed international climate policy could even help mobilize additional resources to bridge the access finance gap. Policy costs for achieving a universal clean cooking goal by 2030 even under stringent climate mitigation could be well within the range of financial transfers that may result from effort sharing international climate regimes. For instance, in a per capita emissions allocation regime, flows to South Asian countries could range from -US\$34 billion to +US\$166 billion per year (with a median across models of US\$71 billion per year; positive values indicate financial transfers into the region) in 2030 (Tavoni et al., 2013), which exceeds considerably the US\$42 billion of access policy costs required to achieve 100% access in the C30 scenario.

Conclusions

Our analysis provides new insights on how compensatory energy access policies could counteract the effects of climate policies on cooking fuel prices in South Asia. Even in the absence of climate policy, we find that significant upscaling of the intervention policies in place today will be needed to achieve a universal clean cooking target by 2030. Climate mitigation policy could intensify this need, making cleaner fuels like LPG unaffordable for a larger fraction of the population. Our analysis of the distributional effects of climate policies suggest that the richest urban and poorest rural households are likely to be least impacted, whereas the urban poor and wealthier rural households are likely to be the most affected by climate policy. Finally, we find that the ultimate cost of improving access varies more with the choice of access policy mechanism than with the stringency of climate policy, and may be well below international financial flows to the region under equitable burden sharing regimes.

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Appendix 6.3.3 – Models used in ADVANCE WP6 / Task 1.4.

The **GEM-E3**[15] model has participated in several related EU funded research projects (e.g. AMPERE, SIMPATIC, ADVANCE, EuropeAid, MILES), has contributed in several related European Commission policy documents (e.g. Economic Assessment of Post-2012 Global Climate Policies, GECO 2015 Global Energy and Climate Outlook, EC Low Carbon Roadmap 2050, EC 2030 Energy and climate policy framework) and has published in several peer-reviewed journals.

GEM-E3 model contributes to the assessment of macroeconomic, employment and competitiveness impacts of the different policy scenarios as well as in the assessment of alternative fiscal and energy policies (e.g. energy subsidy removals, carbon revenue recycling schemes). GEM-E3 will also enable a detailed sectoral analysis of results.

The current analysis shall benefit from the advanced GEM-E3 model version that includes an improved representation of the energy efficiency cost curves and a detailed and extended bottom-up representation of the transport supply sector including electric, hybrid, plug-in, and conventional vehicles and biofuels. Moreover benefits from the incorporation in GEM-E3 of heterogeneous household behavior and disutility costs for transport demand, an improved calibration of the energy sectors in the IO table that is consistent with energy balances along with an extension of the IO table to include power generation technologies, and an improved calibration of taxation so as to correctly include energy taxes and subsidies.

POLES model has also participated in related EU funded research projects (e.g. AMPERE, ADVANCE). POLES was a contributor to IPCC AR5 report and has contributed, often in a soft-link mode with GEM-E3 model, in several related European Commission policy documents (e.g. Economic Assessment of Post-2012 Global Climate Policies, GECO 2015 Global Energy and Climate Outlook, EC 2030 Energy and climate policy framework, World Energy Technology Outlook to 2050, Macroeconomic impacts of shale gas extraction in the EU) and has several academic publications in peer-reviewed journals.

POLES model contributes to the analysis of emission paths for each respective scenario and the evolution of the energy and power system in alternative policy frameworks. POLES also provides results on energy investments, energy prices and energy bills as well as on water consumption of the electricity sector under different policy frameworks.

The latter, i.e. water withdrawals and consumption, is enabled in the advanced model version along with an improved representation of energy demand in buildings and industry, through the introduction of detailed energy uses, insulation and through a scrap module that affects steel production. The improved POLES version also incorporates an advanced representation of electricity supply from variable renewable sources, through the inclusion of new technologies (batteries, split of hydro capacities, demand side management and compressed air technologies), through an improved general and storage planning and through load curve flexibilisation for all regions.

[15] www.gem-e3.net

REMIND model has been participating in related EU funded research projects (e.g. AMPERE, ADVANCE, LIMITS) and was a major contributor to IPCC AR5 report of Working Group 3 and has a wide spectrum of academic publications.

REMIND provides emission-related results per scenario and contributes to the detailed description of the subsequent energy systems (supply and demand) with a focus on the representation of the VRE integration and energy infrastructure and investments. REMIND also provides results on land-use impacts, water consumption and life-cycle impacts of the energy sector as well as aggregate GDP impacts of alternative scenarios.

The emissions and energy-related results provided by REMIND benefit from an improved representation of the energy sector. In particular, the advanced model version features an improved representation of variable renewable energy supply and improved representation of the curtailment of renewable energy based on region-specific residual load duration curves, on updated storage requirements and storage options and on improved calibration of electric grid requirements. The advanced model version also enables the life-cycle analysis of the energy sector.

MESSAGE model provides core inputs for major international assessments and scenarios studies, such as the Intergovernmental Panel of Climate Change (IPCC), the World Energy Council (WEC), the German Advisory Council on Global Change (WBGU), the European Commission, and most recently the Global Energy Assessment (GEA). MESSAGE has been participating in related EU funded research projects (e.g. AMPERE, ADVANCE, LIMITS) and was a major contributor to IPCC AR5 report by developing one of the Representative Concentration Pathways scenarios.

MESSAGE provides emission-related analysis, emission paths per scenario, emission per sector and emission reductions per technology for each scenario. It also contributes to the detailed description of the energy supply patterns. Furthermore, it contributes with results related to energy trade, energy investment requirements and energy taxation policies as well as detailed assessment of variable renewable energy integration and storage technologies. MESSAGE may also provide input on the energy access impacts of alternative policies.

The advanced model version features an improved representation of variable renewable energy incorporating region-specific parameterization, H2 technologies and a separation of flexible and base-load plant operation.

IMACLIM model was a contributor in the IPCC AR5 report, has participated in several related EU funded research projects (e.g. AMPERE, ADVANCE, GLOBIS, RECIPE) and has published several articles in climate and energy related peer-reviewed journals.

IMACLIM provides results related to the macroeconomic and employment impacts of the examined policies and its focus is also on the impacts on transport infrastructure and related investment requirements. IMACLIM provides results on alternative fiscal policies.

The advanced model version represents in a state-of-the-art manner the infrastructure requirements of air, road, and public transport sectors, through better representation of investment, maintenance and operation costs and incorporation of capacity constraints.

WITCH model has participated in EU funded research projects (e.g. ADVANCE, LIMITS, AMPERE, RECIPE) and has published several articles in climate and energy related peer-reviewed journals.

WITCH contributes with the macroeconomic impacts of the climate policies and will focus on the evolution of the energy system, the related investment needs and abatement options, with a special focus on power supply and transport technology choices and related investments for capacity and infrastructure.

The advanced model version features an improved Light-Duty vehicles module, improved model constraints for the integration of variable renewable energy technologies, and improved representation of electric and transport infrastructure.

IMAGE model has also a long experience of analysis of climate and energy policies with a special focus on land use polices and impacts. The IMAGE model has also contributed in IPCC Assessment Reports and has participated in major relevant EU policy and research projects (e.g. ADVANCE, GRP 2005, AMPERE, LIMITS, PATHWAYS) and has published several articles in peer-reviewed journals.

IMAGE model contributes to the analysis with results related to the transformation of the energy system, to land use changes and deforestation impacts, to energy affordability and overall GDP impacts.

The advance model version features an improved representation of energy demand in cement industry and in Light-Duty Vehicles as well as improvements in supply from variable renewable energy technologies (e.g. region-specific load duration curves, early retirement of capacity option, merit order dispatching). The updated model version also enables a detailed analysis of energy-related water demand in the electricity, industry and municipal sectors.

Appendix 6.3.4 – ADVANCE WP6/Task 1.4 Policy scenario protocol: Third round

Authors[16]: Zoi Vrontisi, Gunnar Luderer, Bert Saveyn

The scope of this exercise is to demonstrate the improved suitability of the models that participate in ADVANCE project for the assessment of climate and energy policies. The selected set of scenarios are highly relevant to the current policy debate and are a direct follow-up of the Paris COP21 agreement by providing a first multi-model assessment of the implications of the recent agreement. Moreover, the scenarios will attempt to highlight the relevant area of application and the value added of each improved model by assessing a variety of policy impacts.

Brief description of policy scenarios

The following matrix scenarios are summarizes the policy scenarios:

Policy dimension		Long-term CO2 budget (2011-2100 cumulated)			
	None	1600	1000	400	CO2 price
No Policy	NoPOL				
Reference	REF				
INDCforever	INDC				
INDC2030		INDC2030_1600	INDC2030_1000	INDC2030_400	2030_CO2price_DEF
INDC2020		INDC2020_1600	INDC2020_1000	INDC2020_400	2020_CO2price_High

Red ink marks scenarios that are new or modified compared to the last submission. Please note that we agreed to use 1600 as the higher CO2 budget, instead of 1800 used in the previous round.

The **No-policy** scenario (optional) shall be used only as a reference to support our comprehension of results across models and teams may also use it for the calculation of emission reduction targets that are expressed in relation to BAU. The **No-policy** scenario will not be included in the Deliverable and Final Reports.

The **Reference** scenario describes an energy, climate and economy projection without any new climate policies beyond those implemented and pledged before the announcement of INDCs. The Reference scenario assumes the implementation of the existing climate policies in a realistic manner and assumes a continuation of low ambition policies in the post-2020 period that do not largely increase the rate of improvement of emission intensities. Depending on the evolution of current implementation of existing policies, some countries may achieve their 2020 Copenhagen pledges, while for others the plausibility

[16] The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission

considerations lead to weaker emission reductions than those pledged (similar to the approaches of the AMPERE weak climate policy reference scenario and the Current policies scenario of the “Enhanced Policy scenarios for major emitting countries” report). The Reference scenario will serve as a point of comparison for all WP6 Policy scenarios, thus policy costs should be calculated relative to the Reference scenario.

The **INDCforever** scenario assumes implementation of the INDCs by 2030, but no further intensification of emission reduction commitments for 2030 beyond the INDCs. This scenario also assesses the continuation of the implied ambition level beyond 2030 by assuming that each country continues to reduce its emissions intensity at the rate the INDC indicated for the period 2020-2030, thus assumes a continuation of fragmented and highly diversified action. However, the focus of our analysis for this scenario shall be year 2030 which is the target year of most submitted INDCs. The INDCforever scenario does not represent an intensification of efforts toward the achievement of the 1.5-2°C target as envisioned by the Paris agreement, but rather the floor of ambition implied by the INDCs submitted until the end of 2015. It thus represents a scenario of moderate, fragmented action in which the commitments made in the INDCs are realized, but where the international community fails to ratchet-up 2030 targets and increase long-term ambition relative to the effort implied by the INDCs. This scenario will serve as a point of comparison for the 1.5°C and 2°C scenarios.

The **INDC2030** explores the feasibility of 1.5-2°C-limits from INDC-based near-term pathways in a global cost-effective way, while the **INDC2020** scenario explores the feasibility of the same long-term goals by starting from today’s polices and developing emission trajectories in line with 1.5-2°C in the most cost-effective way, allowing also for an overshooting of INDC targets. These pathways are composed of two distinct phases: in the first phase until 2020 (INDC2020) or 2030 (INDC2030), they follow the developments of the INDCforever scenario (i.e. achieving the current policies included in the Reference for year 2020 for scenario INDC2020 and the INDC targets for scenario INDC2030). Thereafter, they assume stylized, comprehensive climate policies (CO2 prices equalized across regions and sectors) limiting cumulative 2011-2100 CO2 budgets as indicated in the table in line with long-term stabilization in the 1.5-2°C range. The same CO2-price in CO2-equivalent terms shall be applied to non-CO2 greenhouse gases to ensure comparable mitigation efforts across gases. Teams are requested to attempt all scenarios, and to also report scenarios that are infeasible due to the tight emissions constraint.

2020_CO2price_High is a surrogate for models that cannot run INDC2020_400 scenario. Instead of pursuing a CO2 budget, the models should apply the CO2-Price from *INDC2020_1000* multiplied by a factor of 4. As in *INDC2020_1000* the scenario should be fixed to the *INDCforever* scenario until 2020. This scenario will be used to explore the lower limit of emissions abatement.

2030_CO2price_DEF is a scenario to study carbon lock-in effect. After 2030, models should apply the same CO2-Price as in *INDC2020_1000*. Until 2030, the scenario should be fixed to the *INDCforever* scenario as in *INDC2030_1000/1600* scenarios. This scenario will be used to study carbon lock-in by comparing emissions differences relative to the *INDC2020_1000* scenario.

General specifications for all scenarios

The general specifications are identical to the Reference scenario ones given in [WP6 Reference scenario protocol_Nov2015.docx]. For convenience, a summary of the general specifications is also given below:

- Time horizon: 2005-2050, 10 year intervals and optional 5 year intervals (the analysis will focus on 2030 and 2005-2050, but models with longer time horizons are encouraged to submit data out to 2100)

- Regions: There are two sets of common comparison regions for the WP6 scenarios:
  - an indicative mapping with the 5 RCP regions and the 10 key regions that appear in the LIMITS database is given in [ADVANCE_WP6_Reference_Data_09122015_corrected.xlsx]
  - Common predefined WP6 regions (WP6 allows for model specific regions but we strongly suggest to provide also results for the above set of common predefined regions):
    - World, EU28, Brazil, Japan, Russia, China, India, USA, Indonesia, Canada, Mexico, Australia, South Korea (Republic of Korea), Middle_East and Africa (regions defined in the LIMITS database and in [ADVANCE_WP6_Reference_Data_09122015_corrected])
- Population projections according to SSP2
- GDP projections according to SSP2 or according to GECO+[17].
- Carbon price ceiling: If the carbon value of low-income and lower-middle income[18] countries exceeds 25% of the EU carbon price then the emission reduction constraint should be relaxed so as to get a carbon value of around 25% of the EU price in lower-income country, or 40% in the case of lower-middle income countries. For macro-regions grouping countries of different income levels, this rule should be applied based on the majority of the population represented.

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[17] https://ec.europa.eu/jrc/en/news/geco-road-paris-study-published

[18] According to the World Bank for the current 2016 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the *World Bank Atlas* method, of $1,045 or less in 2014; middle-income economies are those with a GNI per capita of more than $1,045 but less than $12,736; high-income economies are those with a GNI per capita of $12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4,125. ADVANCE WP6 does not use GNI but GDP levels, hence teams can identify low-income and lower-middle income countries in the relevant table of World Bank and assume no change of this classification until 2050.

Submission of results

Teams shall submit their results to the IIASA ADVANCE WP6 database (https://tntcat.iiasa.ac.at/ADVANCEWP6DB). The submission procedure is identical to the one of other ADVANCE WPs.

Please use the updated data template as of July 22nd, 2016. New variables are marked in red. Please note that N2O emissions were reverted back to ktN2O instead of MtN2O to ensure consistency with date templates used in other projects. Please not that we also increased the priorization for some key sectoral variables to "mandatory" (also marked in red).

Submission deadline for updated scenarios is September 1st, 2016.

Summary of files provided:

[WP6 Reference scenario protocol_Nov2015.docx]: Reference scenario detailed protocol

[GECO+_SSP2_GDP_Emissions_28102015.xlsx]: comparison of GECO+ Reference scenario with SSP2 Reference scenarios: GDP, Population, GDP per capita, and Emission intensity

[GECO+_LIMITS_GDP_Emission_28102015.xlsx]: comparison of GECO+ Reference scenario with LIMITS Reference scenarios: GDP, Emissions, Emission intensity

[ADVANCE_WP6_Reference Policies 2020_09122015.xlsx]: 2020 policies considered in the GECO+ Reference scenario (energy policies, emission policies) that can be introduced in a bottom-up manner to all participating models

[ADVANCE_WP6_Reference_Data_09122015_corrected]: Detailed outputs from GECO+, on GDP and emissions that provide the trajectories for emission intensity rates and serve as scenario assumptions post-2020 as instructed in [WP6 Reference scenario protocol_Nov2015.docx]

[ADVANCE_WP6_template_10022016.xlsx]: template for data submission

[JRC-IPTS_INDCsdatabase_08032016.xlsx]: a comprehensive listing of all relevant policies included in the INDCs

[ADVANCE_WP6_INDCforever_Data_08032016.xlsx]: Detailed results of the INDCforever scenario from POLES model that serve as reference for the trajectories for emission intensity rates beyond 2030

[ADVANCE WP6 Policy scenarios_08032016.xlsx]: current document consisting of detailed assumptions and instructions for submission of the WP6 Policy scenarios

[ADVANCE-INDC-CO2-long-term-trajectories.xlsx]: emission trajectories for the INDC2020 and INDC2030 scenarios

Detailed specification of the Reference policy scenario

The instructions below are taken from [WP6 Reference scenario protocol_Nov2015.docx].

Implementation of Policies to 2020:

- Teams implement the technology and emissions targets described in the *[ADVANCE_WP6_Reference Policies 2020_09122015.xlsx]*. Higher priority is given to the emission targets. Energy system targets are given in the "2020_Energy" tab for specified countries. Emission or emission intensity reduction targets are given in the "2020_Emi" tab. In order to produce a realistic reference description of emission projections and the energy system in 2020, considering also that the publication of the scenario analysis will take place only few years prior to 2020, some countries do not fully comply with the announced targets. Models are thereby asked to take into consideration and implement the targets according to the "Comments" and to the "2020 ADVANCE Reference vs BY/BAU" and "ADVANCE Reference at target year" columns of the "2020_Emi" and "2020_Energy" sheets. In particular, if pledges are not reached as indicated in the "Comments" column, models are expected to reach the level of ambition indicated in the "2020 ADVANCE Reference vs BY/BAU" column.
- Since no Business As Usual (no policies, BAU) scenario has been specified in WP6, teams are asked to implement the emission reduction targets that are expressed in terms of a BAU scenario, as seen in the "Base Year" column of the "2020_Emi" sheet in *[ADVANCE_WP6_Reference Policies 2020_09122015.xlsx]*, as a reduction from the BAU emission levels provided in the "BY/BAU emissions" column of this excel sheet. For example, taking into consideration the above, Mexico in 2020 should implement a 14% reduction of the 960Mt of the 2020 BAU emissions.
- No emissions constraints should be implemented for regions that do not have any specific target on emissions.
- Regional Aggregation or disaggregation: Overall, data (absolute levels and growth rates) has been provided for 39 separate regions so as to enable teams to adjust to their model regions in an accurate manner.
- In case that the target provided in *[ADVANCE_WP6_Reference Policies 2020_09122015.xlsx]* refers to a sub-region of a model region, then teams should apply the following target to the model region: If sub-region has target ER% (compared to base-year or baseline) and the sub-region's 2005 emissions represent X% of the model region's emissions, then the target of the model region would be ER%*X%.
- In case the target provided in *[ADVANCE_WP6_Reference Policies 2020_09122015.xlsx]* is for a region that is an aggregate of model regions, then each model region should implement the target of the bigger aggregate region.

