

**Submission from National Institute for Environmental Studies (NIES): A response to the Talanoa Dialogue process**

**Summary**

Based on decisions 1/CP.21 (para 20) and 1/CP.23 (para 10-11 and Annex II), this submission provides input to the Talanoa Dialogue from the National Institute of Environmental Studies (NIES), Japan, based on our latest studies. Our inputs are related to three questions: (1) Where are we? (2) Where do we want to go? and (3) How do we get there?

As for “where are we”, our latest studies using the Asia-Pacific Integrated Model (AIM) show that the targets of greenhouse gas (GHG) emissions in 2020 and 2030 are both achievable. On the other hand, as for “where do we want to go”, there is less chance for the world to stay on the emission pathways to realize the 2 °C or 1.5 °C goals, even if the targets in 2020 and 2030 are met. In particular, under the middle-of-road scenario of the shared socio-economic pathways (SSP2), there is no plausible pathway that passes the total Nationally-Determined Contributions (NDCs) of years 2025~2030 and still stays within the emission trajectory towards 1.5 °C goal.

As for “how do we get there”, We used our indicator, the C-PPI, to measure the climate mitigation efforts of G20 countries in the past decade and also in the next decade to reach their respective NDCs. NIES’s studies found that the G20 countries as a whole have helped limit the growth of GHG emissions over the past decade, and they are aiming at further limitations with the goal of reaching their respective NDCs. The efforts, however, are not enough for us to be on the emission trajectory needed to meet the temperature goals. In addition, many countries can improve their policy implementation to increase their NDCs. If all of the additional policies recommended in the study are implemented in all G20 countries, emissions in the post-2020 period could be shifted downward to fill the gap between total NDCs and the trajectory needed to meet the 2 °C goal.

## **1. Background**

Decision 1/CP.21 para 20 states the Conference of the Parties (COP) to the UNFCCC decided to convene a facilitative dialogue among the Parties in 2018. The aim was to take stock of the collective efforts of the Parties regarding progress towards the long-term goal in Article 4.1 of the Paris Agreement and to inform the preparation of nationally determined contributions (NDCs) pursuant to Article 4.8 of the Agreement. The COP, during its 23rd session, welcomed the design of the 2018 facilitative dialogue, to be known as the Talanoa Dialogue, which was launched in January 2018 (decision 1/CP.23, para 10-11 and Annex II). This submission supplies inputs to the Dialogue from the National Institute of Environmental Studies, Japan, on the basis of the latest studies here at NIES. Our inputs are related to three questions: (1) Where are we? (2) Where do we want to go? and (3) How do we get there?

## **2. Where are we?**

In order to assess the present greenhouse gas (GHG) emissions and future GHG emission pathways, we utilize our integrated assessment model, Asia-Pacific Integrated Model (AIM). AIM consists of various types of model to meet the research target, and for this study, we use the global scale computable general equilibrium (CGE) model (AIM/CGE [Global]). Detailed model structure of the AIM/CGE [Global] can be downloaded from the following website: <http://www.nies.go.jp/social/dp/pdf/2012-01.pdf>

The simulation results show that the emission targets in 2020 and 2030 are feasible solutions. This means that the existing targets can be achieved. The cost to attain the targets are different among the countries. To achieve the NDCs in 2030, the GHG price in developed countries are generally higher than developing countries. Simulation result also shows that the GHG price in some developing countries in 2030 is zero or nearly zero. In other words, some countries will be able to achieve the target without any burdens.

## **3. Where do we want to go?**

Future GHG emissions will be decided not only by the GHG mitigation measures such as introduction of renewable energies and energy saving technologies but also by the socio-economic conditions including the lifestyle and infrastructure. We assess the GHG emission pathways toward 1.5 °C or 2 °C target using the AIM/CGE [Global].

Targets proposed in NDCs are meaningful and necessary to develop low carbon society. However, achievement of the 2 °C target will depend on the revision of NDCs and mitigation measures after 2030. Specifically, we will have to reduce GHG emissions drastically between 2030 and 2040 in order to realize the 2 °C target, if the present NDCs is not revised. In order to make the GHG emission pathway easy after 2030, the NDCs in 2025-2030 will have to be strengthened. During the 21<sup>st</sup> century, the GHG emissions especially in Asia are expected to increase. This means that the deeper mitigation measures in Asia will be more important to

realize the 2 °C target.

