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Greenhouse gas emissions inventory capacity: An assessment of Asian developing countries

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Key messages

- In the context of the transparency framework under the Paris Agreement (PA), this paper presents the status and changes in the capacity of 37 developing countries in Asia to develop national GHG inventories by using a matrix of capacity-indicators. It also analysed the availability and scale of international support and assessed variations in capacity building efforts and support.
- Eleven Asian developing countries did not improve their capacity and remained as low capacity across GHG inventories. Nineteen had a relatively high capacity, including those with a relatively high capacity from the first GHG inventory and those whose capacity sufficiently improved. Seven had the highest capacity ready for the communication of GHG inventories on a regular basis.
- International support was provided more to those countries which already had advanced capacities from the earlier stage of inventory development. Less support was given to the countries that require the most international capacity building efforts. Low capacity countries will need to receive increased international support to enable their full participation in the PA's transparency framework.
- The Capacity-building Initiative for Transparency (CBIT) and other international capacity building activities should direct more of their resources to particularly strengthening basic technical capacity in a country (e.g., statistics and the scientific expertise) to support the GHG inventory development process, while addressing the co-benefits of the transparency-related efforts by developing countries.

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1. Introduction

At the 21st session of the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), held in Paris in December 2015, the Paris Agreement (PA) was adopted to strengthen global efforts to mitigate climate change. The core objective of the PA is that all Parties implement their nationally determined contributions (NDCs). Parties track implementation of their NDCs in accordance with the PA's transparency framework, which aims to build mutual trust and confidence and to promote the effective implementation of the PA (UN, 2015).

A national greenhouse gas (GHG) inventory is a compilation of a country's estimated anthropogenic GHG emissions and removals. Almost all Parties to the UNFCCC have reported GHG inventories for nearly 20 years. However, there are clear distinctions between Annex I (developed) and non-Annex I (developing) countries for reporting requirements (UN, 1992). For example, while Annex I Parties are required to submit GHG inventories annually (UNFCCC, 1999 and 2013), non-Annex I Parties should do so every three to four years as part of national communications (NCs) and communicate updates on their inventories as part of biennial update reports (BURs) (UNFCCC, 2002 and 2011). In this paper we refer to Annex I Parties as developed countries and non-Annex I Parties as developing countries.

The PA's transparency framework consists of two information elements: a national inventory report of GHGs and information necessary to track progress in implementing and achieving NDCs by a country (UNFCCC, 2015). This framework will be, in principle, equally applied to all countries while reflecting the circumstances of each country by building in flexibility. However, the existing capacities of developing countries to do so is highly variable (Damasa and Elsayed, 2013). Capacity for the purpose of this study refers to the ability of a country to conduct a GHG inventory in response to the international requirements under the UNFCCC. One illustration for varying capacities in developing countries is that, despite agreeing in COP17 that developing countries would submit their first BUR (BUR1) by December 2014, only nine met this deadline. To date, only 34 countries have submitted their BUR1 (UNFCCC, 2011 and 2016, as of September 2016).

This paper analyses the change in capacity of developing countries across Asia to develop national GHG inventories by comparing the status of capacity at the time of submitting the first GHG inventory with the status of capacity at the time of submitting subsequent GHG inventories. We performed this assessment of GHG inventory capacities by using a matrix of capacity-indicators. Further, to provide context to our results, we analysed the availability and scale of international support and variations in capacity building efforts and support.

2. Data and methodology

2.1 Data

This study focuses on 37 developing countries in Asia[1]. These countries were selected, because they have submitted their GHG inventories at least as part of NC1 and NC2 (seven also submitted BUR1) and also because their NCs and BURs were available on-line (UNFCCC 2016 and 2016b). Data were assembled from publicly available sources and integrated into a single database.

