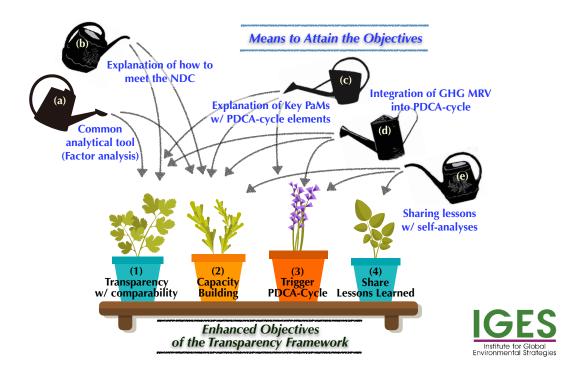
Designing the Modalities, Procedures and Guidelines for the *Enhanced* Transparency Framework for Action under the Paris Agreement on Climate Change

 How to Utilize the Framework for Broader Objectives beyond Transparency

Naoki Matsuo

n_matsuo@iges.or.jp



Executive Summary

This paper proposes various elements to be specified in the rule book: "Modalities, Procedures and Guidelines for the Transparency Framework" (MPG) of the Paris Agreement, focusing on mitigation, based on the past experience of the national reports and their reviews/ assessments.

The underlying motivation is the concern that the current arrangements focus only on "transparency" and do not contribute to other purposes such fostering real actions. It is noted that these arrangements are the mandatory element of the UNFCCC and the Paris Agreement, even if the modalities/levels of the national targets and actions are voluntary-based.

Therefore, this paper recommends to <u>broaden the objective</u> of the new "Transparency Framework" to focus not only on transparency but also to include other important elements to mitigate climate change. Since the development of national reports requires extensive effort, the transparency framework should be utilized for several purposes simultaneously. This paper also recommends several means to realize the broadened objectives.

Specifically, this paper proposes <u>4 objectives of the Framework</u> and <u>5 relevant means</u> to achieve them for consideration at the upcoming negotiation process as a part¹ of agenda item 5 of the Ad-hoc Working Group on the Paris Agreement (APA) for developing the 'enhanced' framework. These proposals also intend for the Framework to benefit all Parties' own development objectives, and not just to promote transparency and climate change mitigation.

The <u>4 objectives</u> are: (1) achieve comparability to strengthen transparency, (2) build the capacity of government officials through their use of the means to enhance their self-understanding, (3) trigger domestic actions to introduce a PDCA (Plan-Do-Check-Act)-cycle with GHG MRV to improve performance, and (4) share lessons learned among the Parties.

This paper also proposes <u>5 means</u> to be included in the Guidelines in order to attain these objectives: (a) a common analytical tool (*i.e.*, factor-analysis), (b) explanation of how each Party will meet its NDC, (c) explanation of key actions with PDCA-elements, (d) integration of GHG MRV information into the PDCA-cycle, and (e) sharing of lessons learned. (a)–(d) would be required and (e) is an encouraged element to be specified in the national reporting guidelines.

The proposed means should apply commonly to all Parties, but the Guidelines (MPGs) could have some flexibility, which this paper does not propose concretely.

In addition, this paper proposes to synchronize the Framework with the NDC 5-year cycle.

¹ "Information necessary to track progress made in implementing and achieving its NDC under Article 4 of the Paris Agreement" as specified in the Article 13, paragraph 7(b) of the Paris Agreement. Note that the Framework has several elements, *e.g.*, adaptation, support, *etc.* and should be balanced among them.

1. Introduction and Motivation

The UNFCCC's transparency arrangements relating to the National Reports and their Reviews/ Assessments have been the Convention's "mandatory" elements since 1994. Parties have accumulated a significant amount of experience through this process, and many lessons can be drawn. Based upon this experience, this paper proposes a package of elements on how to enhance the current arrangements to meet much **broader objectives** beyond just transparency.

Article 13 of the Paris Agreement calls for *enhancing* the current arrangements as the "Transparency Framework". Also, the COP decision (1/CP.21) mandated the Ad-Hoc Working Group on the Paris Agreement (APA) to develop the Modalities, Procedures and Guidelines (MPGs) for the Framework for adoption at COP 24 in 2018. This topic was designated as the item 5 of the APA agenda.

This *enhanced* Transparency Framework will play an essential role under the Paris Agreement to track progress towards achieving each Party's NDC and encourage them to increase the level of ambition. The problem is "how" the Framework could encourage this.

"Transparency" itself could be strengthened by enhancing the comparability and consistency of the National Reports and their Reviews/Assessments. Moreover, greater transparency may put implicit pressure on each Party to strengthen its actions. In addition, it may build the capacity of the governmental officials by providing an opportunity to re-check the Party's status as well as by listening to the expert reviewers' assessments. These are expected "ancillary" benefits. However, it is better to design the Framework to seek and realize such implicit benefits in a more explicit and direct manner.

In addition, it is noted that the climate issue has many cross-cutting aspects which will need to be addressed by many ministries, not just environment ministries. This should also help to encourage the Parties to raise their level of ambition.

Therefore, this proposal intends to <u>broaden the objective</u> of the new "Transparency Framework," not just to achieve transparency, but also to promote other important objectives, especially climate change mitigation, since preparation of the National Reports requires extensive efforts by the Parties.

For this purpose, this paper presents a proposal, which consists of <u>four objectives</u> and <u>five means</u> to attain them beyond transparency as summarized below in Table 1.