Implementation of Policies Post-2020:

- Models implement the emission intensity improvements that appear in *[*ADVANCE_WP6_Reference_Data_09122015_corrected*]* for the periods of 2020-2030 and 2030-2050.
- If model regions differ from those of the *[ADVANCE_WP6_Reference_Data_09122015.xlsx]*, teams are encouraged to use the data provided for 39 separate regions and/or countries in order to aggregate or disaggregate accordingly. In particular it is advised:
    - In case the .xlsx region is a sub-region of a model region, teams should aggregate to the model region by summing the GDP of all sub-regions and the emissions of all sub-regions' post-2020, as those are given in absolute levels in the

*[*ADVANCE_WP6_Reference_Data_09122015_corrected*]*, so as to calculate the emission intensity of the model region.
  - In case the .xlsx region is an aggregate of model regions, then each model region should implement the emission intensity reduction rate of the bigger aggregate region.
- Harmonization of emission intensity growth rates has different tiers:
  - Average growth rates of Emissions intensity|Kyoto excl. Land Use for the two specified periods (2020-2030, 2030-2050) are of high priority and should not deviate more than ±5% of the specified values in the [ADVANCE_WP6_Reference_Data_09122015_corrected.xlsx] as described above,
  - Average growth rates of Emissions intensity|CO2|Fossil Fuels and Industry for the two specified periods (2020-2030, 2030-2050) should not deviate more than ±10%of the specified values in the *[*ADVANCE_WP6_Reference_Data_09122015_corrected.*xlsx]* as described above,
  - Emissions intensity|Kyoto gases may differ depending on the model coverage on Land use emissions.
- *[*ADVANCE_WP6_Reference_Data_09122015_corrected.xlsx*]* also provides the evolution of sectoral emissions in the Reference scenario that models with sectoral detail (e.g. CGEs) can use for their calibration of the reference. Other models can use this input as a benchmark in order to identify big discrepancies and highlight them.
- If the carbon value that corresponds to the prescribed Reference emission reduction of low-income and lower-middle income[19] countries exceeds 25% of the EU carbon price then the emission reduction constraint should be relaxed so as to lower the carbon value to the prescribed level of 25% of the EU price.

Additional Notes: Following the comments and questions received by the teams regarding the WP6 Reference protocol, please take into consideration:

- Harmonization of the rate of growth of emissions intensity should be implemented for all model regions according to the instructions above.
- Please do not considered the level of carbon prices mentioned in [ADVANCE_WP6_Reference Policies 2020_09122015.xlsx] in the “Comments” column of the 2020_Emi sheet but only the level of emission reductions as given in the “2020 ADVANCE Reference vs BY/BAU” column (see above for the description of implementation of policies for 2020).
- As described above, population data should be taken from the SSP2 projections or [ADVANCE_WP6_Reference_Data_09122015_corrected.xlsx], in line with the data source used for GDP projections.
- Aggregation/disaggregation of regions for the implementation of emission reduction targets should be applied as described above and be based on historical 2005 emission levels. However, aggregation of WP6 database regions for the application of emission intensity reduction rates should be based on GDP and emission levels provided in the [ADVANCE_WP6_Reference_Data_09122015_corrected.xlsx] as described above.

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[19] According to the World Bank for the current 2016 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the *World Bank Atlas* method, of $1,045 or less in 2014; middle-income economies are those with a GNI per capita of more than $1,045 but less than $12,736; high-income economies are those with a GNI per capita of $12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4,125. ADVANCE WP6 does not use GNI but GDP levels, hence teams can identify low-income and lower-middle income countries in the relevant table of World Bank and assume no change of this classification until 2050.

Detailed specification of the INDCforever policy scenario

Implementation of Policies to 2020:

The policy framework that was set in COP21 is only relevant to the post-2020 period. Up to 2020 results should be identical to those of the WP6 Reference scenario for all regions and sectors.

Implementation of Policies 2020-2030:

Teams implement the emission reduction targets as those are described in the INDCs which were submitted by each party. In addition to emission reduction targets, teams implement any other quantifiable energy or sector-related targets as those are presented in the INDCs. For those countries that have submitted two levels of INDCs, an unconditional and a conditional one, teams should introduce the conditional levels, i.e. the more ambitious, so as to provide the upper end of INDC impacts on the economy and the energy system.

All relevant policies included in the INDCs have been collected in [JRC-IPTS_INDCsdatabase_080032016.xlsx]. This database includes mainly the targets that refer to countries with >0.1% of global 2010 emissions and some countries with <0.1% of global 2010 emissions that have submitted quantifiable targets.

The **[JRC-IPTS_INDCsdatabase_080032016.xlsx]** can be used as follows:

- For convenience and consistency among all teams, all INDC targets have been expressed in relation to 2010 emissions in column AB of INDC_emi sheet. The above is not available for Ecuador, Philippines, Algeria and Central African Republic since their BAU (point of reference for the INDC) is not provided in the respective document and these countries are not individually represented in POLES model. However, teams that may have a BAU scenario for those individual countries are welcome to use it.
- INDCs that include emission intensity targets have been quantified for both GECO/WP6 Reference GDP levels (column AB of INDC_emi sheet) and for SSP2 OECD GDP levels (column AC).
- INDCs that have a target year different from 2030 have been projected to 2030 with POLES model and have been provided both for the INDC target year (column AB of INDC_emi sheet) and for 2030 as a target year (column AD).
- INDCs that are expressed in relation to a BAU scenario which is not explicitly provided in the INDC document have been calculated in relation to the WP6 Reference emission levels (see WP6 in column M of INDC_emi sheet). Teams may use their own BAU scenario if available.
- Relevant sectoral or energy-related targets of the INDCs are given in sheet "INDC_Other" and should be introduced to the participating models.
- No emissions constraints should be implemented for regions that do not have any specific target on emissions.
- Emission reduction targets have been provided for 63 countries in "INDC_emi" sheet. Teams are advised to base their implementation on the emissions indexed to 2010 as provided in column AB (or AC, AD) as described above. To aggregate country-level INDC emission targets from to their model-specific macro-regions, teams should calculate the combined emissions index as

$$\overline{EI}^{INDC} = \frac{\bar{E}_{2030}^{INDC}}{\bar{E}_{2010}} = \frac{1}{\bar{E}_{2010}} \left(\sum_{i\,w/\,target} E_{i,2010}\ EI_i^{INDC} + \sum_{i\,w/o\,target} E_{i,2010}\ \overline{EI}_{2030}^{BAU} \right)$$

where the sums run over countries *i* with and without an INCD emissions target, respectively, and $\overline{EI}_{2030}^{BAU}$ refers to the emissions index of the macro-region observed in a no-policy baseline or in WP6 Reference scenario.

<u>Implementation of Policies 2030-2050:</u>

As described above, INDCforever scenario is a low ambition scenario of fragmented mitigation action thus for the period beyond 2030, teams are requested to implement an emission intensity reduction rate equal to that of the period 2020-2030 for all regions. The corresponding emission intensity reduction rates for 2030-2050 are provided in [ADVANCE_WP6_INDCforever_Data_08032016.xlsx] for 39 separate regions and/or countries in column T of “scen_data” sheet. Teams can aggregate emission reduction targets to their model-specific regional disaggregation.

- In case the region provided is a sub-region of a model region, teams should aggregate to the model region by summing the GDP of all sub-regions and the emissions of all sub-regions' post-2020, as those are given in absolute levels in the [ADVANCE_WP6_INDCforever_Data_08032016.xlsx] so as to calculate the emission intensity of the model region.
- In case the .xlsx region is an aggregate of model regions, then each model region should implement the emission intensity reduction rate of the bigger aggregate region.

Regarding the energy and sector related policies, teams are advised to continue the 2020-2030 trends for the post-2030 period.

Detailed specification of the INDC2030 and INDC2020 long-term carbon budget scenarios

The CO2 budgets apply to the 90-year period starting with the beginning of 2011 and ending with the end of 2100, including all CO2 emissions (Energy, other industrial processes and AFOLU).

INDC2020: keep results the same as in Reference/INDCforever up to 2020.
INDC2030: keep results the same as INDCforever up to 2030.

Post-2020 or post-2030 assume stylized, comprehensive climate policies (CO2 prices equalized across regions and sectors) limiting cumulative 2011-2100 CO2 budgets as indicated (1800, 1000, 400 CO2 cumulative 2011-2100). The same CO2-price in CO2-equivalent terms shall be applied to non-CO2 greenhouse gases to ensure comparable mitigation efforts across gases. Teams are requested to attempt all scenarios, and to also report scenarios that are infeasible due to the tight emissions constraint.

For models that require a trajectory of CO2 emissions for the post-2030 period, the file "ADVANCE-INDC-CO2-long-term-trajectories.xlsx" provides indicative CO2 emissions (both total and FFI) in 5 year time step resolution from REMIND. If you use this trajectories, please adjust the post-2030 trajectories for higher or lower CO2 emissions 2011-2030 in your model, and/or if your model time step representation is not identical to that of REMIND (in REMIND, "2010" represents the years 2008-2012), so that the 2011-2100 CO2 total budges match the required values (400, 1000 or 1800 Mt). For REMIND, the scenario INDC2030_400 is not feasible, so no indicative trajectory can be provided.

Appendix 6.3.5 – ADVANCE Data Template

Authors[20]: Zoi Vrontisi, Gunnar Luderer, Bert Saveyn

[20] The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission

General Instructions

1. You must report data for 2005, 2010, 2020, 2030, etc. We can also accept data for intermediate future years (e.g., 2035), but note that these may not be taken into account in the analysis, because of lack of comparability between scenarios. You should also provide data for a base year, if your base year is not 2005. In that case, insert a column with the base year in the first row or modify the year of the 2005 column.

2. Do not change any variable names or add any variable categories as these will not be accepted by the automated database system that the template should be submitted to.

3. If your model has global coverage, please submit a global data set with the region identifier "World" (capitalization is important) in addition to your native model regions.

4. Please submit all time-series data for all regions and scenarios on either a single "data" worksheet or, e.g. if you exceed the Excel row limitation, use multiple sheets which have to start with "data" (e.g., "data2", "data3"). There are many fields that a model may not produce, for example, only a subset of models break out offshore wind. In this case, do not fill in the row with a zero, but either write "N/A" into the field or do not include the variable in your submission at all.

Data should be submitted via the IIASA ADVANCE diagnostics web portal (https://tntcat.iiasa.ac.at/ADVANCEWP6DB) by 21/2/2016.

If you have questions or comments about the template, please contact the WP6 team (Zoi and Bert) at wp6.advance@gmail.com

Please note that the database does not require that the fields be in any particular order. This may prove advantageous if you do not want to substantially alter the alogorithms you used to link output data to the template in the previous round.

Notes/Instructions
Please consult the study protocol for the full specification of the diagnostics scenarios. Scenario names used in the data submission need to match the naming convention in the diagnostics protocol.
On this tab you provide numerical scenario results as time series. Data should be reported for each region in your model and each scenario you are submitting. It is important that the same spelling and capitalization of model and region names are used as in the model registration form that was submitted prior to submitting scenario data. Scenario names used in the data submission need to match the naming convention in the diagnostics protocol. There may be categories of data that are not available in your model, please mark these rows with N/A or omit the variables altogether. Please fill in data for any historical years included in your model. For example, if the base year is 2004, you should add a column for 2004. Variables are categorized into three tiers:
This tab provides definitions and reporting conventions for each variable in the data template. Variables include relevant variables from WP1 diagnostics exercise, other variables from other WPs and new variables. Variable names used in WP1 and other WPs have been updated according to IAMC upcoming template. For your convenience old variable names are provided in column E where relevant. Column A indicates the priority status of each variable, which is explained as below: -Mandatory data fields : all teams should submit -Recommended data fields : necessary information for the policy assessment, teams that can provide these resutls should submit to be included in relevant alaysis - Optional data fields : Addittional information to be used for the analysis. Also variables taken from exercises of other WPs are inlcuded here and should be provided by models that have participated in the relevant modelling exercises of the respective WPs
On this tab, you should fill in any information you think is necessary for understanding your scenario data. In particular, if you have to deviate from the variable definition provided, you should note your definition here. For example, if your model uses a different sectoral aggregations than the ones described on the variable definitions tab, please document these deviations by including a comment for this specific variable. Another example relates to describing your method of converting to the specified monetary units. For example, which year's market exchange rates, which country's deflators in the intervening period from which source was used.
On this tab, you should fill in whether the reported data in input to the model (exogeneous) or output of the model (calculated endogenously). This information should be provided for the base year and for projected years.

Please follow instructions as given in [WP6 Reference Scenario protocol_Nov2015.docx]

post 2020 assumptions are given in [ADVANCE_WP6_Reference_Data_09122015.xlsx]
policies for 2020 can be found in [ADVANCE_WP6_Reference Policies 2020_09122015.xlsx]

Data

Model	Status	Scenario	Region	Variable	Unit	2005 to 2100
	Mandatory			Population	million	
	Mandatory			GDP|MER	billion US$2005/yr	
	Mandatory			GDP|PPP	billion US$2005/yr	
	Mandatory			Primary Energy	EJ/yr	
	Mandatory			Primary Energy|Fossil	EJ/yr	
	Mandatory			Primary Energy|Fossil|w/ CCS	EJ/yr	
	Mandatory			Primary Energy|Fossil|w/o CCS	EJ/yr	
	Mandatory			Primary Energy|Coal	EJ/yr	
	Mandatory			Primary Energy|Coal|w/ CCS	EJ/yr	
	Mandatory			Primary Energy|Coal|w/o CCS	EJ/yr	
	Mandatory			Primary Energy|Oil	EJ/yr	
	Mandatory			Primary Energy|Oil|w/ CCS	EJ/yr	
	Mandatory			Primary Energy|Oil|w/o CCS	EJ/yr	
	Mandatory			Primary Energy|Gas	EJ/yr	
	Mandatory			Primary Energy|Gas|w/ CCS	EJ/yr	
	Mandatory			Primary Energy|Gas|w/o CCS	EJ/yr	
	Mandatory			Primary Energy|Biomass	EJ/yr	
	Mandatory			Primary Energy|Biomass|w/ CCS	EJ/yr	
	Mandatory			Primary Energy|Biomass|w/o CCS	EJ/yr	
	Recommended			Primary Energy|Biomass|Modern	EJ/yr	
	Recommended			Primary Energy|Biomass|Traditional	EJ/yr	
	Mandatory			Primary Energy|Nuclear	EJ/yr	
	Mandatory			Primary Energy|Non-Biomass Renewables	EJ/yr	
	Mandatory			Primary Energy|Hydro	EJ/yr	
	Mandatory			Primary Energy|Wind	EJ/yr	
	Mandatory			Primary Energy|Solar	EJ/yr	
	Mandatory			Primary Energy|Geothermal	EJ/yr	
	Mandatory			Primary Energy|Ocean	EJ/yr	
	Mandatory			Primary Energy|Secondary Energy Trade	EJ/yr	
	Mandatory			Primary Energy|Other	EJ/yr	
	Mandatory			Secondary Energy	EJ/yr	
	Mandatory			Secondary Energy|Electricity	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Coal	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Coal|w/ CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Coal|w/o CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Oil	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Oil|w/ CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Oil|w/o CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Gas	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Gas|w/ CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Gas|w/o CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Biomass	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Biomass|w/ CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Biomass|w/o CCS	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Nuclear	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Non-Biomass Renewables	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Hydro	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Solar	EJ/yr	
	Recommended			Secondary Energy|Electricity|Solar|PV	EJ/yr	
	Recommended			Secondary Energy|Electricity|Solar|CSP	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Wind	EJ/yr	
	Recommended			Secondary Energy|Electricity|Wind|Onshore	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Geothermal	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Ocean	EJ/yr	
	Mandatory			Secondary Energy|Electricity|Other	EJ/yr	
	Mandatory			Secondary Energy|Hydrogen	EJ/yr	
	Mandatory			Secondary Energy|Liquids	EJ/yr	
	Mandatory			Secondary Energy|Liquids|Biomass	EJ/yr	
	Recommended			Secondary Energy|Electricity|Wind|Offshore	EJ/yr	
	Recommended			Secondary Energy|Liquids|Biomass|w/ CCS	EJ/yr	
	Recommended			Secondary Energy|Liquids|Biomass|w/o CCS	EJ/yr	
	Mandatory			Secondary Energy|Liquids|Coal	EJ/yr	
	Recommended			Secondary Energy|Liquids|Coal|w/ CCS	EJ/yr	
	Recommended			Secondary Energy|Liquids|Coal|w/o CCS	EJ/yr	
	Mandatory			Secondary Energy|Liquids|Gas	EJ/yr	
	Recommended			Secondary Energy|Liquids|Gas|w/ CCS	EJ/yr	
	Recommended			Secondary Energy|Liquids|Gas|w/o CCS	EJ/yr	
	Mandatory			Secondary Energy|Liquids|Oil	EJ/yr	
	Mandatory			Secondary Energy|Liquids|Other	EJ/yr	
	Mandatory			Secondary Energy|Gases	EJ/yr	
	Mandatory			Secondary Energy|Gases|Natural Gas	EJ/yr	
	Mandatory			Secondary Energy|Gases|Biomass	EJ/yr	
	Mandatory			Secondary Energy|Gases|Coal	EJ/yr	
	Mandatory			Secondary Energy|Gases|Other	EJ/yr	
	Mandatory			Secondary Energy|Solids	EJ/yr	
	Mandatory			Secondary Energy|Solids|Coal	EJ/yr	
	Mandatory			Secondary Energy|Solids|Biomass	EJ/yr	
	Mandatory			Secondary Energy|Heat	EJ/yr	
	Mandatory			Secondary Energy|Other Carrier	EJ/yr	

Model	Status	Scenario	Region	Variable	Unit	2005 to 2100
	Mandatory			Final Energy	EJ/yr	
	Mandatory			Final Energy|Industry	EJ/yr	
	Recommended			Final Energy|Industry|Energy Intensive	EJ/yr	
	Recommended			Final Energy|Residential and Commercial and AFOFI	EJ/yr	
	Mandatory			Final Energy|Residential and Commercial	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Liquids|Oil	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Liquids|Biomass	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Gases|Natural gas	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Electricity	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Hydrogen	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Solids|Solids|Coal	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Heat	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Lighting	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Lighting	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Heating	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Cooling	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Appliances	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Other	EJ/yr	
	Mandatory			Final Energy|Residential	EJ/yr	
	Mandatory			Final Energy|Commercial	EJ/yr	
	Mandatory			Final Energy|AFOFI	EJ/yr	
	Mandatory			Final Energy|Transportation	EJ/yr	
	Optional			Final Energy|Transportation|Aviation	EJ/yr	
	Optional			Final Energy|Transportation|Aviation|International	EJ/yr	
	Optional			Final Energy|Transportation|Aviation|Domestic	EJ/yr	
	Optional			Final Energy|Transportation|Road	EJ/yr	
	Optional			Final Energy|Transportation|Rail	EJ/yr	
	Optional			Final Energy|Transportation|Shipping	EJ/yr	
	Optional			Final Energy|Transportation|Shipping|International	EJ/yr	
	Optional			Final Energy|Transportation|Shipping|Domestic	EJ/yr	
	Optional			Final Energy|Transportation|Other Sector	EJ/yr	
	Optional			Final Energy|Transportation|Liquids|Oil	EJ/yr	
	Optional			Final Energy|Transportation|Liquids|Biomass	EJ/yr	
	Optional			Final Energy|Transportation|Gases|Natural Gas	EJ/yr	
	Optional			Final Energy|Transportation|Electricity	EJ/yr	
	Optional			Final Energy|Transportation|Hydrogen	EJ/yr	
	Recommended			Final Energy|Other Sector	EJ/yr	
	Mandatory			Final Energy|Solids	EJ/yr	
	Mandatory			Final Energy|Solids|Coal	EJ/yr	
	Mandatory			Final Energy|Solids|Biomass	EJ/yr	
	Recommended			Final Energy|Solids|Biomass|Traditional	EJ/yr	
	Mandatory			Final Energy|Liquids	EJ/yr	
	Mandatory			Final Energy|Gases	EJ/yr	
	Mandatory			Final Energy|Electricity	EJ/yr	
	Mandatory			Final Energy|Hydrogen	EJ/yr	
	Mandatory			Final Energy|Heat	EJ/yr	
	Mandatory			Final Energy|Geothermal	EJ/yr	
	Mandatory			Final Energy|Solar	EJ/yr	
	Mandatory			Final Energy|Other	EJ/yr	
	Mandatory			Emissions|CO2	Mt CO2/yr	
	Mandatory			Emissions|CO2|Energy|Supply	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Combustion	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Fugitive	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Electricity	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Heat	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Electricity and Heat	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Liquids	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Solids	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Gases	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Supply|Other Sector	Mt CO2/yr	
	Recommended			Emissions|CO2|Industrial Processes	Mt CO2/yr	
	Mandatory			Emissions|CO2|Energy|Demand	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Industry	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Industry|Energy Intensive	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Residential and Commercial and AFOFI	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Residential and Commercial	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Residential	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Commercial	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|AFOFI	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Aviation	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Aviation|International	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Aviation|Domestic	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Road, Rail and Domestic Shipping	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Road	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Rail	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Shipping	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Shipping|International	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Shipping|Domestic	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Transportation|Other Sector	Mt CO2/yr	
	Recommended			Emissions|CO2|Energy|Demand|Other Sector	Mt CO2/yr	
	Recommended			Emissions|CO2|AFOLU|Land	Mt CO2/yr	
	Recommended			Emissions|CO2|AFOLU|Agriculture	Mt CO2/yr	
	Recommended			Emissions|CO2|Waste	Mt CO2/yr	
	Recommended			Emissions|CO2|Other	Mt CO2/yr	