The emission pathways to achieve the goal of 1.5 °C need the more rigid condition. Under the socio-economic condition of SSP2 (middle of the road among the 5 shared socio-economic pathways), the emission pathway following the present NDCs targets up to 2030 falls short of the pathways to achieve 1.5 °C target after 2030. This result means that the present NDCs targets are completely insufficient to achieve the goal. To attain the 1.5 °C target, the deeper reduction in 2025-2030 all over the world will be absolutely imperative.

Realizing the 2 °C or 1.5 °C target requires not only the GHG mitigation measures but also the appropriate socio-economic condition. Under the high carbon society, application of GHG mitigation measures will be very difficult. To facilitate introduction of mitigation measures, the society itself needs to shift to be consistent with the low or zero carbon society. For example, people's preference and lifestyle will have to change in accordance with their awareness on environment, the payback period of decision making be longer, and so on. If the environmentally conscious society is selected, the GHG mitigation measures will become easier, because the various barriers including the costs to achieve the target become smaller.

#### **4. How do we get there?**

##### **4.1 Measuring countries' effort by C-PPI**

We have designed a set of indicators called the Climate change mitigation Policy Progression Indicator (C-PPI) to assess the sufficiency of policy implementation. The C-PPI consists of two pillars. *Outcome Indicators* assess the status of countries with respect to their achievement of actual GHG emission reductions by comparing each country's data with those of other countries, as well as by checking the trend of each country's time series data. These indicators show the actual quantitative emission status independent of any policy efforts taken by these countries. On the other hand, *Action Indicators* measure countries' level of policy implementation. GHG emissions are affected by various factors such as economic conditions and the weather, which are independent of any implementation of climate change mitigation policies. Action Indicators measure the level of effort related to climate mitigation policies by selecting key policy instruments that could be commonly introduced in all countries.

Although GHG emission sources vary from one country to another and the factors behind emission growth and reduction differ tremendously among countries, several common goals need to be shared by all countries if the world is going to achieve the long-term temperature increase goal of either 2 °C or 1.5 °C. We selected four goals to be applied to both the Action and Outcome Indicators: (1) decarbonizing energy, (2) improving energy efficiency, (3) minimizing demand for energy services, and (4) reducing non-CO<sub>2</sub> GHG and land-use-related emissions. A detailed explanation on the C-PPI methodology can be found at [http://www-iam.nies.go.jp/climatepolicy/cppi/images/2nov2016\\_CPPIver3.pdf](http://www-iam.nies.go.jp/climatepolicy/cppi/images/2nov2016_CPPIver3.pdf).

This section presents the results of one of our studies that used the C-PPI to examine emission-reduction efforts of the G20 countries. Together, the G20 countries generate about

80% of global GHG emissions. Taking a close look at these countries' progress towards developing low-emission economies is useful, not only because of their absolute share of emissions within the global total, but also because other countries see the G20 countries as examples. The country names are not indicated, because the aim of the Talanoa Dialogue is to take stock of the collective efforts of Parties, not to assess the effort of each individual country.

To evaluate the relationship between level of economic development and level of achievement, the G20 countries were categorized into three groups according to per capita GDP in 2010 in real terms (using the average exchange rate of the local currency and US dollar of 2010):

- Group 1 (countries A–H, more than US\$35,000),
- Group 2 (countries I–N, between US\$10,000 and 22,000),
- Group 3 (countries O–S, less than US\$8,000).

#### **4.2 Goal 1: Decarbonizing energy (Figure 1)**

*CO<sub>2</sub> emission / primary energy supply* was chosen as the Outcome Indicator to measure the level of decarbonization of energy. Selected Action Indicators include policies to promote renewable energy, decarbonize fossil-fuel-combustion power plants, set standards for nuclear power plants, and decarbonize the transportation sector. For the Action Indicators, the study rated policy implementation by using seven levels: *A+*, *A*, *AB*, *B*, *BC*, *C*, and *C-*. A rating of *A+* means that the level of policy implementation is sufficient to place the country on the path towards reaching the long-term goal of the Paris Agreement. A *C-* rating means that no policy was found within the chosen criteria.