The main data source to assess the GHG inventory development capacities was the GHG inventory section and annexes of individual Parties' NC1, NC2 and BUR1. Another primary source was information collected from the questionnaire survey targeting GHG inventory experts. GHG inventory experts are those who have experience with developing a GHG inventory of a developing country in Asia or supported such a process as an expert. As mentioned below, the survey was conducted to identify the importance of indicators, which we refer to as indicator weighting. Results of the questionnaire provided by ten experts, nine from developing countries and one from a developed country, were used in this study. Additional information on understanding of IPCC methods, national scientific capacities and statistical capacities was taken from a variety of publicly available sources (Table 1).

Two main data sources for measuring the level of international support related to GHG inventory development were the OECD Rio Marker (OECD, 2016) and the UNFCCC Capacity-building Portal (UNFCCC, 2016c). The OECD Rio Marker is the database focusing on bilateral official development assistance (ODA). The Portal summarises information provided by United Nations agencies and the Global Environment Facility on their respective capacity-building activities, including on GHG inventories. As some information contained in the OECD Rio Marker database for Japan in 2010 was aggregated and not appropriate for the use of this analysis, the Fast-Start Finance (FSF) database was used instead (Nakhooda et al., 2013).

The submission years of NC1 and NC2 from the countries assessed in this study ranged from 1997 to 2007, and from 2003 to 2016. For BUR1, submissions were between 2014 and 2016. Three years, 2000, 2010 and 2014, were chosen as representative years for submissions of NC1, NC2 and BUR1, respectively. Then data for additional information from sources other than NCs and BURs were collected for or as close as possible to these three years, depending on data availability, to assess changes in capacity across different GHG inventories. Data on international support were collected for 2002, 2010 and 2014. However, as no data on support were identified for 2002, data on international support for 2010 and 2014 only were used.

[1] Based on the United Nations Regional Groups of Member States (UN, 2014)

Table 1 Overview of assessment categories, criteria, indicators and the data sources used for calculating the capacity value

Assessment category	Criteria	Indicator (sources)
International engagement	Timely response	Promptness of application for GEF funding by a country for NC1, NC2 and BUR1, if submitted (UNFCCC, 2003, 2012, 2015b)
Institutional capacity	Coordination capacities	Existence of a single overall coordination body (GHGI*)
	National formal/legal arrangements	Exitence of national formal/legal arrangements for developing a GHG inventory (GHGI)
	Continuous improvements	Existence of a continuous improvement plan (GHGI)
	Involvement of stakeholders	Existence of arrangements/systems for Involvement of stakeholders (GHGI)
	Domestic financial resources availability	Existence of domestic financial resources available for sustaining a team of experts (GHGI)
Technical capacity available	Understanding of IPCC methods	Number of authors/contributors to IPCC guidelines and guidance (IPCC, 1997, 2000, 2003, 2006, 2013, 2013b)
	National scientific capacities	Researchers in R&D (per million people) (WB, 2016)
	National statistical capacities	Overall Statistical Capacity Indicator (WB, 2016b)
Technical capacity applied	Transparency	Level of information provided for methodologies in each sector (GHGI)
		Existence of QA/QC plan/arrangements (GHGI)
	Accuracy	Use of tier 2 or 3 methods in each sector (GHGI)
		Application of uncertainty assessment (GHGI)
	Completeness	Comprehensiveness of reporting in each sector (GHGI)
	Comparability	Use of appropriate/latest guidelines (GHGI)
		Application of key category analaysis (GHGI)
	Consistency	Timeseries inventories (GHGI)
		Timeseries consistency (GHGI)

* indicates the GHG inventory section and annexes of NC1, NC2 and BUR1 submitted by each country.

2.2 Methodology

A methodology was developed to attribute a value to the capacity necessary for GHG inventory development at the country level. This approach was derived from the methodology of Romijin et al. (2012), except for indicator weighting applied in this study. The capacity value was calculated by summarising indicators representing four major assessment categories for which fourteen criteria were assessed. We calculated the capacity value at the time of a country's submissions of NC1 and NC2 (and BUR1, if submitted) to the UNFCCC. We classified these values into different capacity status and examined change in capacity status across GHG inventories. In addition, the value of international support provided for GHG inventory development in each developing country was calculated. We then compared the capacity and support values to analyse variations across countries in the availability and scale of support.