Model	Status	Scenario	Region	Variable	Unit	2005 to 2100
	Mandatory			Carbon Sequestration|CCS	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Biomass	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Fossil	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Industrial Processes	Mt CO2/yr	
	Recommended			Carbon Sequestration|Land Use	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Biomass|Energy|Demand|Industry	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Biomass|Energy|Supply	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Biomass|Energy|Supply|Electricity	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Biomass|Energy|Supply|Gases	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Biomass|Energy|Supply|Hydrogen	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Biomass|Energy|Supply|Liquids	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Biomass|Energy|Supply|Other	Mt CO2/yr	
	Optional			Carbon Sequestration|CCS|Fossil|Energy|Demand|Industry	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Fossil|Energy|Supply	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Fossil|Energy|Supply|Electricity	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Fossil|Energy|Supply|Gases	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Fossil|Energy|Supply|Hydrogen	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Fossil|Energy|Supply|Liquids	Mt CO2/yr	
	Recommended			Carbon Sequestration|CCS|Fossil|Energy|Supply|Other	Mt CO2/yr	
	Recommended			Carbon Sequestration|Other	Mt CO2/yr	
	Mandatory			Emissions|N2O	Mt N2O/yr	
	Mandatory			Emissions|CH4	Mt CH4/yr	
	Mandatory			Emissions|F-Gases	Mt CO2-equiv/yr	
	Optional			Emissions|Sulfur	Mt SO2/yr	
	Optional			Emissions|BC	Mt BC/yr	
	Optional			Emissions|OC	Mt OC/yr	
	Optional			Emissions|NOx	Mt NO2/yr	
	Optional			Emissions|CO	Mt CO/yr	
	Recommended			Emissions|PFC	kt CF4-equiv/yr	
	Recommended			Emissions|HFC	kt HFC134a-equiv/yr	
	Recommended			Emissions|SF6	kt SF6/yr	
	Recommended			Concentration|CO2	ppm	
	Recommended			Concentration|CH4	ppb	
	Recommended			Concentration|N2O	ppb	
	Recommended			Forcing	W/m2	
	Recommended			Forcing|Kyoto Gases	W/m2	
	Recommended			Temperature|Global Mean	°C	
	Recommended			Emissions|N2O|Energy|Demand	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Industry	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Industry|Energy Intensive	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Residential and Commercial and AFOFI	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Residential and Commercial	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Residential	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Commercial	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|AFOFI	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Transportation	Mt N2O/yr	
	Optional			Emissions|N2O|Energy|Demand|Transportation|Aviation	Mt N2O/yr	
	Optional			Emissions|N2O|Energy|Demand|Transportation|Road	Mt N2O/yr	
	Optional			Emissions|N2O|Energy|Demand|Transportation|Rail	Mt N2O/yr	
	Optional			Emissions|N2O|Energy|Demand|Transportation|Shipping	Mt N2O/yr	
	Optional			Emissions|N2O|Energy|Demand|Transportation|Other Sector	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Demand|Other Sector	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Combustion	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Fugitive	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Electricity	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Heat	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Electricity and Heat	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Liquids	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Solids	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy|Supply|Gases	Mt N2O/yr	
	Recommended			Emissions|N2O|Industrial Processes	Mt N2O/yr	
	Recommended			Emissions|N2O|Product Use	Mt N2O/yr	
	Recommended			Emissions|N2O|Energy, Industrial Processes and Product Use	Mt N2O/yr	
	Recommended			Emissions|N2O|AFOLU	Mt N2O/yr	
	Optional			Emissions|N2O|AFOLU|Biomass Burning	Mt N2O/yr	
	Optional			Emissions|N2O|AFOLU|Agriculture	Mt N2O/yr	
	Optional			Emissions|N2O|AFOLU|Land	Mt N2O/yr	
	Recommended			Emissions|N2O|Waste	Mt N2O/yr	
	Recommended			Emissions|N2O|Other	Mt N2O/yr	
	Optional			Emissions|CH4|Energy Supply and Demand	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Industry	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Industry|Energy Intensive	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Residential and Commercial and AFOFI	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Residential and Commercial	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Residential	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Commercial	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|AFOFI	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Transportation	Mt CH4/yr	
	Optional			Emissions|CH4|Energy|Demand|Transportation|Aviation	Mt CH4/yr	
	Optional			Emissions|CH4|Energy|Demand|Transportation|Road	Mt CH4/yr	
	Optional			Emissions|CH4|Energy|Demand|Transportation|Rail	Mt CH4/yr	
	Optional			Emissions|CH4|Energy|Demand|Transportation|Shipping	Mt CH4/yr	
	Optional			Emissions|CH4|Energy|Demand|Transportation|Other Sector	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Demand|Other Sector	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Combustion	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Fugitive	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Electricity	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Heat	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Electricity and Heat	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Liquids	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Solids	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy|Supply|Gases	Mt CH4/yr	
	Recommended			Emissions|CH4|Industrial Processes	Mt CH4/yr	
	Recommended			Emissions|CH4|Product Use	Mt CH4/yr	
	Recommended			Emissions|CH4|Energy, Industrial Processes and Product Use	Mt CH4/yr	
	Recommended			Emissions|CH4|AFOLU	Mt CH4/yr	
	Optional			Emissions|CH4|AFOLU|Biomass Burning	Mt CH4/yr	
	Optional			Emissions|CH4|AFOLU|Agriculture	Mt CH4/yr	
	Optional			Emissions|CH4|AFOLU|Land	Mt CH4/yr	
	Optional			Emissions|CH4|Waste	Mt CH4/yr	
	Optional			Emissions|CH4|Other	Mt CH4/yr	
	Optional			Emissions|Sulfur|Energy Supply and Demand	Mt SO2/yr	
	Optional			Emissions|Sulfur|Land Use	Mt SO2/yr	
	Optional			Emissions|BC|Energy Supply and Demand	Mt BC/yr	
	Optional			Emissions|BC|Land Use	Mt BC/yr	
	Optional			Emissions|OC|Energy Supply and Demand	Mt OC/yr	
	Optional			Emissions|OC|Land Use	Mt OC/yr	
	Optional			Emissions|VOC	Mt VOC/yr	
	Optional			Emissions|NH3	Mt NH3/yr	

Model	Status	Scenario	Region	Variable	Unit	2005 to 2100
	Optional			Forcing|AN3A	W/m2	
	Optional			Forcing|Montreal Gases	W/m2	
	Optional			Forcing|CO2	W/m2	
	Optional			Forcing|CH4	W/m2	
	Optional			Forcing|N2O	W/m2	
	Optional			Forcing|F-Gases	W/m2	
	Optional			Forcing|Aerosol	W/m2	
	Optional			Forcing|Tropospheric Ozone	W/m2	
	Optional			Forcing|Albedo Change and Mineral Dust	W/m2	
	Optional			Forcing|Other	W/m2	
	Mandatory			Consumption	billion US$2005/yr	
	Recommended			Consumption|Industry	billion US$2005/yr	
	Recommended			Consumption|Industry|Energy Intensive	billion US$2005/yr	
	Recommended			Consumption|Commercial	billion US$2005/yr	
	Recommended			Consumption|AFOFI	billion US$2005/yr	
	Recommended			Consumption|Transportation	billion US$2005/yr	
	Recommended			Consumption|Other sector	billion US$2005/yr	
	Recommended			Production|Industry	billion US$2005/yr	
	Recommended			Production|Industry|Energy Intensive	billion US$2005/yr	
	Recommended			Production|Commercial	billion US$2005/yr	
	Recommended			Production|AFOFI	billion US$2005/yr	
	Recommended			Production|Transportation	billion US$2005/yr	
	Recommended			Production|Other sector	billion US$2005/yr	
	Recommended			Value Added|Industry	billion US$2005/yr	
	Recommended			Value Added|Industry|Energy Intensive	billion US$2005/yr	
	Recommended			Value Added|Commercial	billion US$2005/yr	
	Recommended			Value Added|AFOFI	billion US$2005/yr	
	Recommended			Value Added|Transportation	billion US$2005/yr	
	Recommended			Value Added|Other sector	billion US$2005/yr	
	Mandatory			Policy Cost|Default for CAV	billion US$2005/yr	
	Mandatory			Policy Cost|Area under MAC Curve	billion US$2005/yr	
	Mandatory			Policy Cost|GDP Loss	billion US$2005/yr	
	Mandatory			Policy Cost|Consumption Loss	billion US$2005/yr	
	Mandatory			Policy Cost|Equivalent Variation	billion US$2005/yr	
	Mandatory			Policy Cost|Additional Total Energy System Cost	billion US$2005/yr	
	Mandatory			Policy Cost|Other	billion US$2005/yr	
	Mandatory			Price|Carbon	US$2005/tCO2	
	Recommended			Price|Primary Energy|Oil	US$2005/GJ	
	Recommended			Price|Primary Energy|Gas	US$2005/GJ	
	Recommended			Price|Primary Energy|Coal	US$2005/GJ	
	Optional			Price|Primary Energy|Biomass	US$2005/GJ	
	Recommended			Price|Secondary Energy|Electricity	US$2005/GJ	
	Optional			Price|Secondary Energy|Liquids	US$2005/GJ	
	Optional			Price|Secondary Energy|Solids	US$2005/GJ	
	Optional			Price|Secondary Energy|Gases	US$2005/GJ	
	Optional			Price|Secondary Energy|Hydrogen	US$2005/GJ	
	Mandatory			Price|Final Energy|Industry|Electricity	US$2005/GJ	
	Mandatory			Price|Final Energy|Industry|Gases|Natural Gas	US$2005/GJ	
	Mandatory			Price|Final Energy|Industry|Liquids|Oil	US$2005/GJ	
	mandatory			Price|Final Energy|Industry|Solids|Coal	US$2005/GJ	
	Recommended			Price|Final Energy|Residential and Commercial|Electricity	US$2005/GJ	
	Recommended			Price|Final Energy|Residential and Commercial|Gases|Natural Gas	US$2005/GJ	
	Recommended			Price|Final Energy|Residential and Commercial|Liquids|Oil	US$2005/GJ	
	Recommended			Price|Final Energy|Residential and Commercial|Solids|Coal	US$2005/GJ	
	Recommended			Price|Final Energy|Transportation|Liquids|Oil	US$2005/GJ	
	Optional			Final Energy|Industry|Solids	EJ/yr	
	Optional			Final Energy|Industry|Liquids	EJ/yr	
	Optional			Final Energy|Industry|Gases	EJ/yr	
	Optional			Final Energy|Industry|Electricity	EJ/yr	
	Optional			Final Energy|Industry|Hydrogen	EJ/yr	
	Optional			Final Energy|Industry|Heat	EJ/yr	
	Optional			Final Energy|Industry|Other	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Solids	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Solids|Coal	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Solids|Biomass	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Liquids	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Gases	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Electricity	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Hydrogen	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Heat	EJ/yr	
	Optional			Final Energy|Residential and Commercial|Other	EJ/yr	
	Optional			Final Energy|Transportation|Liquids	EJ/yr	
	Optional			Final Energy|Transportation|Liquids|Oil	EJ/yr	
	Optional			Final Energy|Transportation|Liquids|Biomass	EJ/yr	
	Optional			Final Energy|Transportation|Liquids|Coal	EJ/yr	
	Optional			Final Energy|Transportation|Gases	EJ/yr	
	Optional			Final Energy|Transportation|Hydrogen	EJ/yr	
	Optional			Final Energy|Transportation|Electricity	EJ/yr	
	Optional			Final Energy|Transportation|Other	EJ/yr	
	Optional			Final Energy|Other Sector|Solids	EJ/yr	
	Optional			Final Energy|Other Sector|Solids|Coal	EJ/yr	
	Optional			Final Energy|Other Sector|Solids|Biomass	EJ/yr	
	Optional			Final Energy|Other Sector|Liquids	EJ/yr	
	Optional			Final Energy|Other Sector|Gases	EJ/yr	
	Optional			Final Energy|Other Sector|Electricity	EJ/yr	
	Optional			Final Energy|Other Sector|Hydrogen	EJ/yr	
	Optional			Final Energy|Other Sector|Heat	EJ/yr	
	Optional			Final Energy|Other Sector|Other	EJ/yr	
	Optional			Energy Service|Residential and Commercial|Floor Space	bn m2/yr	
	Optional			Energy Service|Transportation|Passenger	bn pkm/yr	
	Optional			Energy Service|Transportation|Freight	bn tkm/yr	
	Optional			Trade|Primary Energy|Coal|Volume	EJ/yr	
	Optional			Trade|Primary Energy|Gas|Volume	EJ/yr	
	Optional			Trade|Primary Energy|Oil|Volume	EJ/yr	
	Optional			Trade|Primary Energy|Biomass|Volume	EJ/yr	
	Optional			Trade|Primary Energy|Coal|Value	billion US$2005/yr	
	Optional			Trade|Primary Energy|Gas|Value	billion US$2005/yr	
	Optional			Trade|Primary Energy|Oil|Value	billion US$2005/yr	
	Optional			Trade|Primary Energy|Biomass|Value	billion US$2005/yr	
	Optional			Trade|Exports|Value	billion US$2005/yr OR local currency/year	
	Optional			Trade|Imports|Value	billion US$2005/yr OR local currency/year	
	Optional			Trade|AFOFI	billion US$2005/yr	
	Optional			Trade|Industry	billion US$2005/yr	
	Optional			Trade|Industry|Energy Intensive	billion US$2005/yr	
	Optional			Trade|Transportation	billion US$2005/yr	
	Optional			Trade|Commercial	billion US$2005/yr	
	Optional			Trade|Other Sector	billion US$2005/yr	
	Optional			Employment	million	
	Optional			Employment|AFOFI	million	
	Optional			Employment|Industry	million	
	Optional			Employment|Industry|Energy Intensive	million	
	Optional			Employment|Transportation	million	
	Optional			Employment|Commercial	million	
	Optional			Employment|Other Sector	million	

Model	Status	Scenario	Region	Variable	Unit	2005 to 2100
	Optional			Resource|Cumulative Extraction|Gas|Conventional	EJ	
	Optional			Resource|Cumulative Extraction|Gas|Unconventional	EJ	
	Optional			Resource|Cumulative Extraction|Oil|Conventional	EJ	
	Optional			Resource|Cumulative Extraction|Oil|Unconventional	EJ	
	Optional			Investment|Energy Supply	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Fossil	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Fossil|w/ CCS	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Fossil|w/o CCS	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Non-fossil	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Non-fossil|Biomass	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Non-fossil|Nuclear	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables|Solar	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables|Wind	billion US$2005/yr	
	Optional			Investment|Energy Supply|Electricity|Other	billion US$2005/yr	
	Optional			Investment|Energy Supply|Extraction|Fossil	billion US$2005/yr	
	Optional			Investment|Energy Demand	billion US$2005/yr	
	Optional			Infrastructure Investment|Transportation|Road	billion US$2005/yr	
	Optional			Infrastructure Investment|Transportation|Aviation	billion US$2005/yr	
	Optional			Infrastructure Investment|Transportation|Rail	billion US$2005/yr	
	Optional			Infrastructure Investment|Transportation|Shipping|International	billion US$2005/yr	
	Optional			Land Cover	million Ha/yr	
	Optional			Land Cover|Cropland	million Ha/yr	
	Optional			Land Cover|Pasture	million Ha/yr	
	Optional			Land Cover|Forest	million Ha/yr	
	Optional			Land Cover|Other Land	million Ha/yr	
	Optional			Land Cover|Forest|Managed	million Ha/yr	
	Optional			Land Cover|Cropland|Energy Crops	million Ha/yr	
	Optional			Land Cover|Other Arable Land	million Ha/yr	
	Optional			Energy Service|Transportation|Passenger	billion pkm/yr	
	Optional			Energy Service|Transportation|Freight	billion tkm/yr	
	Optional			Energy Service|Transportation|Road	billion vkm/yr	
	Optional			Energy Service|Transportation|Passenger|Road	billion pkm/yr	
	Optional			Energy Service|Transportation|Passenger|Road|2W and 3W	billion pkm/yr	
	Optional			Energy Service|Transportation|Passenger|Road|LDV	billion pkm/yr	
	Optional			Energy Service|Transportation|Passenger|Road|Bus	billion pkm/yr	
	Optional			Energy Service|Transportation|Freight|Road	billion tkm/yr	
	Optional			Energy Service|Transportation|Aviation	billion vkm/yr	
	Optional			Energy Service|Transportation|Passenger|Aviation	billion pkm/yr	
	Optional			Energy Service|Transportation|Freight|Aviation	billion tkm/yr	
	Optional			Energy Service|Transportation|Rail	billion vkm/yr	
	Optional			Energy Service|Transportation|Passenger|Rail	billion pkm/yr	
	Optional			Energy Service|Transportation|Freight|Rail	billion tkm/yr	
	Optional			Energy Service|Transportation|Shipping|International	billion vkm/yr	
	Optional			Energy Service|Transportation|Passenger|Shipping|International	billion pkm/yr	
	Optional			Energy Service|Transportation|Freight|Shipping|International	billion tkm/yr	
	Optional			Energy Service|Transportation|Bicycling and Walking	billion pkm/yr	
	Optional			Water Consumption|Electricity	km3/yr	
	Optional			Water Consumption|Electricity|Biomass	km3/yr	
	Optional			Water Consumption|Electricity|Biomass|w/ CCS	km3/yr	
	Optional			Water Consumption|Electricity|Biomass|w/o CCS	km3/yr	
	Optional			Water Consumption|Electricity|Coal	km3/yr	
	Optional			Water Consumption|Electricity|Coal|w/ CCS	km3/yr	
	Optional			Water Consumption|Electricity|Coal|w/o CCS	km3/yr	
	Optional			Water Consumption|Electricity|Cooling Pond	km3/yr	
	Optional			Water Consumption|Electricity|Dry Cooling	km3/yr	
	Optional			Water Consumption|Electricity|Fossil	km3/yr	
	Optional			Water Consumption|Electricity|Fossil|w/ CCS	km3/yr	
	Optional			Water Consumption|Electricity|Fossil|w/o CCS	km3/yr	
	Optional			Water Consumption|Electricity|Gas	km3/yr	
	Optional			Water Consumption|Electricity|Gas|w/ CCS	km3/yr	
	Optional			Water Consumption|Electricity|Gas|w/o CCS	km3/yr	
	Optional			Water Consumption|Electricity|Geothermal	km3/yr	
	Optional			Water Consumption|Electricity|Hydro	km3/yr	
	Optional			Water Consumption|Electricity|Non-Biomass Renewables	km3/yr	
	Optional			Water Consumption|Electricity|Nuclear	km3/yr	
	Optional			Water Consumption|Electricity|Ocean	km3/yr	
	Optional			Water Consumption|Electricity|Oil	km3/yr	
	Optional			Water Consumption|Electricity|Oil|w/ CCS	km3/yr	
	Optional			Water Consumption|Electricity|Oil|w/o CCS	km3/yr	
	Optional			Water Consumption|Electricity|Once Through	km3/yr	
	Optional			Water Consumption|Electricity|Other	km3/yr	
	Optional			Water Consumption|Electricity|Sea Cooling	km3/yr	
	Optional			Water Consumption|Electricity|Solar	km3/yr	
	Optional			Water Consumption|Electricity|Solar|CSP	km3/yr	
	Optional			Water Consumption|Electricity|Solar|PV	km3/yr	
	Optional			Water Consumption|Electricity|Wet Tower	km3/yr	
	Optional			Water Consumption|Electricity|Wind	km3/yr	
	Optional			Water Withdrawal|Electricity	km3/yr	
	Optional			Water Withdrawal|Electricity|Biomass	km3/yr	
	Optional			Water Withdrawal|Electricity|Biomass|w/ CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Biomass|w/o CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Coal	km3/yr	
	Optional			Water Withdrawal|Electricity|Coal|w/ CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Coal|w/o CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Cooling Pond	km3/yr	
	Optional			Water Withdrawal|Electricity|Dry Cooling	km3/yr	
	Optional			Water Withdrawal|Electricity|Fossil	km3/yr	
	Optional			Water Withdrawal|Electricity|Fossil|w/ CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Fossil|w/o CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Gas	km3/yr	
	Optional			Water Withdrawal|Electricity|Gas|w/ CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Gas|w/o CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Geothermal	km3/yr	
	Optional			Water Withdrawal|Electricity|Hydro	km3/yr	
	Optional			Water Withdrawal|Electricity|Non-Biomass Renewables	km3/yr	
	Optional			Water Withdrawal|Electricity|Nuclear	km3/yr	
	Optional			Water Withdrawal|Electricity|Ocean	km3/yr	
	Optional			Water Withdrawal|Electricity|Oil	km3/yr	
	Optional			Water Withdrawal|Electricity|Oil|w/ CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Oil|w/o CCS	km3/yr	
	Optional			Water Withdrawal|Electricity|Once Through	km3/yr	
	Optional			Water Withdrawal|Electricity|Other	km3/yr	
	Optional			Water Withdrawal|Electricity|Sea Cooling	km3/yr	
	Optional			Water Withdrawal|Electricity|Solar	km3/yr	
	Optional			Water Withdrawal|Electricity|Solar|CSP	km3/yr	
	Optional			Water Withdrawal|Electricity|Solar|PV	km3/yr	
	Optional			Water Withdrawal|Electricity|Wet Tower	km3/yr	
	Optional			Water Withdrawal|Electricity|Wind	km3/yr	