In the comparison of Groups 1, 2 and 3, it became apparent that the level of decarbonization does not greatly depend on the level of economic development. Rather, it depends more on the initial endowment of potential sources of renewable energy, such as hydropower. Most countries within all three groups have aimed to decarbonize energy during the past decade. Countries that set NDCs aimed at carbon-intensive energy are those that are expecting rapid economic growth entailing increased use of coal power plants or those countries that have previously used mostly biomass energy and are now shifting to fossil-fuel energy sources. These countries would be able to improve their levels of NDCs if they were able to obtain international support to increase the energy supply from renewable energy.

In terms of Action Indicators, many Group 1 countries have already implemented a variety of policies contributing to the decarbonization of energy, but other countries still have much room for policy implementation. To promote renewable energy, the setting of numerical targets and the introduction of economic incentives such as feed-in tariffs were most effective during the past decade to increase the share of renewable energy. For countries that have not yet been able to decarbonize electricity generation, decisions are urgently needed on whether to invest in renewable energy, nuclear power, or carbon capture and storage (CCS). For countries that have already decarbonized electricity generation, electrification in the transportation sector and for heating buildings are likely to be areas in which further progress can be made.

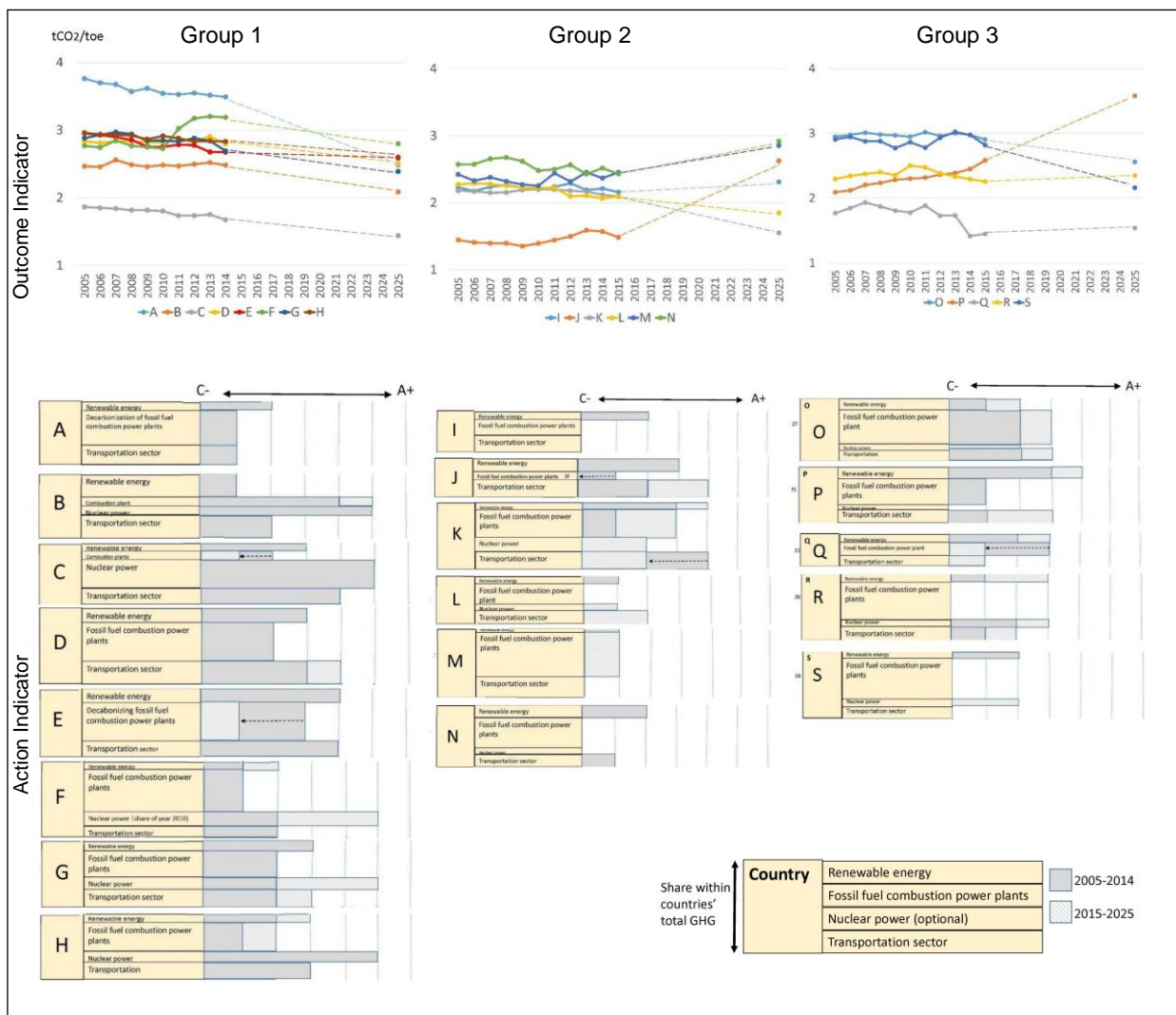


Figure 1: Outcome and Action Indicators for Goal 1 (decarbonizing energy)