2.2.1 The capacity value

A preliminary list of assessment categories, criteria and indicators were developed based on literature review (NCSP, 2005; IPCC, 2006; NIES, 2006; Damasa and Elsayed, 2013; UNFCCC, 2013b; CGE, 2016; US-EPA, 2016). Four assessment categories were identified: (1) international engagement of a country in the GHG inventory-related process; (2) institutional capacity to produce a GHG inventory; (3) existing technical capacity available to develop a GHG inventory; and (4) actual technical capacity applied to produce a GHG inventory.

The first assessment category addresses the level of engagement of a country in the international UNFCCC processes related to NCs and BURs and the understanding that countries have in responding to the UNFCCC requirements, such as access to funding of the Global Environmental Facility (GEF). The second category explains the current national institutional capacity for preparing a GHG inventory. This includes coordination capacities, legal arrangements, existence of systems for stakeholder engagement, etc. (NCSP, 2005; Damasa and Elsayed, 2013; UNFCCC, 2013b; CGE, 2016; US-EPA, 2016). The third category presents technical capacity, that is not specific to, but necessary for GHG inventory development. This includes capacity such as general scientific and statistical capacity of a country (NIES, 2006). The fourth category identifies technical capacities that are specific and applied to submitted GHG inventories. These capacities are formed following the IPCC's principle of transparency, accuracy, completeness, comparability and consistency (IPCC, 2006).

Each assessment category was then divided into the criteria that represent the specific elements of the assessment categories. These 14 criteria consisted of one or two indicators used to assign a value to the criteria during a desk review of data sources (Table 1). The indicator score was then weighted, based on expert opinion of the importance of each category (see indicator weighting methodology below). The sum of the weighted indicator score was used as the capacity value for GHG inventory development in this

study.

2.2.1.1 Indicator score

During the desk review of data sources, an indicator score in the range of -0.5 and 2 was assigned to each indicator characteristic (Table 2). The higher the score, the higher the capacity of a country was in relation to the criteria concerned. Some of the indicator scores also contained "not applicable (N/A)". This meant that the indicator should not be considered, because COP decisions or IPCC guidelines at the time of reporting by countries did not require that capacity to be taken into account. For example, a key source analysis was encouraged to be undertaken for the first time at COP8 in 2002 (Decision 17/CP.8), so any reports submitted beforehand should not be assessed with a lower score, due to a lack of key source analysis (UNFCCC, 2002).