Variable Definitions

<table>
<tr><th>Status</th><th>Variable</th><th>Unit</th><th>Definition</th></tr>
<tr><td>Mandatory</td><td>Population</td><td>million</td><td>total population</td></tr>
<tr><td>Mandatory</td><td>GDP|MER</td><td>billion US$2005/yr</td><td>GDP at market exchange rate</td></tr>
<tr><td>Mandatory</td><td>GDP|PPP</td><td>billion US$2005/yr</td><td>GDP converted to US $ using purchasing power parity</td></tr>
<tr><td>Mandatory</td><td>Primary Energy</td><td>EJ/yr</td><td>total primary energy consumption (direct equivalent)</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Fossil</td><td>EJ/yr</td><td>coal, gas, conventional and unconventional oil primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Fossil|w/ CCS</td><td>EJ/yr</td><td>coal, gas, conventional and unconventional oil primary energy consumption used in combination with CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Fossil|w/o CCS</td><td>EJ/yr</td><td>coal, gas, conventional and unconventional oil primary energy consumption without CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Coal</td><td>EJ/yr</td><td>coal primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Coal|w/ CCS</td><td>EJ/yr</td><td>coal primary energy consumption used in combination with CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Coal|w/o CCS</td><td>EJ/yr</td><td>coal primary energy consumption without CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Oil</td><td>EJ/yr</td><td>conventional & unconventional oil primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Oil|w/ CCS</td><td>EJ/yr</td><td>conventional & unconventional oil primary energy consumption used in combination with CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Oil|w/o CCS</td><td>EJ/yr</td><td>conventional & unconventional oil primary energy consumption without CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Gas</td><td>EJ/yr</td><td>gas primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Gas|w/ CCS</td><td>EJ/yr</td><td>gas primary energy consumption used in combination with CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Gas|w/o CCS</td><td>EJ/yr</td><td>gas primary energy consumption without CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Biomass</td><td>EJ/yr</td><td>consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Biomass|w/ CCS</td><td>EJ/yr</td><td>consumption used in combination with CCS</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Biomass|w/o CCS</td><td>EJ/yr</td><td>consumption without CCS</td></tr>
<tr><td>Recommended</td><td>Primary Energy|Biomass|Modern</td><td>EJ/yr</td><td>solid waste bioenergy</td></tr>
<tr><td>Recommended</td><td>Primary Energy|Biomass|Traditional</td><td>EJ/yr</td><td>traditional biomass primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Nuclear</td><td>EJ/yr</td><td>nuclear primary energy consumption (direct equivalent, includes electricity, heat and hydrogen production from nuclear energy)</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Non-Biomass Renewables</td><td>EJ/yr</td><td>solar electricity and heat and hydrogen, ocean energy)</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Hydro</td><td>EJ/yr</td><td>total hydro primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Wind</td><td>EJ/yr</td><td>total wind primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Solar</td><td>EJ/yr</td><td>total solar primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Geothermal</td><td>EJ/yr</td><td>total geothermal primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Ocean</td><td>EJ/yr</td><td>total ocean primary energy consumption</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Secondary Energy Trade</td><td>EJ/yr</td><td>synfuels, negative means net exports)</td></tr>
<tr><td>Mandatory</td><td>Primary Energy|Other</td><td>EJ/yr</td><td>this category in the 'comments' tab)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy</td><td>EJ/yr</td><td>total secondary energy - the sum of all secondary energy carrier production (for consistency checks)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity</td><td>EJ/yr</td><td>total net electricity production</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Coal</td><td>EJ/yr</td><td>net electricity production from coal</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Coal|w/ CCS</td><td>EJ/yr</td><td>net electricity production from coal with a CO2 capture component</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Coal|w/o CCS</td><td>EJ/yr</td><td>net electricity production from coal with freely vented CO2 emissions</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Oil</td><td>EJ/yr</td><td>net electricity production from refined liquids</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Oil|w/ CCS</td><td>EJ/yr</td><td>net electricity production from refined liquids with a CO2 capture component</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Oil|w/o CCS</td><td>EJ/yr</td><td>net electricity production from refined liquids with freely vented CO2 emissions</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Gas</td><td>EJ/yr</td><td>net electricity production from natural gas</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Gas|w/ CCS</td><td>EJ/yr</td><td>net electricity production from natural gas with a CO2 capture component</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Gas|w/o CCS</td><td>EJ/yr</td><td>net electricity production from natural gas with freely vented CO2 emissions</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Biomass</td><td>EJ/yr</td><td>net electricity production from municipal solid waste, purpose-grown biomass, crop residues, forest industry waste, biogas</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Biomass|w/ CCS</td><td>EJ/yr</td><td>component</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Biomass|w/o CCS</td><td>EJ/yr</td><td>emissions</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Nuclear</td><td>EJ/yr</td><td>net electricity production from nuclear energy</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Non-Biomass Renewables</td><td>EJ/yr</td><td>category for all the non-biomass renewables.</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Hydro</td><td>EJ/yr</td><td>net hydroelectric production</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Solar</td><td>EJ/yr</td><td>net electricity production from all sources of solar energy (e.g., PV and concentrating solar power)</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Electricity|Solar|PV</td><td>EJ/yr</td><td>net electricity production from solar photovoltaics (PV)</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Electricity|Solar|CSP</td><td>EJ/yr</td><td>net electricity production from concentrating solar power (CSP)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Wind</td><td>EJ/yr</td><td>net electricity production from wind energy (on- and offshore)</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Electricity|Wind|Onshore</td><td>EJ/yr</td><td>net electricity production from on-shore wind energy</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Geothermal</td><td>EJ/yr</td><td>net electricity production from all sources of geothermal energy (e.g., hydrothermal, enhanced geothermal systems)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Ocean</td><td>EJ/yr</td><td>net electricity production from all sources of ocean energy (e.g., tidal, wave, ocean thermal electricity generation)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Electricity|Other</td><td>EJ/yr</td><td>'comments' tab)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Hydrogen</td><td>EJ/yr</td><td>total hydrogen production</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Liquids</td><td>EJ/yr</td><td>total liquid fuel production</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Liquids|Biomass</td><td>EJ/yr</td><td>total liquid biofuels production</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Electricity|Wind|Offshore</td><td>EJ/yr</td><td>net electricity production from offshore wind energy</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Liquids|Biomass|w/ CCS</td><td>EJ/yr</td><td>total production of liquid biofuels from facilities with CCS</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Liquids|Biomass|w/o CCS</td><td>EJ/yr</td><td>total production of liquid biofuels from facilities without CCS</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Liquids|Coal</td><td>EJ/yr</td><td>total production of fossil liquid synfuels from coal-to-liquids (CTL) technologies</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Liquids|Coal|w/ CCS</td><td>EJ/yr</td><td>total production of fossil liquid synfuels from CTL technologies with CCS</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Liquids|Coal|w/o CCS</td><td>EJ/yr</td><td>total production of fossil liquid synfuels from CTL technologies without CCS</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Liquids|Gas</td><td>EJ/yr</td><td>total production of fossil liquid synfuels from gas-to-liquids (GTL) technologies</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Liquids|Gas|w/ CCS</td><td>EJ/yr</td><td>total production of fossil liquid synfuels from gas-to-liquids (GTL) technologies with CCS</td></tr>
<tr><td>Recommended</td><td>Secondary Energy|Liquids|Gas|w/o CCS</td><td>EJ/yr</td><td>total production of fossil liquid synfuels from gas-to-liquids (GTL) technologies without CCS</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Liquids|Oil</td><td>EJ/yr</td><td>total production of liquid fuels from petroleum, including both conventional and unconventional sources</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Liquids|Other</td><td>EJ/yr</td><td>total production of liquids from sources that do not fit any other category</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Gases</td><td>EJ/yr</td><td>total production of gaseous fuels, including natural gas</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Gases|Natural Gas</td><td>EJ/yr</td><td>total production of natural gas</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Gases|Biomass</td><td>EJ/yr</td><td>total production of biogas</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Gases|Coal</td><td>EJ/yr</td><td>total production of coal gas from coal gasification</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Gases|Other</td><td>EJ/yr</td><td>total production of gases from sources that do not fit any other category</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Solids</td><td>EJ/yr</td><td>solid secondary energy carriers (e.g., briquettes, coke, wood chips, wood pellets)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Solids|Coal</td><td>EJ/yr</td><td>solid secondary energy carriers produced from coal (e.g., briquettes, coke)</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Solids|Biomass</td><td>EJ/yr</td><td>excluded.</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Heat</td><td>EJ/yr</td><td>total centralized heat generation</td></tr>
<tr><td>Mandatory</td><td>Secondary Energy|Other Carrier</td><td>EJ/yr</td><td>category in the 'comments' tab)</td></tr>
</table>

<table>
<tr><th>Status</th><th>Variable</th><th>Unit</th><th>Definition</th></tr>
<tr><td>Mandatory</td><td>Final Energy</td><td>EJ/yr</td><td>Final energy consumed by end-use sectors, excluding transmission/distribution losses</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Industry</td><td>EJ/yr</td><td>Iron and steel industry [ISIC Group 241 and Class 2431];</td></tr>
<tr><td>Recommended</td><td>Final Energy|Industry|Energy Intensive</td><td>EJ/yr</td><td>metallic minerals (ISIC Group 241 and Class 2431, ISIC Group 242 and Class 2432, ISIC Division 23, ISIC Divisions 20 and 21, ISIC Divisions 17 and</td></tr>
<tr><td>Recommended</td><td>Final Energy|Residential and Commercial and AFOFI</td><td>EJ/yr</td><td>final energy consumed by residential, commercial, institutional sectors and agriculture, forestry, fishing (AFOFI)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Residential and Commercial</td><td>EJ/yr</td><td>(excluding Class 8422), 85-88, 90-99)</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Liquids|Oil</td><td>EJ/yr</td><td>Final energy consumed in the total buildings sector, which includes residential and service sector (commercial and institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Liquids|Biomass</td><td>EJ/yr</td><td>institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Gases|Natural gas</td><td>EJ/yr</td><td>institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Electricity</td><td>EJ/yr</td><td>and institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Hydrogen</td><td>EJ/yr</td><td>institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Solids|Solids|Coal</td><td>EJ/yr</td><td>institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Heat</td><td>EJ/yr</td><td>institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Lighting</td><td>EJ/yr</td><td>institutional) buildings</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Lighting</td><td>EJ/yr</td><td>lighting purpose</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Heating</td><td>EJ/yr</td><td>heating purpose</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Cooling</td><td>EJ/yr</td><td>cooling purpose</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Appliances</td><td>EJ/yr</td><td>appliances purpose</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Other</td><td>EJ/yr</td><td>other purpose</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Residential</td><td>EJ/yr</td><td>final energy consumed by residential (ISIC Divisions 97,98)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Commercial</td><td>EJ/yr</td><td>Class 8422), 85-88, 90-96 and 99)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|AFOFI</td><td>EJ/yr</td><td>final energy consumed by agriculture, forestry, fishing (AFOFI) (ISIC Division 01-03)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Transportation</td><td>EJ/yr</td><td>final energy consumed by transportation sector (ISIC Divisions 49 to 51 excluding Group 493)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Aviation</td><td>EJ/yr</td><td>final energy consumed by domestic and Iinternational aviation (ISIC 51)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Aviation|International</td><td>EJ/yr</td><td>final energy consumed by international aviation</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Aviation|Domestic</td><td>EJ/yr</td><td>final energy consumed by domestic aviation</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Road</td><td>EJ/yr</td><td>final energy consumed by road transportation (ISIC Group 492)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Rail</td><td>EJ/yr</td><td>final energy consumed by rail transportation (ISIC Group 491)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Shipping</td><td>EJ/yr</td><td>final energy consumed by water-borne navigation (ISIC 50)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Shipping|International</td><td>EJ/yr</td><td>final energy consumed by international water-borne navigation, i.e. international marine bunkers</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Shipping|Domestic</td><td>EJ/yr</td><td>final energy consumed by domestic water-borne navigation</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Other Sector</td><td>EJ/yr</td><td>final energy consumed by other transportation sectors (please provide a definition of other sources in this category in the 'comments' tab)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Liquids|Oil</td><td>EJ/yr</td><td>Final oil based (liquid or gas) energy consumed in the transport sector by passenger and freight vehicles</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Liquids|Biomass</td><td>EJ/yr</td><td>Final biofuels based (liquid or gas) energy consumed in the transport sector by passenger and freight vehicles</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Gases|Natural Gas</td><td>EJ/yr</td><td>Final natural gas based (liquid or gas) energy consumed in the transport sector by passenger and freight vehicles</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Electricity</td><td>EJ/yr</td><td>Final energy consumed, in the form of electricity, in the transport sector by passenger and freight vehicles</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Hydrogen</td><td>EJ/yr</td><td>Final energy consumed, in the form of hydrogen, in the transport sector by passenger and freight vehicles</td></tr>
<tr><td>Recommended</td><td>Final Energy|Other Sector</td><td>EJ/yr</td><td>final energy consumed by other energy demand sectors (please provide a definition of other sources in this category in the 'comments' tab)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Solids</td><td>EJ/yr</td><td>final energy solid fuel consumption (including coal and solid biomass)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Solids|Coal</td><td>EJ/yr</td><td>final energy coal consumption</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Solids|Biomass</td><td>EJ/yr</td><td>liquids category</td></tr>
<tr><td>Recommended</td><td>Final Energy|Solids|Biomass|Traditional</td><td>EJ/yr</td><td>final energy consumption of traditional biomass</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Liquids</td><td>EJ/yr</td><td>final energy consumption of refined liquids (conventional & unconventional oil, biofuels, coal-to-liquids, gas-to-liquids)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Gases</td><td>EJ/yr</td><td>final energy consumption of gases (natural gas, biogas, coal-gas), excluding transmission/distribution losses</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Electricity</td><td>EJ/yr</td><td>final energy consumption of electricity (including on-site solar PV), excluding transmission/distribution losses</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Hydrogen</td><td>EJ/yr</td><td>final energy consumption of hydrogen</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Heat</td><td>EJ/yr</td><td>geothermal and solar heating</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Geothermal</td><td>EJ/yr</td><td>heat pumps</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Solar</td><td>EJ/yr</td><td>final energy consumption of solar energy (e.g., from roof-top solar hot water collector systems)</td></tr>
<tr><td>Mandatory</td><td>Final Energy|Other</td><td>EJ/yr</td><td>'comments' tab)</td></tr>
<tr><td>Mandatory</td><td>Emissions|CO2</td><td>Mt CO2/yr</td><td>total carbon dioxide emissions, including emissions from fossil fuel combustion, industrial processes and land-use change</td></tr>
<tr><td>Mandatory</td><td>Emissions|CO2|Energy|Supply</td><td>Mt CO2/yr</td><td>other energy conversion (e.g. refineries, synfuel production, solid fuel processing, IPCC category 1Ab, 1Ac), incl. pipeline transportation (IPCC</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Combustion</td><td>Mt CO2/yr</td><td>refineries, synfuel production, solid fuel processing, IPCC category 1Ab, 1Ac), incl. pipeline transportation (IPCC category 1A3ei) and emissions</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Fugitive</td><td>Mt CO2/yr</td><td>CO2 fugitive emissions from fuels in energy extraction, processing, storage and transport (IPCC category 1B)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Electricity</td><td>Mt CO2/yr</td><td>associated with CO2 capture from electricity generation should be included here, negative emissions from application of BECCS in electricity</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Heat</td><td>Mt CO2/yr</td><td>from heat production should be included here, negative emissions from application of BECCS in heat production should also be accounted here</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Electricity and Heat</td><td>Mt CO2/yr</td><td>CO2 capture from electricity and heat generation should be included here, negative emissions from application of BECCS in electricity and heat</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Liquids</td><td>Mt CO2/yr</td><td>synfuel production, IPCC category 1A1b, parts of 1A1cii, 1B2a); note that emissions (and reductions) associated with CO2 capture from liquid</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Solids</td><td>Mt CO2/yr</td><td>1B1); note that emissions (and reductions) associated with CO2 capture from solid fuel production should be included here, negative emissions</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Gases</td><td>Mt CO2/yr</td><td>production, IPCC category 1B2b, parts of 1A1cii); note that emissions (and reductions) associated with CO2 capture from gaseous fuel</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Supply|Other Sector</td><td>Mt CO2/yr</td><td>'comments' tab)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Industrial Processes</td><td>Mt CO2/yr</td><td>industrial processes should be included here</td></tr>
<tr><td>Mandatory</td><td>Emissions|CO2|Energy|Demand</td><td>Mt CO2/yr</td><td>fishing (AFOFI) (IPCC category 1A4a, 1A4b, 1A4c), and transportation sector (IPCC category 1A3), excluding pipeline emissions (IPCC category</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Industry</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in industry (IPCC category 1A2)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Industry|Energy Intensive</td><td>Mt CO2/yr</td><td>print, non-metallic minerals (IPCC category 1A2a, b, c, d, f)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Residential and Commercial and AFOFI</td><td>Mt CO2/yr</td><td>1A4a, 1A4b, 1A4c)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Residential and Commercial</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in residential, commercial, institutional sectors (IPCC category 1A4a, 1A4b)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Residential</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in residential (IPCC category 1A4b)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Commercial</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in commercial and institutional sectors (IPCC category 1A4a)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|AFOFI</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in agriculture, forestry, fishing (AFOFI) (IPCC category 1A4c)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in transportation sector (IPCC category 1A3), excluding pipeline emissions (IPCC category 1A3ei)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Aviation</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in domestic and Iinternational aviation (IPCC category 1A3a)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Aviation|International</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in international aviation (IPCC category 1A3ai)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Aviation|Domestic</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in domestic aviation (IPCC category 1A3aii)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Road, Rail and Domestic Shipping</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in road, rail and inland waterways (IPCC category 1A3b, 1A3c, 1A3dii), exluding pipelines</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Road</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in road transportation (IPCC category 1A3b)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Rail</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in rail transportation (IPCC category 1A3c)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Shipping</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in water-borne navigation (IPCC category 1A3d)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Shipping|International</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in international water-borne navigation, i.e. international marine bunkers (IPCC category 1A3di)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Shipping|Domestic</td><td>Mt CO2/yr</td><td>CO2 emissions from fuel combustion in domestic water-borne navigation (IPCC category 1A3dii)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Transportation|Other Sector</td><td>Mt CO2/yr</td><td>'comments' tab)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Energy|Demand|Other Sector</td><td>Mt CO2/yr</td><td>'comments' tab)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|AFOLU|Land</td><td>Mt CO2/yr</td><td>biomass burning, fertilizer use, rice cultivation (IPCC category 3C)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|AFOLU|Agriculture</td><td>Mt CO2/yr</td><td>CO2 emissions from enteric fermentation, manure management, use of pesticides, fertilizer use (IPCC categories 3A, 3C2, 3C3, 3C4, 3C5/6?, 3C7)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Waste</td><td>Mt CO2/yr</td><td>CO2 emissions from landfills, wastewater treatment, human wastewater disposal and (non-energy) waste incineration (IPCC category 4)</td></tr>
<tr><td>Recommended</td><td>Emissions|CO2|Other</td><td>Mt CO2/yr</td><td>CO2 emissions from other sources (please provide a definition of other sources in this category in the 'comments' tab)</td></tr>
</table>