#### 4.3 Goal 2: Improving energy efficiency (Figure 2)

*Final energy consumption/GDP* was chosen as the Outcome Indicator to measure level of energy efficiency improvement. Policies to improve energy efficiency in the industrial, building, and transportation sectors were chosen as Action Indicators.

The Outcome Indicator showed that all countries have been aiming at improving energy efficiency during the past decade. All countries have also set NDCs that aim at further improvement in the post-2020 period, but the rate of improvement is likely to slow down in many countries. A comparison across Groups 1, 2, and 3 reveals that some countries in Group 2 have been able to make minor improvements in the past decade, even though their per capita GDPs are much higher than those of countries in Group 3. The Action Indicators for Groups 2 and 3 also showed a subtle difference in the level of policy introduction, meaning

that Group 2 countries could place effort into introducing policies to improve energy efficiency to achieve and deepen their NDCs in the post-2020 period.

Various policies have been found to be effective in improving energy efficiency. These include introducing reporting and reviewing processes for energy-intensive industries, implementing building codes (including for wall and window insulation), and regulating inefficient old automobiles. Labeling is one of the most popular policies that has already been put in place in most countries. Increasing the price of energy is also an effective tool to incentivize improvements in energy efficiency, and reducing energy subsidies is an effective policy in many developing countries. In the future, these regulatory policies need to be upgraded in all countries to reach NDCs aimed at greater improvements in energy efficiency. Even among Group 1 countries, the level of policy implementation was found to vary from one country to another.