Table 2 Overview of indicator characteristics and score

Indicator	Characteristics (score)
Promptness of application for GEF funding by a country for NC1, NC2 and BUR1, if submitted*	After a call for application and before the relevant COP decision (1.5); Within 2 years after the relevant COP decision (1); Within 2-4 years after the relevant COP decision (0.5); More than 4 years after the relevant COP decision (0)
Existence of a single overall coordination body	Existence with clear role (1.5); Existence without clear role (1); Acknowledgement of a lack of existence (0.5); No data (0)
Exitence of national formal/legal arrangements for developing a GHG inventory	Existence with clear role (1.5); Existence without clear role (1); Acknowledgement of a lack of existence (0.5); No data (0)
Existence of a continuous improvement plan	Existence with clear role (1.5); Existence without clear role (1); Acknowledgement of a lack of existence (0.5); No data (0)
Existence of arrangements/systems for Involvement of stakeholders	Existence with clear role (1.5); Existence without clear role (1); Acknowledgement of a lack of existence (0.5); No data (0)
Existence of domestic financial resources available for sustaining a team of experts	Existence at the level sufficient to sustain a team of experts (1.5); Existence at the level not sufficient to sustain a team of experts (1); Acknowledgement of no domestic fund available (0.5); No data (0)
Number of authors/contributors to IPCC guidelines and guidance	>10 (1.5); >2 (1); = 1 (0.5); = 0 (0)
Researchers in R&D (per million people)	> 1,500 (1.5); > 1,000 (1); > 500 (0.5); > 0 or no data (0)
Overall Statistical Capacity Indicator	>80 (1.5); >60 (1); >40 (0.5); >0 or no data (0)
Level of information provided for methodologies in each sector	Methodologies are clearly mentioned for all reported categories (1); Methodologies are clearly mentioned for some of reported categories (0.5); No data (-0.5); N/A (0)
Existence of QA/QC plan/arrangements	Existence of a plan/arrangements (1.5); QA/QC mentioned or aknowledgment of lack of a plan/arrangements (1); No data (-0.5); N/A (0)
Use of tier 2 or 3 methods in each sector	All reported categories (2); Some of reported categories (1); None (0.5); N/A (0)
Application of uncertainty assessment	Application to all or some of reported categories (1.5); Acknowledgement of lack of assessment (1); No data (-0.5); N/A (0)
Comprehensiveness of reporting in each sector	All required categories are reported (1); Some of required categories are reported (0.5); No data (-0.5); N/A (0)
Use of appropriate/latest guidelines	Use of appropriate/latest guidelines for all sectors (1); Use of appropriate/latest guidelines for some sectors (0.5); No data (-0.5)
Application of key category analaysis	Key category analysis conducted quantitatively (1); Key category analysis mentioned or acknowledgement of lack of analysis (0.5); No data (-0.5); N/A (0)
Timeseries inventories	Reported (1); Acknowledgement of lack of reporting (0.5); No data (-0.5); N/A (0)
Timeseries consistency	Consistent (Recalculated) (1); Acknowledgement of lack of consistency (0.5); No data (-0.5); N/A (0)

* Singapore and the Republic of Korea, which did not use the GEF funding, were scored at 1.5 (UNFCCC, 2015c and 2015d).

2.2.1.2 Indicator weighting

Based on the list of assessment categories and criteria, a questionnaire survey was conducted with GHG inventory experts. Survey results (n=10) were used to identify the importance of the assessment categories and produce an expert generated list of indicator weights. With the questionnaire survey, experts were asked to distribute a total score of 100 for each of the four assessment categories, depending on how important they considered the assessment category in the overall GHG inventory capacity of a developing county. The average score of each assessment category was then used to calculate the indicator weighting using Equation 1 (below).

Equation 1: Indicator weighting in category (1, 2, 3 or 4) = Average category score / the number of criteria / the number of indicators

Table 3 The average score of each assessment category used for calculating the indicator weighting

Assessment category	Score
International engagement	12.0
Institutional capacity	36.5
Technical capacity available	26.1
Technical capacity applied	25.4

The capacity value of a country was determined by adding up the weighted indicator scores across the four assessment categories following Equation 2. The highest possible value that could be obtained by a country was 111, the lowest possible score was –11.

Equation 2: Overall capacity value = (Σ (indicator score * indicator weighting of category 1, 2, 3 and 4)

We then divided these overall values into four overarching description of capacity status: Limited, Intermediate, Good and Very good (Table 4). Any change in this capacity status was then assessed for a country over time by comparing the status of NC1, NC2 and BUR1, if applicable.

Table 4 The overarching description of capacity status based on the capacity value

Capacity status	Capacity value
Limited	>0
Intermediate	>20
Good	>40
Very good	>60

2.2.2 The support value

A separate calculation was made for determining the value of international support, both bilateral and multilateral, provided to each developing country with respect to GHG inventory development. The support value was represented by the number of GHG inventory-related capacity building projects in each developing country. For bilateral support, projects in the OECD Rio Marker were chosen as relevant, if a project title or project description contained any of the following key words: "greenhouse gas inventories", "inventory", "monitoring", "reporting", "MRV", "emission" and "carbon". The data of Germany, Japan, UK and the USA as a contributor country were used, because these four countries are the major donors during the first-start finance period (2010-2012) of climate finance under the UNFCCC (Nakhooda et al., 2013). For multilateral support, projects in the UNFCCC database under capacity building activities with priority area listed as GHG inventories was selected. Both bilateral and multilateral support were then combined to estimate the support value for each developing country. We then divided these overall values of support into overarching description of support levels: Low, Medium and High (Table 5).