<table>
<tr><th>Status</th><th>Variable</th><th>Unit</th><th>Definition</th></tr>
<tr><td>Mandatory</td><td>Carbon Sequestration|CCS</td><td>Mt CO2/yr</td><td>aquifers) and the deep ocean, stored amounts should be reported as positive numbers</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Biomass</td><td>Mt CO2/yr</td><td>seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive numbers</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Fossil</td><td>Mt CO2/yr</td><td>seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive numbers</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Industrial Processes</td><td>Mt CO2/yr</td><td>geological deposits (e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|Land Use</td><td>Mt CO2/yr</td><td>total carbon dioxide sequestered through land-based sinks (e.g., afforestation, soil carbon enhancement, biochar)</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Biomass|Energy|Demand|Industry</td><td>Mt CO2/yr</td><td>oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive numbers</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Biomass|Energy|Supply</td><td>Mt CO2/yr</td><td>seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive numbers</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Biomass|Energy|Supply|Electricity</td><td>Mt CO2/yr</td><td>deposits (e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Biomass|Energy|Supply|Gases</td><td>Mt CO2/yr</td><td>geological deposits (e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Biomass|Energy|Supply|Hydrogen</td><td>Mt CO2/yr</td><td>(e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Biomass|Energy|Supply|Liquids</td><td>Mt CO2/yr</td><td>deposits (e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Biomass|Energy|Supply|Other</td><td>Mt CO2/yr</td><td>(e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive</td></tr>
<tr><td>Optional</td><td>Carbon Sequestration|CCS|Fossil|Energy|Demand|Industry</td><td>Mt CO2/yr</td><td>oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive numbers</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Fossil|Energy|Supply</td><td>Mt CO2/yr</td><td>depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive numbers</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Fossil|Energy|Supply|Electricity</td><td>Mt CO2/yr</td><td>deposits (e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Fossil|Energy|Supply|Gases</td><td>Mt CO2/yr</td><td>geological deposits (e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Fossil|Energy|Supply|Hydrogen</td><td>Mt CO2/yr</td><td>(e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Fossil|Energy|Supply|Liquids</td><td>Mt CO2/yr</td><td>(e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|CCS|Fossil|Energy|Supply|Other</td><td>Mt CO2/yr</td><td>(e.g. in depleted oil and gas fields, unmined coal seams, saline aquifers) and the deep ocean, stored amounts should be reported as positive</td></tr>
<tr><td>Recommended</td><td>Carbon Sequestration|Other</td><td>Mt CO2/yr</td><td>total carbon dioxide sequestered through other techniques (please provide a definition of other sources in this category in the 'comments' tab)</td></tr>
<tr><td>Mandatory</td><td>Emissions|N2O</td><td>Mt N2O/yr</td><td>total N2O emissions</td></tr>
<tr><td>Mandatory</td><td>Emissions|CH4</td><td>Mt CH4/yr</td><td>total CH4 emissions</td></tr>
<tr><td>Mandatory</td><td>Emissions|F-Gases</td><td>Mt CO2-equiv/yr</td><td>total F-gas emissions, including sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), others?</td></tr>
<tr><td>Optional</td><td>Emissions|Sulfur</td><td>Mt SO2/yr</td><td>total sulfur emissions</td></tr>
<tr><td>Optional</td><td>Emissions|BC</td><td>Mt BC/yr</td><td>total black carbon emissions</td></tr>
<tr><td>Optional</td><td>Emissions|OC</td><td>Mt OC/yr</td><td>total organic carbon emissions</td></tr>
<tr><td>Optional</td><td>Emissions|NOx</td><td>Mt NO2/yr</td><td>total nitrogen oxide emissions</td></tr>
<tr><td>Optional</td><td>Emissions|CO</td><td>Mt CO/yr</td><td>total carbon monoxide emissions</td></tr>
<tr><td>Recommended</td><td>Emissions|PFC</td><td>kt CF4-equiv/yr</td><td>total emissions of perfluorocarbons (PFCs), provided as aggregate CF4-equivalents</td></tr>
<tr><td>Recommended</td><td>Emissions|HFC</td><td>kt HFC134a-equiv/yr</td><td>total emissions of hydrofluorocarbons (HFCs), provided as aggregate HFC134a-equivalents</td></tr>
<tr><td>Recommended</td><td>Emissions|SF6</td><td>kt SF6/yr</td><td>total emissions of sulfur hexafluoride (SF6)</td></tr>
<tr><td>Recommended</td><td>Concentration|CO2</td><td>ppm</td><td>atmospheric concentration of carbon dioxide</td></tr>
<tr><td>Recommended</td><td>Concentration|CH4</td><td>ppb</td><td>atmospheric concentration of methane</td></tr>
<tr><td>Recommended</td><td>Concentration|N2O</td><td>ppb</td><td>atmospheric concentration of nitrous oxide</td></tr>
<tr><td>Recommended</td><td>Forcing</td><td>W/m2</td><td>radiative forcing from all greenhouse gases and forcing agents, including contributions from albedo, nitrate, and mineral dust</td></tr>
<tr><td>Recommended</td><td>Forcing|Kyoto Gases</td><td>W/m2</td><td>radiative forcing of the six Kyoto gases (CO2, CH4, N2O, SF6, HFCs, PFCs)</td></tr>
<tr><td>Recommended</td><td>Temperature|Global Mean</td><td>°C</td><td>change in global mean temperature relative to pre-industrial</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand</td><td>Mt N2O/yr</td><td>fishing (AFOFI) (IPCC category 1A4a, 1A4b, 1A4c), and transportation sector (IPCC category 1A3), excluding pipeline emissions (IPCC category</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Industry</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in industry (IPCC category 1A2)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Industry|Energy Intensive</td><td>Mt N2O/yr</td><td>print, non-metallic minerals (IPCC category 1A2a, b, c, d, f)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Residential and Commercial and AFOFI</td><td>Mt N2O/yr</td><td>1A4a, 1A4b, 1A4c)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Residential and Commercial</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in residential, commercial, institutional sectors (IPCC category 1A4a, 1A4b)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Residential</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in residential (IPCC category 1A4b)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Commercial</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in commercial and institutional sectors (IPCC category 1A4a)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|AFOFI</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in agriculture, forestry, fishing (AFOFI) (IPCC category 1A4c)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Transportation</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in transportation sector (IPCC category 1A3), excluding pipeline emissions (IPCC category 1A3ei)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|Energy|Demand|Transportation|Aviation</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in domestic and Iinternational aviation (IPCC category 1A3a)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|Energy|Demand|Transportation|Road</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in road transportation (IPCC category 1A3b)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|Energy|Demand|Transportation|Rail</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in rail transportation (IPCC category 1A3c)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|Energy|Demand|Transportation|Shipping</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion in water-borne navigation (IPCC category 1A3d)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|Energy|Demand|Transportation|Other Sector</td><td>Mt N2O/yr</td><td>'comments' tab)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Demand|Other Sector</td><td>Mt N2O/yr</td><td>'comments' tab)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply</td><td>Mt N2O/yr</td><td>other energy conversion (e.g. refineries, synfuel production, solid fuel processing, IPCC category 1Ab, 1Ac), incl. pipeline transportation (IPCC</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Combustion</td><td>Mt N2O/yr</td><td>refineries, synfuel production, solid fuel processing, IPCC category 1Ab, 1Ac), incl. pipeline transportation (IPCC category 1A3ei) and emissions</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Fugitive</td><td>Mt N2O/yr</td><td>N2O fugitive emissions from fuels in energy extraction, processing, storage and transport (IPCC category 1B)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Electricity</td><td>Mt N2O/yr</td><td>N2O emissions from electricity and CHP production and distribution (IPCC category 1A1ai and 1A1aii)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Heat</td><td>Mt N2O/yr</td><td>N2O emissions from heat production and distribution (IPCC category 1A1aiii)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Electricity and Heat</td><td>Mt N2O/yr</td><td>N2O emissions from electricity and heat production and distribution (IPCC category 1A1a)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Liquids</td><td>Mt N2O/yr</td><td>synfuel production, IPCC category 1A1b, parts of 1A1cii, 1B2a)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Solids</td><td>Mt N2O/yr</td><td>1A1cii, 1B1)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy|Supply|Gases</td><td>Mt N2O/yr</td><td>production, IPCC category 1B2b, parts of 1A1cii)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Industrial Processes</td><td>Mt N2O/yr</td><td>N2O emissions from industrial processes (IPCC categories 2A, B, C, E)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Product Use</td><td>Mt N2O/yr</td><td>N2O emissions from product use (IPCC category 2D, 2F, 2G)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Energy, Industrial Processes and Product Use</td><td>Mt N2O/yr</td><td>N2O emissions from fuel combustion, industrial processes, product use and fugitive emissions (IPCC categories 1, 2)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|AFOLU</td><td>Mt N2O/yr</td><td>N2O emissions from agriculture, forestry and other land use (IPCC category 3)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|AFOLU|Biomass Burning</td><td>Mt N2O/yr</td><td>N2O emissions from on-field biomass burning (e.g., agricultural waste including stubble, straw, IPCC category 3C1)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|AFOLU|Agriculture</td><td>Mt N2O/yr</td><td>3C7)</td></tr>
<tr><td>Optional</td><td>Emissions|N2O|AFOLU|Land</td><td>Mt N2O/yr</td><td>biomass burning, fertilizer use, rice cultivation (IPCC category 3C)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Waste</td><td>Mt N2O/yr</td><td>N2O emissions from landfills, wastewater treatment, human wastewater disposal and (non-energy) waste incineration (IPCC category 4)</td></tr>
<tr><td>Recommended</td><td>Emissions|N2O|Other</td><td>Mt N2O/yr</td><td>N2O emissions from other sources (please provide a definition of other sources in this category in the 'comments' tab)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Energy Supply and Demand</td><td>Mt CH4/yr</td><td>total methane emissions from energy use on supply and demand side</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand</td><td>Mt CH4/yr</td><td>fishing (AFOFI) (IPCC category 1A4a, 1A4b, 1A4c), and transportation sector (IPCC category 1A3), excluding pipeline emissions (IPCC category</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Industry</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in industry (IPCC category 1A2)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Industry|Energy Intensive</td><td>Mt CH4/yr</td><td>print, non-metallic minerals (IPCC category 1A2a, b, c, d, f)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Residential and Commercial and AFOFI</td><td>Mt CH4/yr</td><td>1A4a, 1A4b, 1A4c)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Residential and Commercial</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in residential, commercial, institutional sectors (IPCC category 1A4a, 1A4b)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Residential</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in residential (IPCC category 1A4b)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Commercial</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in commercial and institutional sectors (IPCC category 1A4a)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|AFOFI</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in agriculture, forestry, fishing (AFOFI) (IPCC category 1A4c)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Transportation</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in transportation sector (IPCC category 1A3), excluding pipeline emissions (IPCC category 1A3ei)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Energy|Demand|Transportation|Aviation</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in domestic and Iinternational aviation (IPCC category 1A3a)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Energy|Demand|Transportation|Road</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in road transportation (IPCC category 1A3b)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Energy|Demand|Transportation|Rail</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in rail transportation (IPCC category 1A3c)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Energy|Demand|Transportation|Shipping</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion in water-borne navigation (IPCC category 1A3d)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Energy|Demand|Transportation|Other Sector</td><td>Mt CH4/yr</td><td>'comments' tab)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Demand|Other Sector</td><td>Mt CH4/yr</td><td>'comments' tab)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply</td><td>Mt CH4/yr</td><td>other energy conversion (e.g. refineries, synfuel production, solid fuel processing, IPCC category 1Ab, 1Ac), incl. pipeline transportation (IPCC</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Combustion</td><td>Mt CH4/yr</td><td>refineries, synfuel production, solid fuel processing, IPCC category 1Ab, 1Ac), incl. pipeline transportation (IPCC category 1A3ei) and emissions</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Fugitive</td><td>Mt CH4/yr</td><td>CH4 fugitive emissions from fuels in energy extraction, processing, storage and transport (IPCC category 1B)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Electricity</td><td>Mt CH4/yr</td><td>CH4 emissions from electricity and CHP production and distribution (IPCC category 1A1ai and 1A1aii)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Heat</td><td>Mt CH4/yr</td><td>CH4 emissions from heat production and distribution (IPCC category 1A1aiii)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Electricity and Heat</td><td>Mt CH4/yr</td><td>CH4 emissions from electricity and heat production and distribution (IPCC category 1A1a)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Liquids</td><td>Mt CH4/yr</td><td>synfuel production, IPCC category 1A1b, parts of 1A1cii, 1B2a)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Solids</td><td>Mt CH4/yr</td><td>1B1)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy|Supply|Gases</td><td>Mt CH4/yr</td><td>production, IPCC category 1B2b, parts of 1A1cii)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Industrial Processes</td><td>Mt CH4/yr</td><td>CH4 emissions from industrial processes (IPCC categories 2A, B, C, E)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Product Use</td><td>Mt CH4/yr</td><td>CH4 emissions from product use (IPCC category 2D, 2F, 2G)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|Energy, Industrial Processes and Product Use</td><td>Mt CH4/yr</td><td>CH4 emissions from fuel combustion, industrial processes, product use and fugitive emissions (IPCC categories 1, 2)</td></tr>
<tr><td>Recommended</td><td>Emissions|CH4|AFOLU</td><td>Mt CH4/yr</td><td>CH4 emissions from agriculture, forestry and other land use (IPCC category 3)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|AFOLU|Biomass Burning</td><td>Mt CH4/yr</td><td>CH4 emissions from on-field biomass burning (e.g., agricultural waste including stubble, straw, IPCC category 3C1)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|AFOLU|Agriculture</td><td>Mt CH4/yr</td><td>CH4 emissions from enteric fermentation, manure management, use of pesticides, fertilizer use (IPCC categories 3A, 3C2, 3C3, 3C4, 3C5/6?, 3C7)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|AFOLU|Land</td><td>Mt CH4/yr</td><td>biomass burning, fertilizer use, rice cultivation (IPCC category 3C)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Waste</td><td>Mt CH4/yr</td><td>CH4 emissions from landfills, wastewater treatment, human wastewater disposal and (non-energy) waste incineration (IPCC category 4)</td></tr>
<tr><td>Optional</td><td>Emissions|CH4|Other</td><td>Mt CH4/yr</td><td>CH4 emissions from other sources (please provide a definition of other sources in this category in the 'comments' tab)</td></tr>
<tr><td>Optional</td><td>Emissions|Sulfur|Energy Supply and Demand</td><td>Mt SO2/yr</td><td>total sulfur emissions from energy use on supply and demand side</td></tr>
<tr><td>Optional</td><td>Emissions|Sulfur|Land Use</td><td>Mt SO2/yr</td><td>total sulfur emissions from land sources</td></tr>
<tr><td>Optional</td><td>Emissions|BC|Energy Supply and Demand</td><td>Mt BC/yr</td><td>total black carbon emissions from energy use on supply and demand side</td></tr>
<tr><td>Optional</td><td>Emissions|BC|Land Use</td><td>Mt BC/yr</td><td>total black carbon emissions from land sources</td></tr>
<tr><td>Optional</td><td>Emissions|OC|Energy Supply and Demand</td><td>Mt OC/yr</td><td>total organic carbon emissions from energy use on supply and demand side</td></tr>
<tr><td>Optional</td><td>Emissions|OC|Land Use</td><td>Mt OC/yr</td><td>total organic carbon emissions from land sources</td></tr>
<tr><td>Optional</td><td>Emissions|VOC</td><td>Mt VOC/yr</td><td>Total Volatile Organic Compounds Emissions</td></tr>
<tr><td>Optional</td><td>Emissions|NH3</td><td>Mt NH3/yr</td><td>total ammonium emissions</td></tr>
</table>