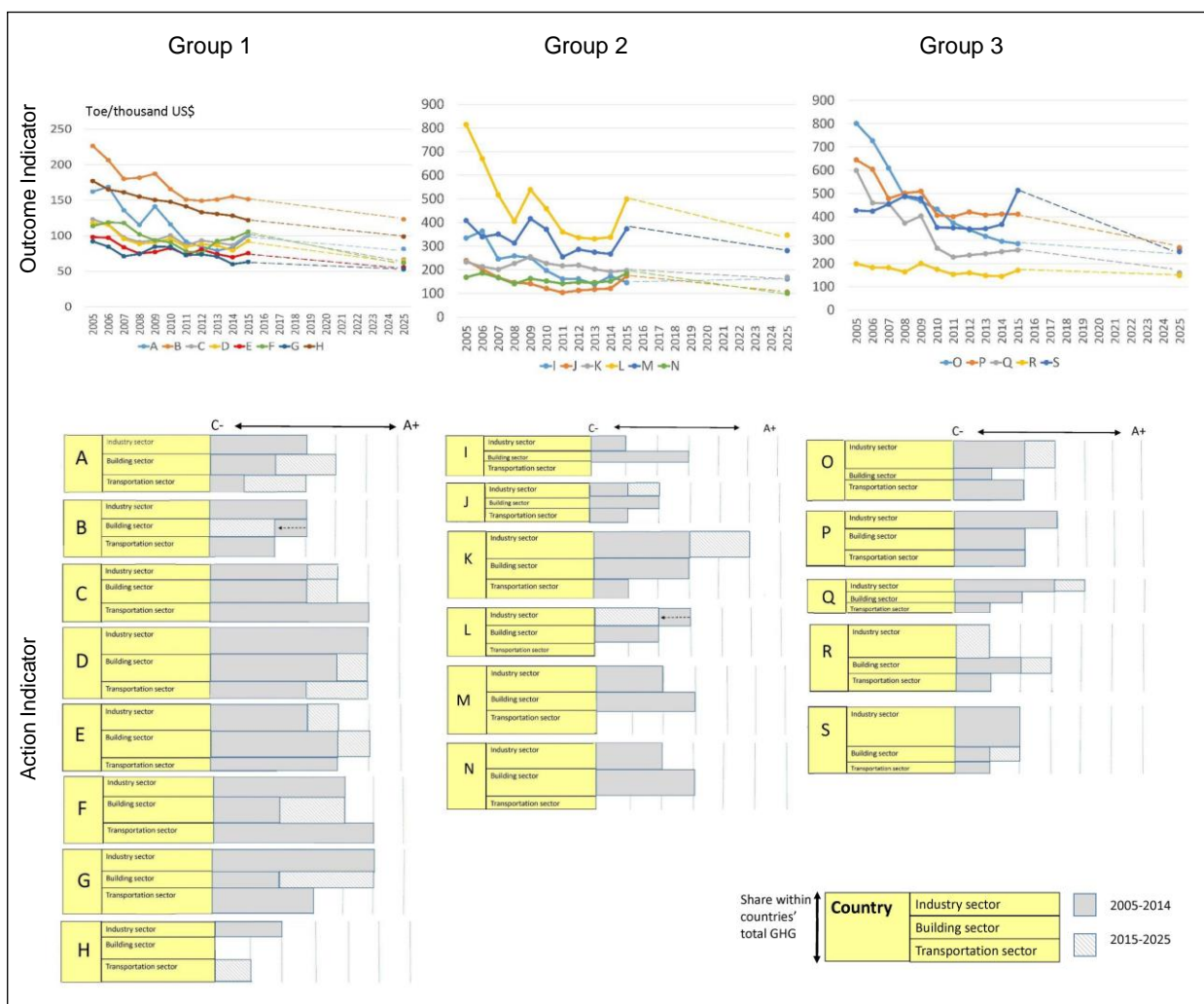


Figure 2: Outcome and Action Indicators for Goal 2 (improving energy efficiency)

#### 4.4 Goal 3: Minimizing demand for energy service (Figure 3)

*Final energy consumption/person* was chosen as the Outcome Indicator to measure level of demand for energy services. Policies to minimize energy demand were selected from the industrial, building, and transportation sectors as Action Indicators.

Only Group 1 countries have made progress in energy consumption per capita in the last decade, although progress is slow even in these countries. Countries in Groups 2 and 3 have actually increased per capita energy consumption in the last decade. Although this may partially be necessary to meet basic human needs in poor countries, it is not necessarily the case in countries with a per-capita GDP near that of Group 1 countries. Some countries in Group 2 are not expected to be able to decrease their demand for energy service in the next decade. Even in many Group 1 countries, additional decreases are not expected in their NDCs. All countries, except those in Group 3, need to improve their NDCs to seek additional decreases in this area.

Less policy implementation was observed for this goal than for the previous two goals in almost all countries. This means that all countries need to implement additional policies aimed at decreasing demand for energy services. In particular, some of the countries in Group 2 need to implement policies in this area to achieve lower NDCs. Unlike in other Goals, there was no clear consistency between level of policy implementation and level of outcome in each country. This means improvements in this area require not only climate-related policies but packages of policies that cut across various policy areas such as urban planning and education.