Table 5 The overarching description of support levels based on the support value

Support levels	Support value
None	0
Low	1
Medium	2-3
High	>4

3. Results

3.1 Status and changes in GHG inventory development capacities

This study highlights variations in the status of Asian developing countries' (n=37) capacity to develop a GHG inventory and how capacity changed over time. Table 6 presents the changes of capacity status from NC1, NC2 then BUR1, if submitted. Figure 1 shows the spatial distribution of capacity status for these countries at the time that they submitted NC1 and NC2.

Table 6 Number of countries at different capacity status comparing at the time of NC1 and NC2 and NC2 and BUR1

		Capacity status (NC2)				
		Limited	Intermediate	Good	Very good	Sum
Capacity status (NC1)	Limited	2	3	2	0	7
	Intermediate	1	5	5	2	13
	Good	0	0	5	5	10
	Very good	0	0	1	6	7
	Sum	3	8	13	13	37

		Capacity status (BUR1)				
		Limited	Intermediate	Good	Very good	Sum
Capacity status (NC2)	Limited	0	0	0	0	0
	Intermediate	0	0	0	0	0
	Good	0	0	1	0	1
	Very good	0	0	0	6	6
	Sum	0	0	1	6	7

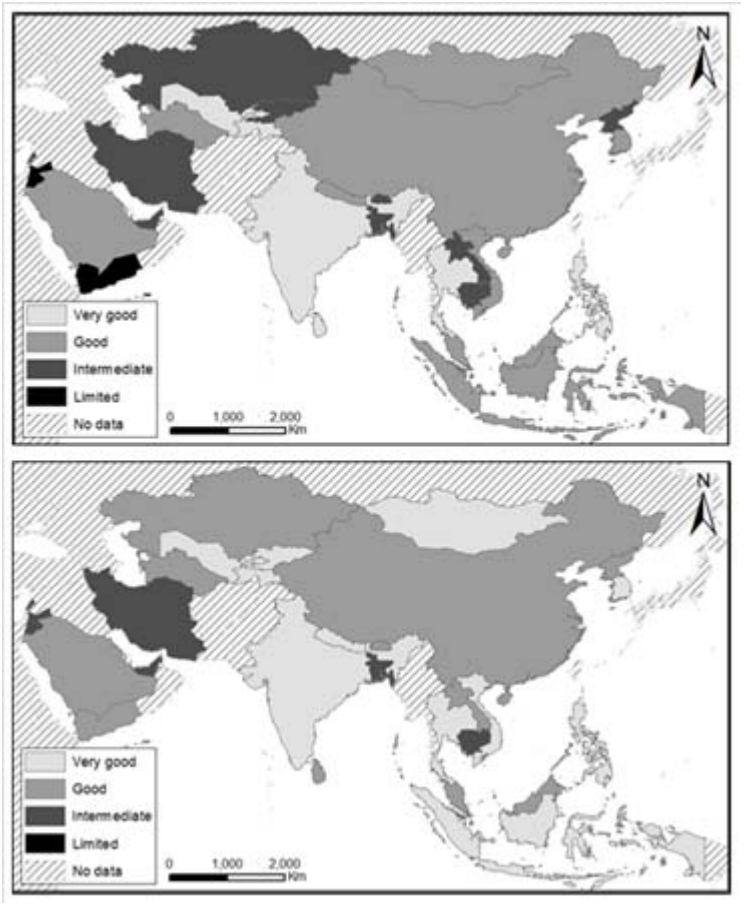

Figure 1 Spatial distribution of capacity status for 37 Asian developing countries at the time of NC1 (above) and NC2 (below)