<table>
<tr><th>Status</th><th>Variable</th><th>Unit</th><th>Definition</th></tr>
<tr><td>Optional</td><td>Forcing|AN3A</td><td>W/m2</td><td>radiative forcing from all greenhouse gases and forcing agents, excluding contributions from albedo, nitrate, and mineral dust</td></tr>
<tr><td>Optional</td><td>Forcing|Montreal Gases</td><td>W/m2</td><td>total radiative forcing from Montreal gases</td></tr>
<tr><td>Optional</td><td>Forcing|CO2</td><td>W/m2</td><td>total radiative forcing from CO2</td></tr>
<tr><td>Optional</td><td>Forcing|CH4</td><td>W/m2</td><td>total radiative forcing from CH4</td></tr>
<tr><td>Optional</td><td>Forcing|N2O</td><td>W/m2</td><td>total radiative forcing from N2O</td></tr>
<tr><td>Optional</td><td>Forcing|F-Gases</td><td>W/m2</td><td>total radiative forcing from F-gases</td></tr>
<tr><td>Optional</td><td>Forcing|Aerosol</td><td>W/m2</td><td>total radiative forcing from all aerosols</td></tr>
<tr><td>Optional</td><td>Forcing|Tropospheric Ozone</td><td>W/m2</td><td>total radiative forcing from tropospheric ozone</td></tr>
<tr><td>Optional</td><td>Forcing|Albedo Change and Mineral Dust</td><td>W/m2</td><td>total radiative forcing from albedo change and mineral dust</td></tr>
<tr><td>Optional</td><td>Forcing|Other</td><td>W/m2</td><td>total radiative forcing from factors not covered in other categories (including stratospheric ozone and stratospheric water vapor)</td></tr>
<tr><td>Mandatory</td><td>Consumption</td><td>billion US$2005/yr</td><td>total consumption of all goods, by all consumers in a region</td></tr>
<tr><td>Recommended</td><td>Consumption|Industry</td><td>billion US$2005/yr</td><td>Total domestic consumption of products by industry</td></tr>
<tr><td>Recommended</td><td>Consumption|Industry|Energy Intensive</td><td>billion US$2005/yr</td><td>cement)</td></tr>
<tr><td>Recommended</td><td>Consumption|Commercial</td><td>billion US$2005/yr</td><td>Total domestic consumption of broducts by commercial and institutional sectors (activities linked with emissions from IPCC category 1A4a)</td></tr>
<tr><td>Recommended</td><td>Consumption|AFOFI</td><td>billion US$2005/yr</td><td>Total domestic consumption of products by agriculture, forestry, fishing (AFOFI) (activities linked with emissions from IPCC category 1A4c)</td></tr>
<tr><td>Recommended</td><td>Consumption|Transportation</td><td>billion US$2005/yr</td><td>Total domestic consumption of services by transportation sector (activities linked with emissions from IPCC category 1A3)</td></tr>
<tr><td>Recommended</td><td>Consumption|Other sector</td><td>billion US$2005/yr</td><td>Total domestic consumption of products by other sector (please provide a definitation of sectors included)</td></tr>
<tr><td>Recommended</td><td>Production|Industry</td><td>billion US$2005/yr</td><td>Total domestic production of products by industry</td></tr>
<tr><td>Recommended</td><td>Production|Industry|Energy Intensive</td><td>billion US$2005/yr</td><td>cement)</td></tr>
<tr><td>Recommended</td><td>Production|Commercial</td><td>billion US$2005/yr</td><td>Total domestic production of broducts by commercial and institutional sectors (activities linked with emissions from IPCC category 1A4a)</td></tr>
<tr><td>Recommended</td><td>Production|AFOFI</td><td>billion US$2005/yr</td><td>Total domestic production of products by agriculture, forestry, fishing (AFOFI) (activities linked with emissions from IPCC category 1A4c)</td></tr>
<tr><td>Recommended</td><td>Production|Transportation</td><td>billion US$2005/yr</td><td>Total domestic production of services by transportation sector (activities linked with emissions from IPCC category 1A3)</td></tr>
<tr><td>Recommended</td><td>Production|Other sector</td><td>billion US$2005/yr</td><td>Total domestic production of products by other sector (please provide a definitation of sectors included)</td></tr>
<tr><td>Recommended</td><td>Value Added|Industry</td><td>billion US$2005/yr</td><td>industry [ISIC Divisions 20 and 21] excluding petrochemical feedstocks;</td></tr>
<tr><td>Recommended</td><td>Value Added|Industry|Energy Intensive</td><td>billion US$2005/yr</td><td>(ISIC Group 241 and Class 2431, ISIC Group 242 and Class 2432, ISIC Division 23, ISIC Divisions 20 and 21, ISIC Divisions 17 and 18, ISIC Division</td></tr>
<tr><td>Recommended</td><td>Value Added|Commercial</td><td>billion US$2005/yr</td><td>(excluding Class 8422), 85-88, 90-96 and 99)</td></tr>
<tr><td>Recommended</td><td>Value Added|AFOFI</td><td>billion US$2005/yr</td><td>Value added of products by agriculture, forestry, fishing (AFOFI) (ISIC Division 01-03)</td></tr>
<tr><td>Recommended</td><td>Value Added|Transportation</td><td>billion US$2005/yr</td><td>Value added of services by transportation sector (ISIC Divisions 49 to 51 excluding Group 493)</td></tr>
<tr><td>Recommended</td><td>Value Added|Other sector</td><td>billion US$2005/yr</td><td>Value added of products by other sector (please provide a definitation of sectors included)</td></tr>
<tr><td>Mandatory</td><td>Policy Cost|Default for CAV</td><td>billion US$2005/yr</td><td>for calculation of Cost over Abatement Value (CAV) indicator. Must be identical to the policy costs in one of the reported metrics.</td></tr>
<tr><td>Mandatory</td><td>Policy Cost|Area under MAC Curve</td><td>billion US$2005/yr</td><td>total costs of the policy, i.e. the area under the Marginal Abatement Cost (MAC) curve</td></tr>
<tr><td>Mandatory</td><td>Policy Cost|GDP Loss</td><td>billion US$2005/yr</td><td>GDP loss in a policy scenario compared to the corresponding baseline (losses should be reported as negative numbers)</td></tr>
<tr><td>Mandatory</td><td>Policy Cost|Consumption Loss</td><td>billion US$2005/yr</td><td>consumption loss in a policy scenario compared to the corresponding baseline (losses should be reported as negative numbers)</td></tr>
<tr><td>Mandatory</td><td>Policy Cost|Equivalent Variation</td><td>billion US$2005/yr</td><td>equivalent variation associated with the given policy</td></tr>
<tr><td>Mandatory</td><td>Policy Cost|Additional Total Energy System Cost</td><td>billion US$2005/yr</td><td>additional energy system cost associated with the policy</td></tr>
<tr><td>Mandatory</td><td>Policy Cost|Other</td><td>billion US$2005/yr</td><td>any other indicator of policy cost (e.g., compensated variation). (please indicate what type of policy cost is measured on the 'comments' tab)</td></tr>
<tr><td>Mandatory</td><td>Price|Carbon</td><td>US$2005/tCO2</td><td>marginal cost of abatement (for regional aggregrates a weighted sum by subregion emissions should be used)</td></tr>
<tr><td>Recommended</td><td>Price|Primary Energy|Oil</td><td>US$2005/GJ</td><td>crude oil price at the primary level (i.e. the spot price at the global or regional market)</td></tr>
<tr><td>Recommended</td><td>Price|Primary Energy|Gas</td><td>US$2005/GJ</td><td>natural gas price at the primary level (i.e. the spot price at the global or regional market)</td></tr>
<tr><td>Recommended</td><td>Price|Primary Energy|Coal</td><td>US$2005/GJ</td><td>coal price at the primary level (i.e. the spot price at the global or regional market)</td></tr>
<tr><td>Optional</td><td>Price|Primary Energy|Biomass</td><td>US$2005/GJ</td><td>biomass producer price</td></tr>
<tr><td>Recommended</td><td>Price|Secondary Energy|Electricity</td><td>US$2005/GJ</td><td>prices.</td></tr>
<tr><td>Optional</td><td>Price|Secondary Energy|Liquids</td><td>US$2005/GJ</td><td>liquids price at the secondary level, i.e. for large scale consumers (e.g. aluminum production). Prices should include the effect of carbon prices.</td></tr>
<tr><td>Optional</td><td>Price|Secondary Energy|Solids</td><td>US$2005/GJ</td><td>solids price at the secondary level, i.e. for large scale consumers (e.g. aluminum production). Prices should include the effect of carbon prices.</td></tr>
<tr><td>Optional</td><td>Price|Secondary Energy|Gases</td><td>US$2005/GJ</td><td>gases price at the secondary level, i.e. for large scale consumers (e.g. aluminum production). Prices should include the effect of carbon prices.</td></tr>
<tr><td>Optional</td><td>Price|Secondary Energy|Hydrogen</td><td>US$2005/GJ</td><td>prices.</td></tr>
<tr><td>Mandatory</td><td>Price|Final Energy|Industry|Electricity</td><td>US$2005/GJ</td><td>the price of emitting one tonne of carbon in to the atmosphere</td></tr>
<tr><td>Mandatory</td><td>Price|Final Energy|Industry|Gases|Natural Gas</td><td>US$2005/GJ</td><td>natural gas price at the final level in industry. Prices should include the effect of carbon prices.</td></tr>
<tr><td>Mandatory</td><td>Price|Final Energy|Industry|Liquids|Oil</td><td>US$2005/GJ</td><td>oil products price at the final level in industry. Prices should include the effect of carbon prices.</td></tr>
<tr><td>mandatory</td><td>Price|Final Energy|Industry|Solids|Coal</td><td>US$2005/GJ</td><td>coal price at the secondary level, i.e. for large scale consumers (e.g. coal power plant). Prices should include the effect of carbon prices.</td></tr>
<tr><td>Recommended</td><td>Price|Final Energy|Residential and Commercial|Electricity</td><td>US$2005/GJ</td><td>electricity price at the final level in residential/commercial. Prices should include the effect of carbon prices.</td></tr>
<tr><td>Recommended</td><td>Price|Final Energy|Residential and Commercial|Gases|Natural Gas</td><td>US$2005/GJ</td><td>natural gas price at the final level in residential/commercial. Prices should include the effect of carbon prices.</td></tr>
<tr><td>Recommended</td><td>Price|Final Energy|Residential and Commercial|Liquids|Oil</td><td>US$2005/GJ</td><td>oil products price at the final level in residential/commercial. Prices should include the effect of carbon prices.</td></tr>
<tr><td>Recommended</td><td>Price|Final Energy|Residential and Commercial|Solids|Coal</td><td>US$2005/GJ</td><td>coal price at the final level in residential/commercial. Prices should include the effect of carbon prices.</td></tr>
<tr><td>Recommended</td><td>Price|Final Energy|Transportation|Liquids|Oil</td><td>US$2005/GJ</td><td>oil products price at the final level in transport. Prices should include the effect of carbon prices.</td></tr>
<tr><td>Optional</td><td>Final Energy|Industry|Solids</td><td>EJ/yr</td><td>final energy solid fuel consumption by the industrial sector (including coal and solid biomass)</td></tr>
<tr><td>Optional</td><td>Final Energy|Industry|Liquids</td><td>EJ/yr</td><td>final energy consumption by the industrial sector of refined liquids (conventional & unconventional oil, biofuels, coal-to-liquids, gas-to-liquids)</td></tr>
<tr><td>Optional</td><td>Final Energy|Industry|Gases</td><td>EJ/yr</td><td>final energy consumption by the industrial sector of gases (natural gas, biogas, coal-gas), excluding transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Industry|Electricity</td><td>EJ/yr</td><td>final energy consumption by the industrial sector of electricity (including on-site solar PV), excluding transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Industry|Hydrogen</td><td>EJ/yr</td><td>final energy consumption by the industrial sector of hydrogen</td></tr>
<tr><td>Optional</td><td>Final Energy|Industry|Heat</td><td>EJ/yr</td><td>transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Industry|Other</td><td>EJ/yr</td><td>sources in this category in the 'comments' tab)</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Solids</td><td>EJ/yr</td><td>final energy solid fuel consumption by the residential & commercial sector (including coal and solid biomass)</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Solids|Coal</td><td>EJ/yr</td><td>final energy coal consumption by the residential & commercial sector</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Solids|Biomass</td><td>EJ/yr</td><td>of bioliquids which are reported in the liquids category</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Liquids</td><td>EJ/yr</td><td>gas-to-liquids)</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Gases</td><td>EJ/yr</td><td>losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Electricity</td><td>EJ/yr</td><td>losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Hydrogen</td><td>EJ/yr</td><td>final energy consumption by the residential & commercial sector of hydrogen</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Heat</td><td>EJ/yr</td><td>excluding transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Residential and Commercial|Other</td><td>EJ/yr</td><td>definition of the sources in this category in the 'comments' tab)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Liquids</td><td>EJ/yr</td><td>liquids)</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Liquids|Oil</td><td>EJ/yr</td><td>final energy consumed in the transportation, bunker fuels (excluding pipelines) coming from petroleum products</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Liquids|Biomass</td><td>EJ/yr</td><td>final energy consumed in the transportation, bunker fuels (excluding pipelines) coming from biofuels</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Liquids|Coal</td><td>EJ/yr</td><td>final energy consumed in the transportation, bunker fuels (excluding pipelines) coming from liquified coal</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Gases</td><td>EJ/yr</td><td>final energy consumption by the transportation sector of gases (natural gas, biogas, coal-gas), excluding transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Hydrogen</td><td>EJ/yr</td><td>final energy consumption by the transportation sector of hydrogen</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Electricity</td><td>EJ/yr</td><td>final energy consumption by the transportation sector of electricity (including on-site solar PV), excluding transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Transportation|Other</td><td>EJ/yr</td><td>sources in this category in the 'comments' tab)</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Solids</td><td>EJ/yr</td><td>final energy solid fuel consumption by other sectors (including coal and solid biomass)</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Solids|Coal</td><td>EJ/yr</td><td>final energy coal consumption by other sectors</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Solids|Biomass</td><td>EJ/yr</td><td>reported in the liquids category</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Liquids</td><td>EJ/yr</td><td>final energy consumption by other sectors of refined liquids (conventional & unconventional oil, biofuels, coal-to-liquids, gas-to-liquids)</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Gases</td><td>EJ/yr</td><td>final energy consumption by other sectors of gases (natural gas, biogas, coal-gas), excluding transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Electricity</td><td>EJ/yr</td><td>final energy consumption by other sectors of electricity (including on-site solar PV), excluding transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Hydrogen</td><td>EJ/yr</td><td>final energy consumption by other sectors of hydrogen</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Heat</td><td>EJ/yr</td><td>transmission/distribution losses</td></tr>
<tr><td>Optional</td><td>Final Energy|Other Sector|Other</td><td>EJ/yr</td><td>this category in the 'comments' tab)</td></tr>
<tr><td>Optional</td><td>Energy Service|Residential and Commercial|Floor Space</td><td>bn m2/yr</td><td>energy service demand for conditioned floor space in buildings</td></tr>
<tr><td>Optional</td><td>Energy Service|Transportation|Passenger</td><td>bn pkm/yr</td><td>energy service demand for passenger transport</td></tr>
<tr><td>Optional</td><td>Energy Service|Transportation|Freight</td><td>bn tkm/yr</td><td>energy service demand for freight transport</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Coal|Volume</td><td>EJ/yr</td><td>net exports of coal, at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Gas|Volume</td><td>EJ/yr</td><td>net exports of natural gas, at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Oil|Volume</td><td>EJ/yr</td><td>net exports of crude oil (excluding refined oil products), at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Biomass|Volume</td><td>EJ/yr</td><td>net exports of solid, unprocessed biomass, at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Coal|Value</td><td>billion US$2005/yr</td><td>net exports of coal, at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Gas|Value</td><td>billion US$2005/yr</td><td>net exports of natural gas, at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Oil|Value</td><td>billion US$2005/yr</td><td>net exports of crude oil, at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Primary Energy|Biomass|Value</td><td>billion US$2005/yr</td><td>net exports of biomass, at the global level these should add up to the trade losses only</td></tr>
<tr><td>Optional</td><td>Trade|Exports|Value</td><td>billion US$2005/yr OF</td><td>value of all exported goods</td></tr>
<tr><td>Optional</td><td>Trade|Imports|Value</td><td>billion US$2005/yr OF</td><td>value of all imported goods</td></tr>
<tr><td>Optional</td><td>Trade|AFOFI</td><td>billion US$2005/yr</td><td>net exports of products by agriculture, forestry, fishing (AFOFI) (ISIC Division 01-03)</td></tr>
<tr><td>Optional</td><td>Trade|Industry</td><td>billion US$2005/yr</td><td>Iron and steel industry [ISIC Group 241 and Class 2431];</td></tr>
<tr><td>Optional</td><td>Trade|Industry|Energy Intensive</td><td>billion US$2005/yr</td><td>2431, ISIC Group 242 and Class 2432, ISIC Division 23, ISIC Divisions 20 and 21, ISIC Divisions 17 and 18, ISIC Division 23)</td></tr>
<tr><td>Optional</td><td>Trade|Transportation</td><td>billion US$2005/yr</td><td>net exports of transportation services   (ISIC Divisions 49 to 51 excluding Group 493)</td></tr>
<tr><td>Optional</td><td>Trade|Commercial</td><td>billion US$2005/yr</td><td>8422), 85-88, 90-96 and 99)</td></tr>
<tr><td>Optional</td><td>Trade|Other Sector</td><td>billion US$2005/yr</td><td>net exports of products of other sectors (please provide a definition of sectors)</td></tr>
<tr><td>Optional</td><td>Employment</td><td>million</td><td>and-guidelines/lang--en/index.htm)</td></tr>
<tr><td>Optional</td><td>Employment|AFOFI</td><td>million</td><td>Number of employed inhabitants in agriculture, forestry, fishing (AFOFI) (ISIC Division 01-03)</td></tr>
<tr><td>Optional</td><td>Employment|Industry</td><td>million</td><td>Iron and steel industry [ISIC Group 241 and Class 2431];</td></tr>
<tr><td>Optional</td><td>Employment|Industry|Energy Intensive</td><td>million</td><td>cement)(ISIC Group 241 and Class 2431, ISIC Group 242 and Class 2432, ISIC Division 23, ISIC Divisions 20 and 21, ISIC Divisions 17 and 18, ISIC</td></tr>
<tr><td>Optional</td><td>Employment|Transportation</td><td>million</td><td>Number of employed inhabitants in transportation services (ISIC Divisions 49 to 51 excluding Group 493)</td></tr>
<tr><td>Optional</td><td>Employment|Commercial</td><td>million</td><td>(excluding Class 8422), 85-88, 90-96 and 99)</td></tr>
<tr><td>Optional</td><td>Employment|Other Sector</td><td>million</td><td>Number of employed inhabitants in other sectors (please provide a definition of sectors)</td></tr>
</table>