Examples of key policy areas that are important in decreasing the demand for energy services include increasing combined heat and power (CHPs) systems in industrial parks and urban areas to make the best use of waste heat; increasing consumer awareness by informing consumers of their own energy consumption through the use of, for example, smart metering and visualization of energy consumption; and improving urban planning to reduce the demand for automobile transportation. Policies such as increasing energy prices for consumers can be introduced simultaneously with policies that offer relevant alternatives to stimulate behavioral changes. For example, an increase in the price of gas should be more effective when public transportation is convenient, affordable and safe.

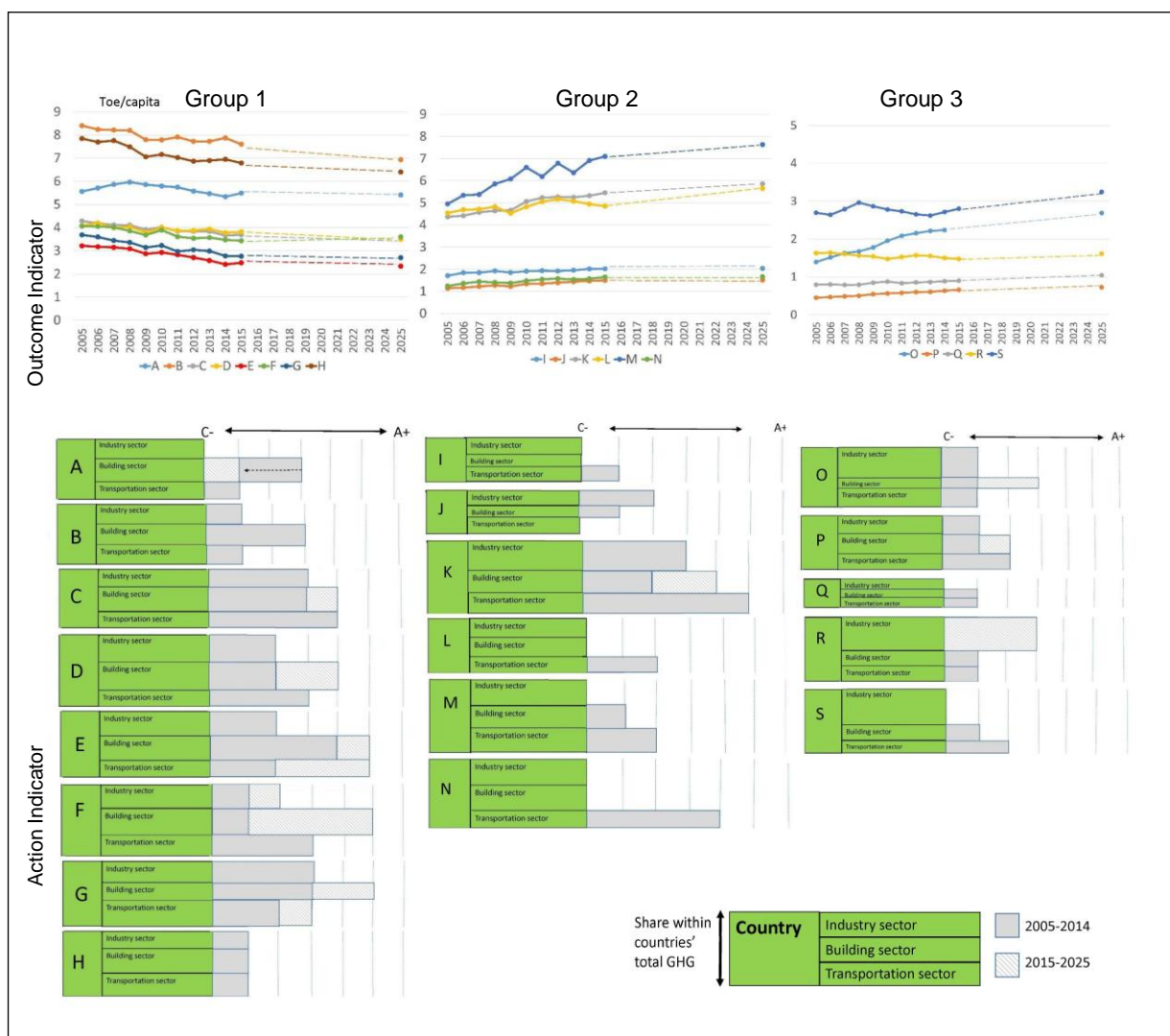


Figure 3: Outcome and Action indicators for Goal 3 (decreasing demand for energy services)