Of the 37 countries assessed in Asia, 20 had limited to intermediate capacity and 17 had good to very good capacity at the time of submitting NC1. About half of the countries in the first group (n=11) continued to have low capacity levels when they submitted NC2, indicating they had little capacity development between the two GHG inventory submission years. For the purpose of our discussion here, we call this group of countries the "low improvement group". In contrast, the other half (n=9) showed increases in capacity, referenced here as the "improvement growth group". In Figure 2, the capacity values of these different country groups are presented with respect to each of the four assessment categories. In contrast to the low improvement group, the capacity development of the improvement growth group was largely due to increases in institutional capacity (category 2) and actual technical capacity applied to GHG inventories (category 4). Changes in the other two categories, international engagement (category 1) and technical capacities available in a country (category 3), were not found to be significant in any change to the overall GHG inventory development capacity.

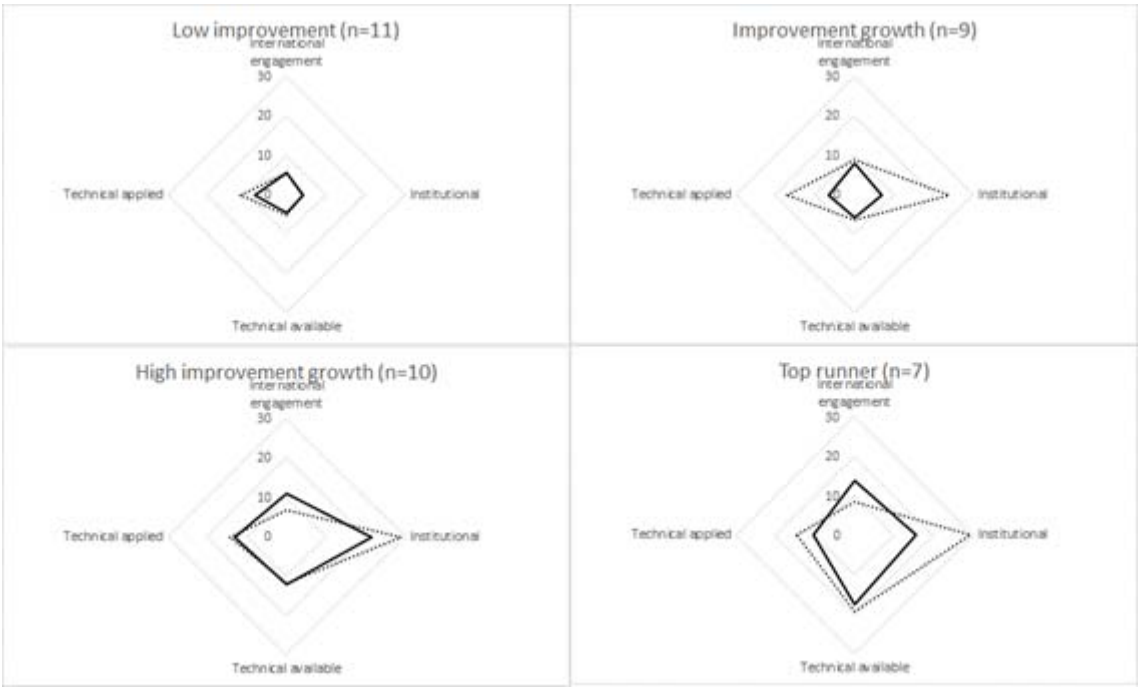

Figure 2 Capacity values for the four assessment categories of NC1 (lines) and NC2 (dot lines) by different country groups

All 17 countries which had good to very good capacity for NC1 were observed to then have high capacity for NC2. We divide them into two groups: the "top runner" group and the "high improvement group". The top runner group included all of the seven countries which submitted BUR1, and of these, six had very good capacity at the time of submitting BUR1. These countries can be perceived as top runners in the region with established capacities. The "high improvement growth group" (n=10) also consistently had good to

very good capacity across GHG inventories. Half of them were at the stage of very good capacity. However, none of them submitted its BUR1. The countries in both of the top runners and the high improvement growth group showed high capacity with respect to all categories (Figure 2). The top runners especially demonstrated high technical capacities available in a country compared to other groups.