Status	Variable	Unit	Definition
Optional	Resource|Cumulative Extraction|Gas|Conventional	EJ	Cumulative extraction of conventional gas
Optional	Resource|Cumulative Extraction|Gas|Unconventional	EJ	Cumulative extraction of unconventional gas
Optional	Resource|Cumulative Extraction|Oil|Conventional	EJ	Cumulative extraction of conventional oil
Optional	Resource|Cumulative Extraction|Oil|Unconventional	EJ	Cumulative extraction of unconventional oil
Optional	Investment|Energy Supply	billion US$2005/yr	Investments into the energy supply system
Optional	Investment|Energy Supply|Electricity	billion US$2005/yr	Investments into new electricity generation capacity
Optional	Investment|Energy Supply|Electricity|Fossil	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Fossil|w/ CCS	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Fossil|w/o CCS	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Non-fossil	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Non-fossil|Biomass	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Non-fossil|Nuclear	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables|Solar	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables|Wind	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Electricity|Other	billion US$2005/yr	investments should be reported. For plants equipped with CCS, the investment in the capturing equipment should be included but not the one
Optional	Investment|Energy Supply|Extraction|Fossil	billion US$2005/yr	investments for all types of fossil extraction
Optional	Investment|Energy Demand	billion US$2005/yr	investments into energy demand
Optional	Infrastructure Investment|Transportation|Road	billion US$2005/yr	Investment in road transport infrastructure in the reported year. Please indicate what is taken in to account in the comments.
Optional	Infrastructure Investment|Transportation|Aviation	billion US$2005/yr	Investment in air transport infrastructure (e.g airports) in the reported year. Please indicate what is taken in to account in the comments.
Optional	Infrastructure Investment|Transportation|Rail	billion US$2005/yr	Investment in rail transport infrastructure (e.g. railways) in the reported year. Please indicate what is taken in to account in the comments.
Optional	Infrastructure Investment|Transportation|Shipping|International	billion US$2005/yr	Investment in water transport infrastructure (e.g. harbours) in the reported year. Please indicate what is taken in to account in the comments.
Optional	Land Cover	million Ha/yr	total land cover
Optional	Land Cover|Cropland	million Ha/yr	total arable land, i.e. land in non-forest bioenergy crop, food, and feed/fodder crops, as well as other arable land (cultivated area)
Optional	Land Cover|Pasture	million Ha/yr	pasture
Optional	Land Cover|Forest	million Ha/yr	managed and unmanaged forest area
Optional	Land Cover|Other Land	million Ha/yr	in this category in the 'comments' tab)
Optional	Land Cover|Forest|Managed	million Ha/yr	managed forests producing commercial wood supply for timber or energy (note: woody energy crops reported under "energy crops")
Optional	Land Cover|Cropland|Energy Crops	million Ha/yr	land dedicated to energy crops (e.g., switchgrass, miscanthus, fast-growing wood species)
Optional	Land Cover|Other Arable Land	million Ha/yr	other arable land that is unmanaged (e.g., grassland, savannah, shrubland), excluding unmanaged forests that are arable
Optional	Energy Service|Transportation|Passenger	billion pkm/yr	Total demand for passenger travel
Optional	Energy Service|Transportation|Freight	billion tkm/yr	Total demand for freight transport
Optional	Energy Service|Transportation|Road	billion vkm/yr	Total demand for road travel
Optional	Energy Service|Transportation|Passenger|Road	billion pkm/yr	Total demand for road passenger travel
Optional	Energy Service|Transportation|Passenger|Road|2W and 3W	billion pkm/yr	Total demand for 2W &3W passenger travel
Optional	Energy Service|Transportation|Passenger|Road|LDV	billion pkm/yr	Total demand for LDV passenger travel
Optional	Energy Service|Transportation|Passenger|Road|Bus	billion pkm/yr	Total demand for bus passenger travel
Optional	Energy Service|Transportation|Freight|Road	billion tkm/yr	Total demand for road freight transport
Optional	Energy Service|Transportation|Aviation	billion vkm/yr	Total demand for air transport
Optional	Energy Service|Transportation|Passenger|Aviation	billion pkm/yr	Total demand for air passenger travel
Optional	Energy Service|Transportation|Freight|Aviation	billion tkm/yr	Total demand for air freight transport
Optional	Energy Service|Transportation|Rail	billion vkm/yr	Total demand for transport by rail
Optional	Energy Service|Transportation|Passenger|Rail	billion pkm/yr	Total demand for passenger travel by rail
Optional	Energy Service|Transportation|Freight|Rail	billion tkm/yr	Total demand for freight transport by rail
Optional	Energy Service|Transportation|Shipping|International	billion vkm/yr	Total demand for maritime transport
Optional	Energy Service|Transportation|Passenger|Shipping|International	billion pkm/yr	Total demand for passenger maritime transport
Optional	Energy Service|Transportation|Freight|Shipping|International	billion tkm/yr	Total demand for freight maritime transport
Optional	Energy Service|Transportation|Bicycling and Walking	billion pkm/yr	Total demand for road bicylce and walking passenger travel
Optional	Water Consumption|Electricity	km3/yr	total water consumption for net electricity production
Optional	Water Consumption|Electricity|Biomass	km3/yr	biogas
Optional	Water Consumption|Electricity|Biomass|w/ CCS	km3/yr	a CO2 capture component
Optional	Water Consumption|Electricity|Biomass|w/o CCS	km3/yr	freely vented CO2 emissions
Optional	Water Consumption|Electricity|Coal	km3/yr	water consumption for net electricity production from coal
Optional	Water Consumption|Electricity|Coal|w/ CCS	km3/yr	water consumption for net electricity production from coal with a CO2 capture component
Optional	Water Consumption|Electricity|Coal|w/o CCS	km3/yr	water consumption for net electricity production from coal with freely vented CO2 emissions
Optional	Water Consumption|Electricity|Cooling Pond	km3/yr	water consumption for net electricity production using pond cooling
Optional	Water Consumption|Electricity|Dry Cooling	km3/yr	water consumption for net electricity production using dry cooling
Optional	Water Consumption|Electricity|Fossil	km3/yr	water consumption for net electricity production from coal, gas, conventional and unconventional oil
Optional	Water Consumption|Electricity|Fossil|w/ CCS	km3/yr	water consumption for net electricity production from coal, gas, conventional and unconventional oil used in combination with CCS
Optional	Water Consumption|Electricity|Fossil|w/o CCS	km3/yr	water consumption for net electricity production from coal, gas, conventional and unconventional oil without CCS
Optional	Water Consumption|Electricity|Gas	km3/yr	water consumption for net electricity production from natural gas
Optional	Water Consumption|Electricity|Gas|w/ CCS	km3/yr	water consumption for net electricity production from natural gas with a CO2 capture component
Optional	Water Consumption|Electricity|Gas|w/o CCS	km3/yr	water consumption for net electricity production from natural gas with freely vented CO2 emissions
Optional	Water Consumption|Electricity|Geothermal	km3/yr	water consumption for net electricity production from all sources of geothermal energy (e.g., hydrothermal, enhanced geothermal systems)
Optional	Water Consumption|Electricity|Hydro	km3/yr	water consumption for net hydroelectric production
Optional	Water Consumption|Electricity|Non-Biomass Renewables	km3/yr	bioenergy). This is a summary category for all the non-biomass renewables.
Optional	Water Consumption|Electricity|Nuclear	km3/yr	water consumption for net electricity production from nuclear energy
Optional	Water Consumption|Electricity|Ocean	km3/yr	generation)
Optional	Water Consumption|Electricity|Oil	km3/yr	water consumption for net electricity production from refined liquids
Optional	Water Consumption|Electricity|Oil|w/ CCS	km3/yr	water consumption for net electricity production from refined liquids with a CO2 capture component
Optional	Water Consumption|Electricity|Oil|w/o CCS	km3/yr	water consumption for net electricity production from refined liquids with freely vented CO2 emissions
Optional	Water Consumption|Electricity|Once Through	km3/yr	water consumption for net electricity production using once through cooling
Optional	Water Consumption|Electricity|Other	km3/yr	this category in the 'comments' tab)
Optional	Water Consumption|Electricity|Sea Cooling	km3/yr	water consumption for net electricity production using sea water cooling
Optional	Water Consumption|Electricity|Solar	km3/yr	water consumption for net electricity production from all sources of solar energy (e.g., PV and concentrating solar power)
Optional	Water Consumption|Electricity|Solar|CSP	km3/yr	water consumption for net electricity production from concentrating solar power (CSP)
Optional	Water Consumption|Electricity|Solar|PV	km3/yr	water consumption for net electricity production from solar photovoltaics (PV)
Optional	Water Consumption|Electricity|Wet Tower	km3/yr	water consumption for net electricity production using wet tower cooling
Optional	Water Consumption|Electricity|Wind	km3/yr	water consumption for net electricity production from wind energy (on- and offshore)
Optional	Water Withdrawal|Electricity	km3/yr	total water withdrawals for net electricity production
Optional	Water Withdrawal|Electricity|Biomass	km3/yr	biogas
Optional	Water Withdrawal|Electricity|Biomass|w/ CCS	km3/yr	CO2 capture component
Optional	Water Withdrawal|Electricity|Biomass|w/o CCS	km3/yr	freely vented CO2 emissions
Optional	Water Withdrawal|Electricity|Coal	km3/yr	water withdrawals for net electricity production from coal
Optional	Water Withdrawal|Electricity|Coal|w/ CCS	km3/yr	water withdrawals for net electricity production from coal with a CO2 capture component
Optional	Water Withdrawal|Electricity|Coal|w/o CCS	km3/yr	water withdrawals for net electricity production from coal with freely vented CO2 emissions
Optional	Water Withdrawal|Electricity|Cooling Pond	km3/yr	water withdrawals for net electricity production using pond cooling
Optional	Water Withdrawal|Electricity|Dry Cooling	km3/yr	water withdrawals for net electricity production using dry cooling
Optional	Water Withdrawal|Electricity|Fossil	km3/yr	water withdrawals for net electricity production from coal, gas, conventional and unconventional oil
Optional	Water Withdrawal|Electricity|Fossil|w/ CCS	km3/yr	water withdrawals for net electricity production from coal, gas, conventional and unconventional oil used in combination with CCS
Optional	Water Withdrawal|Electricity|Fossil|w/o CCS	km3/yr	water withdrawals for net electricity production from coal, gas, conventional and unconventional oil without CCS
Optional	Water Withdrawal|Electricity|Gas	km3/yr	water withdrawals for net electricity production from natural gas
Optional	Water Withdrawal|Electricity|Gas|w/ CCS	km3/yr	water withdrawals for net electricity production from natural gas with a CO2 capture component
Optional	Water Withdrawal|Electricity|Gas|w/o CCS	km3/yr	water withdrawals for net electricity production from natural gas with freely vented CO2 emissions
Optional	Water Withdrawal|Electricity|Geothermal	km3/yr	water withdrawals for net electricity production from all sources of geothermal energy (e.g., hydrothermal, enhanced geothermal systems)
Optional	Water Withdrawal|Electricity|Hydro	km3/yr	water withdrawals for net hydroelectric production
Optional	Water Withdrawal|Electricity|Non-Biomass Renewables	km3/yr	bioenergy). This is a summary category for all the non-biomass renewables.
Optional	Water Withdrawal|Electricity|Nuclear	km3/yr	water withdrawals for net electricity production from nuclear energy
Optional	Water Withdrawal|Electricity|Ocean	km3/yr	generation)
Optional	Water Withdrawal|Electricity|Oil	km3/yr	water withdrawals for net electricity production from refined liquids
Optional	Water Withdrawal|Electricity|Oil|w/ CCS	km3/yr	water withdrawals for net electricity production from refined liquids with a CO2 capture component
Optional	Water Withdrawal|Electricity|Oil|w/o CCS	km3/yr	water withdrawals for net electricity production from refined liquids with freely vented CO2 emissions
Optional	Water Withdrawal|Electricity|Once Through	km3/yr	water withdrawals for net electricity production using once through cooling
Optional	Water Withdrawal|Electricity|Other	km3/yr	this category in the 'comments' tab)
Optional	Water Withdrawal|Electricity|Sea Cooling	km3/yr	water withdrawals for net electricity production using sea water cooling
Optional	Water Withdrawal|Electricity|Solar	km3/yr	water withdrawals for net electricity production from all sources of solar energy (e.g., PV and concentrating solar power)
Optional	Water Withdrawal|Electricity|Solar|CSP	km3/yr	water withdrawals for net electricity production from concentrating solar power (CSP)
Optional	Water Withdrawal|Electricity|Solar|PV	km3/yr	water withdrawals for net electricity production from solar photovoltaics (PV)
Optional	Water Withdrawal|Electricity|Wet Tower	km3/yr	water withdrawals for net electricity production using wet tower cooling
Optional	Water Withdrawal|Electricity|Wind	km3/yr	water withdrawals for net electricity production from wind energy (on- and offshore)

Input-Output

Model	Scenario	Region	Variable	Unit	base year: exogeneous or endogeneous	projected data: exogeneous or endogeneous
			Population	million		
			GDP|MER	billion US$2005/yr		
			GDP|PPP	billion US$2005/yr		
			Primary Energy	EJ/yr		
			Primary Energy|Fossil	EJ/yr		
			Primary Energy|Fossil|w/ CCS	EJ/yr		
			Primary Energy|Fossil|w/o CCS	EJ/yr		
			Primary Energy|Coal	EJ/yr		
			Primary Energy|Coal|w/ CCS	EJ/yr		
			Primary Energy|Coal|w/o CCS	EJ/yr		
			Primary Energy|Oil	EJ/yr		
			Primary Energy|Oil|w/ CCS	EJ/yr		
			Primary Energy|Oil|w/o CCS	EJ/yr		
			Primary Energy|Gas	EJ/yr		
			Primary Energy|Gas|w/ CCS	EJ/yr		
			Primary Energy|Gas|w/o CCS	EJ/yr		
			Primary Energy|Biomass	EJ/yr		
			Primary Energy|Biomass|w/ CCS	EJ/yr		
			Primary Energy|Biomass|w/o CCS	EJ/yr		
			Primary Energy|Biomass|Modern	EJ/yr		
			Primary Energy|Biomass|Traditional	EJ/yr		
			Primary Energy|Nuclear	EJ/yr		
			Primary Energy|Non-Biomass Renewables	EJ/yr		
			Primary Energy|Hydro	EJ/yr		
			Primary Energy|Wind	EJ/yr		
			Primary Energy|Solar	EJ/yr		
			Primary Energy|Geothermal	EJ/yr		
			Primary Energy|Ocean	EJ/yr		
			Primary Energy|Secondary Energy Trade	EJ/yr		
			Primary Energy|Other	EJ/yr		
			Secondary Energy	EJ/yr		
			Secondary Energy|Electricity	EJ/yr		
			Secondary Energy|Electricity|Coal	EJ/yr		
			Secondary Energy|Electricity|Coal|w/ CCS	EJ/yr		
			Secondary Energy|Electricity|Coal|w/o CCS	EJ/yr		
			Secondary Energy|Electricity|Oil	EJ/yr		
			Secondary Energy|Electricity|Oil|w/ CCS	EJ/yr		
			Secondary Energy|Electricity|Oil|w/o CCS	EJ/yr		
			Secondary Energy|Electricity|Gas	EJ/yr		
			Secondary Energy|Electricity|Gas|w/ CCS	EJ/yr		
			Secondary Energy|Electricity|Gas|w/o CCS	EJ/yr		
			Secondary Energy|Electricity|Biomass	EJ/yr		
			Secondary Energy|Electricity|Biomass|w/ CCS	EJ/yr		
			Secondary Energy|Electricity|Biomass|w/o CCS	EJ/yr		
			Secondary Energy|Electricity|Nuclear	EJ/yr		
			Secondary Energy|Electricity|Non-Biomass Renewables	EJ/yr		
			Secondary Energy|Electricity|Hydro	EJ/yr		
			Secondary Energy|Electricity|Solar	EJ/yr		
			Secondary Energy|Electricity|Solar|PV	EJ/yr		
			Secondary Energy|Electricity|Solar|CSP	EJ/yr		
			Secondary Energy|Electricity|Wind	EJ/yr		
			Secondary Energy|Electricity|Wind|Onshore	EJ/yr		
			Secondary Energy|Electricity|Geothermal	EJ/yr		
			Secondary Energy|Electricity|Ocean	EJ/yr		
			Secondary Energy|Electricity|Other	EJ/yr		
			Secondary Energy|Hydrogen	EJ/yr		
			Secondary Energy|Liquids	EJ/yr		
			Secondary Energy|Liquids|Biomass	EJ/yr		
			Secondary Energy|Electricity|Wind|Offshore	EJ/yr		
			Secondary Energy|Liquids|Biomass|w/ CCS	EJ/yr		
			Secondary Energy|Liquids|Biomass|w/o CCS	EJ/yr		
			Secondary Energy|Liquids|Coal	EJ/yr		
			Secondary Energy|Liquids|Coal|w/ CCS	EJ/yr		
			Secondary Energy|Liquids|Coal|w/o CCS	EJ/yr		
			Secondary Energy|Liquids|Gas	EJ/yr		
			Secondary Energy|Liquids|Gas|w/ CCS	EJ/yr		
			Secondary Energy|Liquids|Gas|w/o CCS	EJ/yr		
			Secondary Energy|Liquids|Oil	EJ/yr		
			Secondary Energy|Liquids|Other	EJ/yr		
			Secondary Energy|Gases	EJ/yr		
			Secondary Energy|Gases|Natural Gas	EJ/yr		
			Secondary Energy|Gases|Biomass	EJ/yr		
			Secondary Energy|Gases|Coal	EJ/yr		
			Secondary Energy|Gases|Other	EJ/yr		
			Secondary Energy|Solids	EJ/yr		
			Secondary Energy|Solids|Coal	EJ/yr		
			Secondary Energy|Solids|Biomass	EJ/yr		
			Secondary Energy|Heat	EJ/yr		
			Secondary Energy|Other Carrier	EJ/yr		

Model	Scenario	Region	Variable	Unit	base year: exogeneous or endogeneous	projected data: exogeneous or endogeneous
			Final Energy	EJ/yr		
			Final Energy|Industry	EJ/yr		
			Final Energy|Industry|Energy Intensive	EJ/yr		
			Final Energy|Residential and Commercial and AFOFI	EJ/yr		
			Final Energy|Residential and Commercial	EJ/yr		
			Final Energy|Residential and Commercial|Liquids|Oil	EJ/yr		
			Final Energy|Residential and Commercial|Liquids|Biomass	EJ/yr		
			Final Energy|Residential and Commercial|Gases|Natural gas	EJ/yr		
			Final Energy|Residential and Commercial|Electricity	EJ/yr		
			Final Energy|Residential and Commercial|Hydrogen	EJ/yr		
			Final Energy|Residential and Commercial|Solids|Solids|Coal	EJ/yr		
			Final Energy|Residential and Commercial|Heat	EJ/yr		
			Final Energy|Residential and Commercial|Lighting	EJ/yr		
			Final Energy|Residential and Commercial|Lighting	EJ/yr		
			Final Energy|Residential and Commercial|Heating	EJ/yr		
			Final Energy|Residential and Commercial|Cooling	EJ/yr		
			Final Energy|Residential and Commercial|Appliances	EJ/yr		
			Final Energy|Residential and Commercial|Other	EJ/yr		
			Final Energy|Residential	EJ/yr		
			Final Energy|Commercial	EJ/yr		
			Final Energy|AFOFI	EJ/yr		
			Final Energy|Transportation	EJ/yr		
			Final Energy|Transportation|Aviation	EJ/yr		
			Final Energy|Transportation|Aviation|International	EJ/yr		
			Final Energy|Transportation|Aviation|Domestic	EJ/yr		
			Final Energy|Transportation|Road	EJ/yr		
			Final Energy|Transportation|Rail	EJ/yr		
			Final Energy|Transportation|Shipping	EJ/yr		
			Final Energy|Transportation|Shipping|International	EJ/yr		
			Final Energy|Transportation|Shipping|Domestic	EJ/yr		
			Final Energy|Transportation|Other Sector	EJ/yr		
			Final Energy|Transportation|Liquids|Oil	EJ/yr		
			Final Energy|Transportation|Liquids|Biomass	EJ/yr		
			Final Energy|Transportation|Gases|Natural Gas	EJ/yr		
			Final Energy|Transportation|Electricity	EJ/yr		
			Final Energy|Transportation|Hydrogen	EJ/yr		
			Final Energy|Other Sector	EJ/yr		
			Final Energy|Solids	EJ/yr		
			Final Energy|Solids|Coal	EJ/yr		
			Final Energy|Solids|Biomass	EJ/yr		
			Final Energy|Solids|Biomass|Traditional	EJ/yr		
			Final Energy|Liquids	EJ/yr		
			Final Energy|Gases	EJ/yr		
			Final Energy|Electricity	EJ/yr		
			Final Energy|Hydrogen	EJ/yr		
			Final Energy|Heat	EJ/yr		
			Final Energy|Geothermal	EJ/yr		
			Final Energy|Solar	EJ/yr		
			Final Energy|Other	EJ/yr		
			Emissions|CO2	Mt CO2/yr		
			Emissions|CO2|Energy|Supply	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Combustion	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Fugitive	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Electricity	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Heat	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Electricity and Heat	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Liquids	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Solids	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Gases	Mt CO2/yr		
			Emissions|CO2|Energy|Supply|Other Sector	Mt CO2/yr		
			Emissions|CO2|Industrial Processes	Mt CO2/yr		
			Emissions|CO2|Energy|Demand	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Industry	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Industry|Energy Intensive	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Residential and Commercial and AFOFI	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Residential and Commercial	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Residential	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Commercial	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|AFOFI	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Aviation	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Aviation|International	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Aviation|Domestic	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Road, Rail and Domestic Shipping	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Road	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Rail	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Shipping	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Shipping|International	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Shipping|Domestic	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Transportation|Other Sector	Mt CO2/yr		
			Emissions|CO2|Energy|Demand|Other Sector	Mt CO2/yr		
			Emissions|CO2|AFOLU|Land	Mt CO2/yr		
			Emissions|CO2|AFOLU|Agriculture	Mt CO2/yr		
			Emissions|CO2|Waste	Mt CO2/yr		
			Emissions|CO2|Other	Mt CO2/yr		