#### 4.5 Goal 4: Reducing non-CO<sub>2</sub> GHG and land-use-related emissions (Figure 4)

*Non-CO<sub>2</sub> gases emission/person* was used as the Outcome Indicator to measure the level of effort to reduce non-CO<sub>2</sub> GHG (methane, nitrous oxide, and f-gases) emissions. The rate of change of forest area was selected to measure land-use-related emissions. It should be noted that less data on emissions and NDCs were available for these gases, and thus, levels indicated in Figure 4 are tentative for many countries. Policies related to methane emissions from the agriculture, mining, and waste disposal sectors, and those related to emissions of f-gases, were selected as Action Indicators to measure actions to reduce non-CO<sub>2</sub> GHG emissions. Policies related to target setting for forest areas, forest management, and procurement of sustainable wood products were used as Action Indicators to measure forest-related activities.

In most countries, emissions of non-CO<sub>2</sub> gases remained relatively the same in the past



decade, and the same situation is projected in the next decade. As for forest coverage, some countries have maintained positive percentage throughout the last decade, meaning these countries continued increasing forest area at a certain rate throughout the decade. In some other countries, the rate is stable at nearly zero (meaning forest unchanged). Only one country in Group 1 was able to change decreasing trend (negative level) into increasing trend (positive level).

Per-capita emissions of non-CO<sub>2</sub> gases are not necessarily affected by a country's level of economic wealth. Rather, they were affected by the level of activities of certain industries that emit large amounts of non-CO<sub>2</sub> GHGs, such as agriculture and fossil fuel industries. Forest coverage change was also not related to level of economic wealth.

The height of each Action Indicator (bottom half in Figure 4) reflects the share of emissions and sequestrations within total national emissions. In the comparison of Action Indicators shown in Figures 1, 2, and 3, some countries' emissions in these sectors account for a significant percentage of national emissions, but almost no policies are being implemented to mitigate methane and nitrous oxide emissions. Although tackling non-CO<sub>2</sub> GHG emissions is a challenging task, it is indispensable to reach the long-term goal set by the Paris Agreement.

Key policies to reduce non-CO<sub>2</sub> gases include collection of methane from fossil fuel extraction plants and land-fill waste disposal sites. Policies to reduce f-gases are introduced mostly in Group 1 countries, mainly because they are major f-gas users. In general, there are very few number of policies to reduce non-CO<sub>2</sub> gases compared to policies aimed at other three Goals. We observed a strong linkage between forest coverage change and implementation of forest-related policies. Countries that set absolute numerical targets for afforestation area or for number of trees to be planted were able to increase afforestation or decrease deforestation. Target setting and subsidizing tree-planting activities appear to be an effective policy package that works as an incentive to increase and maintain forest coverage.