3.2 Availability and scale of support

Comparison between changes in capacity status by country groups and support levels are presented in Table 7. Around half of the countries covered in this study did not receive support in 2010 (n=16) and 2014 (n= 23). The other half had support at different levels. Ten out of the eleven countries in the low improvement group received no to little support in 2010 and 2014, despite their lack of capacity. The improvement growth group (n=9) also did not receive much support in these years, except for a few which had medium support. Countries in the high improvement growth group (n=10) received no to little international support in 2010. Four of them received medium to high support in 2014. Most of the top runners received higher levels of international support compared to other groups. Six out of seven top runner countries had medium to high support in 2010, and four received medium to high support in 2014.

Table 7 Support provided for different country groups in 2010 and 2014

		Support level 2010				
		None	Low	Medium	High	Sum
Country group	Low improvement	5	5	1	0	11
	Improvement growth	5	2	2	0	9
	High improvement growth	6	4	0	0	10
	Top runners	0	1	3	3	7
	Sum	16	12	6	3	37

		Support level 2014				
		None	Low	Medium	High	Sum
Country group	Low improvement	10	0	1	0	11
	Improvement growth	5	1	3	0	9
	High improvement growth	6	1	1	2	10
	Top runners	2	1	1	3	7
	Sum	23	3	6	5	37

4. Discussion

4.1 Has the GHG inventory development capacity been improved?

Our analysis found varying capacity for producing a GHG inventory in 37 Asian

developing countries and variations in changes of that capacity. Seven countries, including the Republic of Korea and Singapore, were found to be equipped with established capacities for preparing GHG inventories on a regular basis. These countries are closest to being able to implement the PA's transparency framework. Another 19 countries had a relatively high capacity when they submitted inventories as part of NC2. These countries included both those which had a relatively high capacity at the time of their first GHG inventory as part of NC1 (e.g., China, Philippines, Tajikistan) and the countries whose capacity sufficiently improved (e.g., Kyrgyzstan, Samoa, Yemen). The remaining 11 Asian countries in our analysis did not improve their capacity and remained as low capacity across GHG inventories. Further, there exist around 20 more Asian developing countries which have not submitted any reports beyond their NC1, thus were not subject to this study. We believe that these countries have the lowest capacity status in the region.

The analysis also showed that those Asian developing countries which improved their institutional capacity and technical capacity specific to GHG inventories, also improved their overall GHG inventory capacity between the submission years of NC1 and NC2. When it comes to the more frequent reporting of BURs, it appears that what matters for the overall GHG inventory capacity is basic technical capacity in a country (e.g., statistics and the scientific expertise) to support the GHG inventory development process. Thus, if all countries in Asia are to participate in future GHG inventory reporting under the PA's transparency framework, and if participation is expected to be of the same scope and quality as countries with advanced capacity, improvement in their basic technical capacity will be a key for enabling their participation in the PA's transparency framework.

4.2 The gaps in international support

We found that international support was provided more to those countries that already had advanced capacities at an earlier stage of inventory development, rather than to countries with the most international capacity building needs. One possible reason for why high capacity countries exhibited receiving a higher level of support is that international capacity building activities often invite them to share their successful experiences with others. As a result, they would have had more opportunities to engage international support. Another possible reason is that donors generally pay more attention to countries with larger GHG emissions, because countries with larger GHG emissions are considered to have higher potential to reduce emissions. Of the 11 Asian developing countries with limited capacity improvement, four were Small Island Developing States (SIDSs) and two were Least Developed Countries (LDCs) with modest GHG emissions (UNESCO, 2016; UNFCCC, 2016d). We believe these trends in the allocation of support call for reconsideration so as to better meet developing country needs. Low capacity countries will need to receive increased international support, if they are to ultimately participate in the PA's transparency framework.