Model	Scenario	Region	Variable	Unit	base year: exogeneous or endogeneous	projected data: exogeneous or endogeneous
			Carbon Sequestration|CCS	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil	Mt CO2/yr		
			Carbon Sequestration|CCS|Industrial Processes	Mt CO2/yr		
			Carbon Sequestration|Land Use	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass|Energy|Demand|Industry	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass|Energy|Supply	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass|Energy|Supply|Electricity	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass|Energy|Supply|Gases	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass|Energy|Supply|Hydrogen	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass|Energy|Supply|Liquids	Mt CO2/yr		
			Carbon Sequestration|CCS|Biomass|Energy|Supply|Other	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil|Energy|Demand|Industry	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil|Energy|Supply	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil|Energy|Supply|Electricity	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil|Energy|Supply|Gases	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil|Energy|Supply|Hydrogen	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil|Energy|Supply|Liquids	Mt CO2/yr		
			Carbon Sequestration|CCS|Fossil|Energy|Supply|Other	Mt CO2/yr		
			Carbon Sequestration|Other	Mt CO2/yr		
			Emissions|N2O	Mt N2O/yr		
			Emissions|CH4	Mt CH4/yr		
			Emissions|F-Gases	Mt CO2-equiv/yr		
			Emissions|Sulfur	Mt SO2/yr		
			Emissions|BC	Mt BC/yr		
			Emissions|OC	Mt OC/yr		
			Emissions|NOx	Mt NO2/yr		
			Emissions|CO	Mt CO/yr		
			Emissions|PFC	kt CF4-equiv/yr		
			Emissions|HFC	kt HFC134a-equiv/yr		
			Emissions|SF6	kt SF6/yr		
			Concentration|CO2	ppm		
			Concentration|CH4	ppb		
			Concentration|N2O	ppb		
			Forcing	W/m2		
			Forcing|Kyoto Gases	W/m2		
			Temperature|Global Mean	°C		
			Emissions|N2O|Energy|Demand	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Industry	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Industry|Energy Intensive	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Residential and Commercial and AFOFI	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Residential and Commercial	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Residential	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Commercial	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|AFOFI	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Transportation	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Transportation|Aviation	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Transportation|Road	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Transportation|Rail	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Transportation|Shipping	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Transportation|Other Sector	Mt N2O/yr		
			Emissions|N2O|Energy|Demand|Other Sector	Mt N2O/yr		
			Emissions|N2O|Energy|Supply	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Combustion	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Fugitive	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Electricity	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Heat	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Electricity and Heat	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Liquids	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Solids	Mt N2O/yr		
			Emissions|N2O|Energy|Supply|Gases	Mt N2O/yr		
			Emissions|N2O|Industrial Processes	Mt N2O/yr		
			Emissions|N2O|Product Use	Mt N2O/yr		
			Emissions|N2O|Energy, Industrial Processes and Product Use	Mt N2O/yr		
			Emissions|N2O|AFOLU	Mt N2O/yr		
			Emissions|N2O|AFOLU|Biomass Burning	Mt N2O/yr		
			Emissions|N2O|AFOLU|Agriculture	Mt N2O/yr		
			Emissions|N2O|AFOLU|Land	Mt N2O/yr		
			Emissions|N2O|Waste	Mt N2O/yr		
			Emissions|N2O|Other	Mt N2O/yr		
			Emissions|CH4|Energy Supply and Demand	Mt CH4/yr		
			Emissions|CH4|Energy|Demand	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Industry	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Industry|Energy Intensive	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Residential and Commercial and AFOFI	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Residential and Commercial	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Residential	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Commercial	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|AFOFI	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Transportation	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Transportation|Aviation	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Transportation|Road	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Transportation|Rail	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Transportation|Shipping	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Transportation|Other Sector	Mt CH4/yr		
			Emissions|CH4|Energy|Demand|Other Sector	Mt CH4/yr		
			Emissions|CH4|Energy|Supply	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Combustion	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Fugitive	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Electricity	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Heat	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Electricity and Heat	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Liquids	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Solids	Mt CH4/yr		
			Emissions|CH4|Energy|Supply|Gases	Mt CH4/yr		
			Emissions|CH4|Industrial Processes	Mt CH4/yr		
			Emissions|CH4|Product Use	Mt CH4/yr		
			Emissions|CH4|Energy, Industrial Processes and Product Use	Mt CH4/yr		
			Emissions|CH4|AFOLU	Mt CH4/yr		
			Emissions|CH4|AFOLU|Biomass Burning	Mt CH4/yr		
			Emissions|CH4|AFOLU|Agriculture	Mt CH4/yr		
			Emissions|CH4|AFOLU|Land	Mt CH4/yr		
			Emissions|CH4|Waste	Mt CH4/yr		
			Emissions|CH4|Other	Mt CH4/yr		
			Emissions|Sulfur|Energy Supply and Demand	Mt SO2/yr		
			Emissions|Sulfur|Land Use	Mt SO2/yr		
			Emissions|BC|Energy Supply and Demand	Mt BC/yr		
			Emissions|BC|Land Use	Mt BC/yr		
			Emissions|OC|Energy Supply and Demand	Mt OC/yr		
			Emissions|OC|Land Use	Mt OC/yr		
			Emissions|VOC	Mt VOC/yr		
			Emissions|NH3	Mt NH3/yr		

Model	Scenario	Region	Variable	Unit	base year: exogeneous or endogeneous	projected data: exogeneous or endogeneous
			Forcing|AN3A	W/m2		
			Forcing|Montreal Gases	W/m2		
			Forcing|CO2	W/m2		
			Forcing|CH4	W/m2		
			Forcing|N2O	W/m2		
			Forcing|F-Gases	W/m2		
			Forcing|Aerosol	W/m2		
			Forcing|Tropospheric Ozone	W/m2		
			Forcing|Albedo Change and Mineral Dust	W/m2		
			Forcing|Other	W/m2		
			Consumption	billion US$2005/yr		
			Consumption|Industry	billion US$2005/yr		
			Consumption|Industry|Energy Intensive	billion US$2005/yr		
			Consumption|Commercial	billion US$2005/yr		
			Consumption|AFOFI	billion US$2005/yr		
			Consumption|Transportation	billion US$2005/yr		
			Consumption|Other sector	billion US$2005/yr		
			Production|Industry	billion US$2005/yr		
			Production|Industry|Energy Intensive	billion US$2005/yr		
			Production|Commercial	billion US$2005/yr		
			Production|AFOFI	billion US$2005/yr		
			Production|Transportation	billion US$2005/yr		
			Production|Other sector	billion US$2005/yr		
			Value Added|Industry	billion US$2005/yr		
			Value Added|Industry|Energy Intensive	billion US$2005/yr		
			Value Added|Commercial	billion US$2005/yr		
			Value Added|AFOFI	billion US$2005/yr		
			Value Added|Transportation	billion US$2005/yr		
			Value Added|Other sector	billion US$2005/yr		
			Policy Cost|Default for CAV	billion US$2005/yr		
			Policy Cost|Area under MAC Curve	billion US$2005/yr		
			Policy Cost|GDP Loss	billion US$2005/yr		
			Policy Cost|Consumption Loss	billion US$2005/yr		
			Policy Cost|Equivalent Variation	billion US$2005/yr		
			Policy Cost|Additional Total Energy System Cost	billion US$2005/yr		
			Policy Cost|Other	billion US$2005/yr		
			Price|Carbon	US$2005/tCO2		
			Price|Primary Energy|Oil	US$2005/GJ		
			Price|Primary Energy|Gas	US$2005/GJ		
			Price|Primary Energy|Coal	US$2005/GJ		
			Price|Primary Energy|Biomass	US$2005/GJ		
			Price|Secondary Energy|Electricity	US$2005/GJ		
			Price|Secondary Energy|Liquids	US$2005/GJ		
			Price|Secondary Energy|Solids	US$2005/GJ		
			Price|Secondary Energy|Gases	US$2005/GJ		
			Price|Secondary Energy|Hydrogen	US$2005/GJ		
			Price|Final Energy|Industry|Electricity	US$2005/GJ		
			Price|Final Energy|Industry|Gases|Natural Gas	US$2005/GJ		
			Price|Final Energy|Industry|Liquids|Oil	US$2005/GJ		
			Price|Final Energy|Industry|Solids|Coal	US$2005/GJ		
			Price|Final Energy|Residential and Commercial|Electricity	US$2005/GJ		
			Price|Final Energy|Residential and Commercial|Gases|Natural Gas	US$2005/GJ		
			Price|Final Energy|Residential and Commercial|Liquids|Oil	US$2005/GJ		
			Price|Final Energy|Residential and Commercial|Solids|Coal	US$2005/GJ		
			Price|Final Energy|Transportation|Liquids|Oil	US$2005/GJ		
			Final Energy|Industry|Solids	EJ/yr		
			Final Energy|Industry|Liquids	EJ/yr		
			Final Energy|Industry|Gases	EJ/yr		
			Final Energy|Industry|Electricity	EJ/yr		
			Final Energy|Industry|Hydrogen	EJ/yr		
			Final Energy|Industry|Heat	EJ/yr		
			Final Energy|Industry|Other	EJ/yr		
			Final Energy|Residential and Commercial|Solids	EJ/yr		
			Final Energy|Residential and Commercial|Solids|Coal	EJ/yr		
			Final Energy|Residential and Commercial|Solids|Biomass	EJ/yr		
			Final Energy|Residential and Commercial|Liquids	EJ/yr		
			Final Energy|Residential and Commercial|Gases	EJ/yr		
			Final Energy|Residential and Commercial|Electricity	EJ/yr		
			Final Energy|Residential and Commercial|Hydrogen	EJ/yr		
			Final Energy|Residential and Commercial|Heat	EJ/yr		
			Final Energy|Residential and Commercial|Other	EJ/yr		
			Final Energy|Transportation|Liquids	EJ/yr		
			Final Energy|Transportation|Liquids|Oil	EJ/yr		
			Final Energy|Transportation|Liquids|Biomass	EJ/yr		
			Final Energy|Transportation|Liquids|Coal	EJ/yr		
			Final Energy|Transportation|Gases	EJ/yr		
			Final Energy|Transportation|Hydrogen	EJ/yr		
			Final Energy|Transportation|Electricity	EJ/yr		
			Final Energy|Transportation|Other	EJ/yr		
			Final Energy|Other Sector|Solids	EJ/yr		
			Final Energy|Other Sector|Solids|Coal	EJ/yr		
			Final Energy|Other Sector|Solids|Biomass	EJ/yr		
			Final Energy|Other Sector|Liquids	EJ/yr		
			Final Energy|Other Sector|Gases	EJ/yr		
			Final Energy|Other Sector|Electricity	EJ/yr		
			Final Energy|Other Sector|Hydrogen	EJ/yr		
			Final Energy|Other Sector|Heat	EJ/yr		
			Final Energy|Other Sector|Other	EJ/yr		
			Energy Service|Residential and Commercial|Floor Space	bn m2/yr		
			Energy Service|Transportation|Passenger	bn pkm/yr		
			Energy Service|Transportation|Freight	bn tkm/yr		
			Trade|Primary Energy|Coal|Volume	EJ/yr		
			Trade|Primary Energy|Gas|Volume	EJ/yr		
			Trade|Primary Energy|Oil|Volume	EJ/yr		
			Trade|Primary Energy|Biomass|Volume	EJ/yr		
			Trade|Primary Energy|Coal|Value	billion US$2005/yr		
			Trade|Primary Energy|Gas|Value	billion US$2005/yr		
			Trade|Primary Energy|Oil|Value	billion US$2005/yr		
			Trade|Primary Energy|Biomass|Value	billion US$2005/yr		
			Trade|Exports|Value	billion US$2005/yr OR local currency/year		
			Trade|Imports|Value	billion US$2005/yr OR local currency/year		
			Trade|AFOFI	billion US$2005/yr		
			Trade|Industry	billion US$2005/yr		
			Trade|Industry|Energy Intensive	billion US$2005/yr		
			Trade|Transportation	billion US$2005/yr		
			Trade|Commercial	billion US$2005/yr		
			Trade|Other Sector	billion US$2005/yr		
			Employment	million		
			Employment|AFOFI	million		
			Employment|Industry	million		
			Employment|Industry|Energy Intensive	million		
			Employment|Transportation	million		
			Employment|Commercial	million		
			Employment|Other Sector	million		

Model	Scenario	Region	Variable	Unit	base year: exogeneous or endogeneous	projected data: exogeneous or endogeneous
			Resource|Cumulative Extraction|Gas|Conventional	EJ		
			Resource|Cumulative Extraction|Gas|Unconventional	EJ		
			Resource|Cumulative Extraction|Oil|Conventional	EJ		
			Resource|Cumulative Extraction|Oil|Unconventional	EJ		
			Investment|Energy Supply	billion US$2005/yr		
			Investment|Energy Supply|Electricity	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Fossil	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Fossil|w/ CCS	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Fossil|w/o CCS	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Non-fossil	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Non-fossil|Biomass	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Non-fossil|Nuclear	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables|Solar	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Non-fossil|Non-Biomass Renewables|Wind	billion US$2005/yr		
			Investment|Energy Supply|Electricity|Other	billion US$2005/yr		
			Investment|Energy Supply|Extraction|Fossil	billion US$2005/yr		
			Investment|Energy Demand	billion US$2005/yr		
			Infrastructure Investment|Transportation|Road	billion US$2005/yr		
			Infrastructure Investment|Transportation|Aviation	billion US$2005/yr		
			Infrastructure Investment|Transportation|Rail	billion US$2005/yr		
			Infrastructure Investment|Transportation|Shipping|International	billion US$2005/yr		
			Land Cover	million Ha/yr		
			Land Cover|Cropland	million Ha/yr		
			Land Cover|Pasture	million Ha/yr		
			Land Cover|Forest	million Ha/yr		
			Land Cover|Other Land	million Ha/yr		
			Land Cover|Forest|Managed	million Ha/yr		
			Land Cover|Cropland|Energy Crops	million Ha/yr		
			Land Cover|Other Arable Land	million Ha/yr		
			Energy Service|Transportation|Passenger	billion pkm/yr		
			Energy Service|Transportation|Freight	billion tkm/yr		
			Energy Service|Transportation|Road	billion vkm/yr		
			Energy Service|Transportation|Passenger|Road	billion pkm/yr		
			Energy Service|Transportation|Passenger|Road|2W and 3W	billion pkm/yr		
			Energy Service|Transportation|Passenger|Road|LDV	billion pkm/yr		
			Energy Service|Transportation|Passenger|Road|Bus	billion pkm/yr		
			Energy Service|Transportation|Freight|Road	billion tkm/yr		
			Energy Service|Transportation|Aviation	billion vkm/yr		
			Energy Service|Transportation|Passenger|Aviation	billion pkm/yr		
			Energy Service|Transportation|Freight|Aviation	billion tkm/yr		
			Energy Service|Transportation|Rail	billion vkm/yr		
			Energy Service|Transportation|Passenger|Rail	billion pkm/yr		
			Energy Service|Transportation|Freight|Rail	billion tkm/yr		
			Energy Service|Transportation|Shipping|International	billion vkm/yr		
			Energy Service|Transportation|Passenger|Shipping|International	billion pkm/yr		
			Energy Service|Transportation|Freight|Shipping|International	billion tkm/yr		
			Energy Service|Transportation|Bicycling and Walking	billion pkm/yr		
			Water Consumption|Electricity	km3/yr		
			Water Consumption|Electricity|Biomass	km3/yr		
			Water Consumption|Electricity|Biomass|w/ CCS	km3/yr		
			Water Consumption|Electricity|Biomass|w/o CCS	km3/yr		
			Water Consumption|Electricity|Coal	km3/yr		
			Water Consumption|Electricity|Coal|w/ CCS	km3/yr		
			Water Consumption|Electricity|Coal|w/o CCS	km3/yr		
			Water Consumption|Electricity|Cooling Pond	km3/yr		
			Water Consumption|Electricity|Dry Cooling	km3/yr		
			Water Consumption|Electricity|Fossil	km3/yr		
			Water Consumption|Electricity|Fossil|w/ CCS	km3/yr		
			Water Consumption|Electricity|Fossil|w/o CCS	km3/yr		
			Water Consumption|Electricity|Gas	km3/yr		
			Water Consumption|Electricity|Gas|w/ CCS	km3/yr		
			Water Consumption|Electricity|Gas|w/o CCS	km3/yr		
			Water Consumption|Electricity|Geothermal	km3/yr		
			Water Consumption|Electricity|Hydro	km3/yr		
			Water Consumption|Electricity|Non-Biomass Renewables	km3/yr		
			Water Consumption|Electricity|Nuclear	km3/yr		
			Water Consumption|Electricity|Ocean	km3/yr		
			Water Consumption|Electricity|Oil	km3/yr		
			Water Consumption|Electricity|Oil|w/ CCS	km3/yr		
			Water Consumption|Electricity|Oil|w/o CCS	km3/yr		
			Water Consumption|Electricity|Once Through	km3/yr		
			Water Consumption|Electricity|Other	km3/yr		
			Water Consumption|Electricity|Sea Cooling	km3/yr		
			Water Consumption|Electricity|Solar	km3/yr		
			Water Consumption|Electricity|Solar|CSP	km3/yr		
			Water Consumption|Electricity|Solar|PV	km3/yr		
			Water Consumption|Electricity|Wet Tower	km3/yr		
			Water Consumption|Electricity|Wind	km3/yr		
			Water Withdrawal|Electricity	km3/yr		
			Water Withdrawal|Electricity|Biomass	km3/yr		
			Water Withdrawal|Electricity|Biomass|w/ CCS	km3/yr		
			Water Withdrawal|Electricity|Biomass|w/o CCS	km3/yr		
			Water Withdrawal|Electricity|Coal	km3/yr		
			Water Withdrawal|Electricity|Coal|w/ CCS	km3/yr		
			Water Withdrawal|Electricity|Coal|w/o CCS	km3/yr		
			Water Withdrawal|Electricity|Cooling Pond	km3/yr		
			Water Withdrawal|Electricity|Dry Cooling	km3/yr		
			Water Withdrawal|Electricity|Fossil	km3/yr		
			Water Withdrawal|Electricity|Fossil|w/ CCS	km3/yr		
			Water Withdrawal|Electricity|Fossil|w/o CCS	km3/yr		
			Water Withdrawal|Electricity|Gas	km3/yr		
			Water Withdrawal|Electricity|Gas|w/ CCS	km3/yr		
			Water Withdrawal|Electricity|Gas|w/o CCS	km3/yr		
			Water Withdrawal|Electricity|Geothermal	km3/yr		
			Water Withdrawal|Electricity|Hydro	km3/yr		
			Water Withdrawal|Electricity|Non-Biomass Renewables	km3/yr		
			Water Withdrawal|Electricity|Nuclear	km3/yr		
			Water Withdrawal|Electricity|Ocean	km3/yr		
			Water Withdrawal|Electricity|Oil	km3/yr		
			Water Withdrawal|Electricity|Oil|w/ CCS	km3/yr		
			Water Withdrawal|Electricity|Oil|w/o CCS	km3/yr		
			Water Withdrawal|Electricity|Once Through	km3/yr		
			Water Withdrawal|Electricity|Other	km3/yr		
			Water Withdrawal|Electricity|Sea Cooling	km3/yr		
			Water Withdrawal|Electricity|Solar	km3/yr		
			Water Withdrawal|Electricity|Solar|CSP	km3/yr		
			Water Withdrawal|Electricity|Solar|PV	km3/yr		
			Water Withdrawal|Electricity|Wet Tower	km3/yr		
			Water Withdrawal|Electricity|Wind	km3/yr		