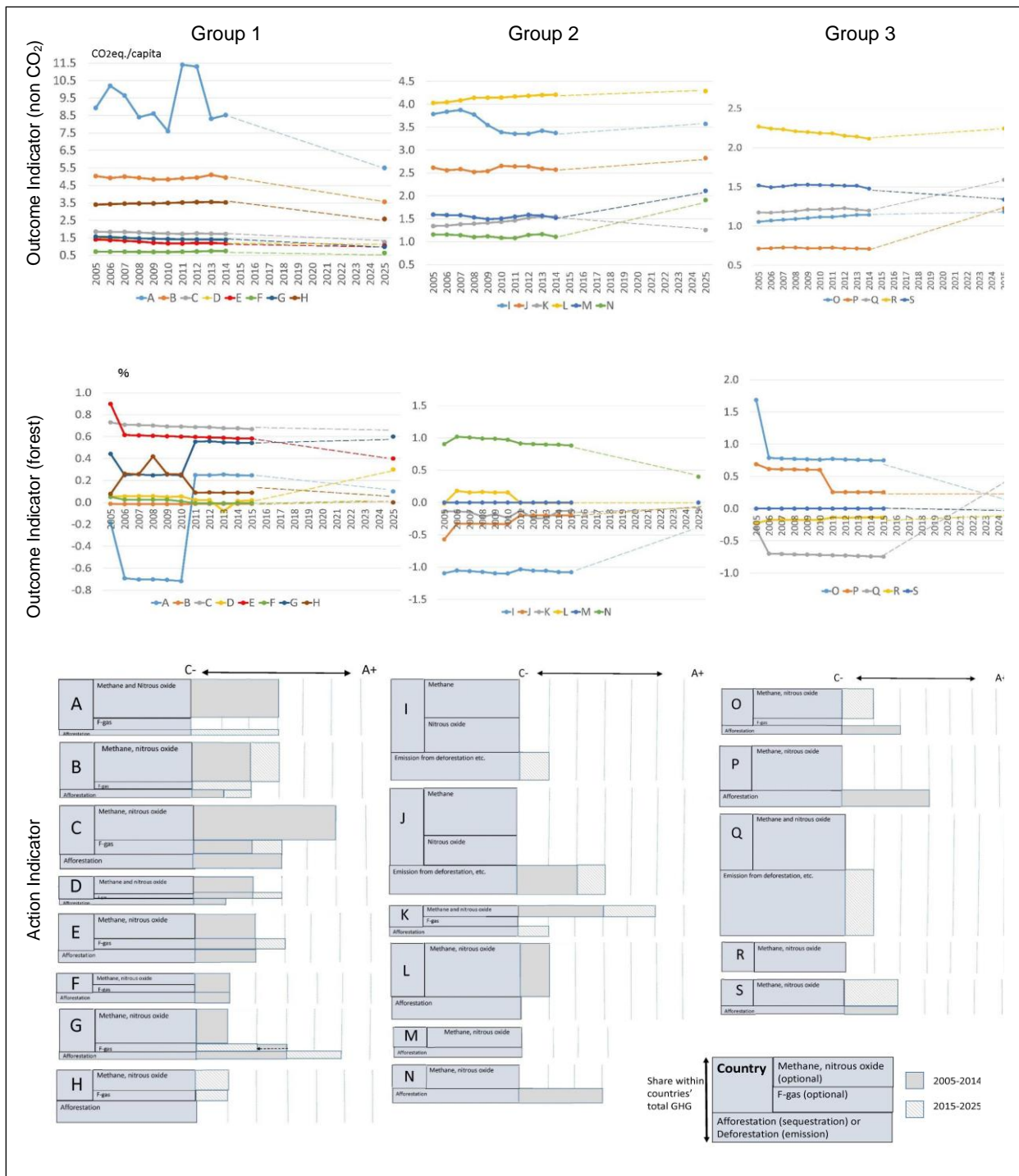


Figure 4: Outcome and Action Indicators for Goal 4 (reduce non-CO<sub>2</sub> GHG emissions and increase sequestration by land-use change)

#### 4. Conclusions

This study investigated the three questions posed by the Talanoa Process. From the modeling exercise, it was found that the emission targets for years 2020 and beyond are achievable targets. On the other hand, there are less chances for the world to stay on the emission trajectory towards the 2 °C or 1.5 °C goals, even if the targets in 2020 and 2030 were met. Especially, there is no plausible pathway that passes the total NDCs of years 2025~2030 and still stay within the emission trajectory towards 1.5 °C goal. This means the NDCs for these years need to be further deepened for the world to reach the 1.5 °C goal.

With the aim of looking for linkages between policy implementation and emissions, these studies investigated the actions taken by, and GHG emission trends of, G20 countries. In general, policy implementation was found to actually influence emission trends. There still is a great deal of potential for further implementation of climate mitigation policies in the future in all countries. If the additional policies noted in this submission are implemented by all G20 countries, emissions in the post-2020 period could shift downwards to fill the current gap between total NDCs and the pathway towards the 2 °C goal.

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