Many of existing capacity building approaches have focused on improving individual capacity through the provision of technical advice and training. They have not deeply addressed the needs for capacity building of national institutions and the enabling environment (Dagnet et al., 2015). Future international capacity building efforts therefore should direct resources to strengthening the basic technical capacity in Asian developing countries.

4.3 Policy recommendations

Parties agreed at COP21 on the urgent need to enhance capacity building, and established a new Capacity-building Initiative for Transparency (CBIT) (UNFCCC, 2015). The purpose of the CBIT is three-fold: strengthening national institutions; providing relevant tools, training and assistance; assisting in the improvement of transparency over time (UNFCCC, 2015). The CBIT and other international efforts and activities would need to focus on the improvement of capacity in countries where its capacity was barely improved and only scarce international support was provided. To implement this, the international community needs to conduct an assessment of capacity in each developing country for implementing the PA's transparency framework and monitor its implementation. Using the existing reporting scheme under the UNFCCC, namely BURs, would be an option to minimise the incremental costs involved in collecting information on the capacity status and supporting the needs of developing countries. However, as not all developing countries have been able to submit their BURs, there is a need for other assessment channels (Umemiya et al., 2016). The cost for collecting and assessing information can be reduced by utilising existing networks among countries and experts, which were created through previous capacity building activities and initiatives (GEF, 2016).

As indicated earlier, capacity building efforts will be increasingly necessary for strengthening the fundamental technical capacity in a country, such as the ability to collect and manage statistics, as well as foster and maintain the scientific community to support GHG inventory development. Building the basic technical capacity is not only a basis for GHG inventories, but also a necessity for sound environmental and development policy formulation. We have less experience with supporting this approach. The current focus of the CBIT, as mentioned above, also does not appear to take into consideration this need for improvement of basic technical capacity (GEF, 2016). By its nature, capacity building for building the basic technical capacity of a country requires more resources in the longer term compared to, for instance, increasing the technical understanding on GHG inventories. To move in this direction, we believe that the co-benefits of national systems for the transparency framework have to be properly addressed and promoted, e.g. air pollution, forest conservation, waste management. Firstly, this could motivate developing countries to enhance and sustain capacity, because these non-climate issues are likely to be of higher priority in their national development plans. Secondly, co-

benefits could be a good reason for donors to devote more international support, since such support could bring benefits to multiple environmental and development issues. The scope of the PA's transparency framework covers not only national GHG inventories, but also information on progress related to NDC implementation. We believe that enhancement of the basic technical capacity in countries is essential. Otherwise, only a handful of countries will be able to meet with the PA's requirement, undermining the core objective of the PA and its transparency framework in which all countries are expected to take part.

4.4 Limitation of data and methodology

In this study, we used information expressed in submitted communications, particularly the section of these documents devoted to reporting a country's GHG inventory. These reports were the primary source of data for scoring indicators. When a lack of information in these reports was noted, corresponding indicators were given lower scores. However, because there is no common reporting format for NCs and BURs, it was up to countries to decide what to report and in how much detail. Therefore, it is possible that even if a country had institutional arrangements, this study gave it a low score, because there was little information available in the submitted reports to the UNFCCC. Future data collection efforts would be useful to account for this potentially missing information. In addition, data on international support were gathered for the particular three years (i.e. 2002, 2010, 2014) with focus on four major donor countries for bilateral support. This was because the purpose of this study was to analyse the general correspondence of changes in capacity and the scale of support. It would be valuable for future research to cover more years and more donor countries, so that the data coverage of this analysis can be more comprehensive.

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