The four objectives of this proposal, therefore, cover more than just simple transparency. Objective 2 recommends a self-analysis tool for deeper understanding of NDCs, together with objective 3, which encourages each Party to establish a "Plan-Do-Check-Act" (PDCA) process for key actions and/or action plans to enhance the progress of the NDCs.

To meet these four objectives, this paper proposes five means which are expected to be commonly applied to all Parties, though some countries may require additional time to be fully prepared to utilize them. The five proposed means include (a) a simple factor analysis, (b) explanation of the Party's approach to meet its NDC, (c) clear identification and quantification of policies and

measures (PaMs) with PDCA (d) linked to GHG MRV, and (e) sharing of lessons learned with other Parties, whenever possible.

In addition, as indicated in Table 1, the modalities of the Enhanced Transparency Framework should be designed as much as possible so that effective linkage could be established with the five-year NDC and Global Stocktaking exercise.

Table 1: Core Elements of the Proposal for the Enhanced Transparency Framework for Action (APA agenda item 5)

| | Current Arrangements | • | Proposed Framework |
|------------|--|---|---|
| Modalities | NC/BR/BUR (reports) and IDR/IAR/ICA (review/ assessment) | | Two (simple and detailed) 5-year cyclic reporting and review/assessment processes synchronized with the NDC process. NDC Guidance (esp., for methodological requirements) should be integrated. |
| Objectives | Transparency | • | Strengthen transparency with comparability and consistency among Parties. Build the Party's capacity by self-analysis for deeper understanding. Trigger domestic actions to introduce PDCA-cycle with GHG MRV for better performance. Share lessons learned (esp., good practices) among Parties. |
| Means | Projection section is hard to understand in continuation from its historical profile although it is linked to the target directly. | | (a) Factor analysis as the common analytical tool with a template is provided for analyses of energy-CO₂ profiles from historical trends to future projections (1), (2). (b) Requirements to explain how the Party intends to meet its NDC target (1), (2). |
| | No identification of key PaMs. Limited info and analyses for each PaM, esp., on its status/trends and reasons analysis. | | (c) Requirement to identify the key PaMs/programs/actions and explain (if not or partially installed, possible) elements of its PDCA-cycle with history (1), (2), (3). (d) The information on GHG MRV for the key PaMs (integrated into the PDCA-cycle processes as appropriate) (1), (2), (3). "V" could be a domestic review process of PaMs/programs. |
| | Sharing lessons is not encouraged. | | (e) Strong encouragement to share the lessons learned of the Party with self analyses (e.g., applicability conditions). Workshops and awards could follow (2), (3), (4). |
| Guidelines | Different Guidelines for Annex I and Non-Annex I countries. Fact-oriented. Completeness (not contents) is important. Flexible but difficult to be comparable among countries. | • | Common Guidelines (for contents) but flexible reflecting the Party's capacity (for "shall", "should", "may", and "encouraged" elements, including 'graduation' arrangements triggered by support). Standardized analytical tool provided with template. Comparability and consistency among Parties are strengthened. |

[Abbreviations]

APA: Ad-Hoc Working Group on the Paris Agreement; NC: National Communication; BR: Biennial Report; BUR: Biennial Update Report; IDR: In-Depth Review; IAR: International Assessment and Review; ICA: International Consultation and Analysis; NDC: Nationally Determined Contribution; PaMs: Policies and Measures; PDCA: Plan-Do-Check-Act; GHG: Greenhouse Gas; MRV: Measurement, Reporting and Verification.

To date, although several research papers (e.g., Briner, et al. 2016; Dagnet, et. al. 2017; Deprez, et al. 2015; Huang 2016a: Huang 2016b; Jacoby, et.al. 2017; SEI 2016), governmental submissions on APA item 5 (APA submission portal), and partnerships (e.g., Partnership on Transparency in the Paris Agreement) have considered how the Transparency Framework should be enhanced, most of them focus on how to deepen its original objective to increase the transparency. They do not consider how to broaden the objectives of the Transparency Framework to include other elements.

Future papers are expected to develop this proposal in more detail with concrete examples, and broaden the scope of its application.

2. Strengthening the effectiveness of domestic actions (NDCs)

The key idea of the proposed enhanced new Framework is to help <u>strengthen the effectiveness</u> of domestic actions. Since domestic actions are voluntary, the new National Reporting Guidelines cannot directly require Parties to implement them in particular ways. On the other hand, all Parties wish their actions to be more effective. The challenge is how the international Reporting Guidelines can encourage improvements in the performance of domestic actions indirectly but effectively.

Each Party is implementing a variety of PaMs, which include programs and actions (hereafter, called "actions" in general) to achieve its various national development goals, e.g., as specified in the Sustainable Development Goals (SDGs) and/or other national development plans or policies. Achieving some development goals can also contribute to climate change mitigation simultaneously, which is commonly referred to as "co-benefits". In any case, increasing the effectiveness of each of these actions is crucial to achieve their primary purposes as well as for climate mitigation. The question is how to maximize synergies among primary purposes which are mostly domestic, and the secondary purpose of climate mitigations, which has often been seen as an international rather than a domestic goal, despite the fact that such actions are implemented usually by sectoral ministries other than the Environment Ministry.

Among the objectives proposed for the enhanced Transparency Framework in Table 1, Objective (3):

"trigger domestic actions to introduce a PDCA-cycle with GHG MRV for better performance"

is the key incremental function beyond transparency to foster the performance of real actions which would result in more GHG reductions both for developed and developing countries. Although the <u>international guidelines</u> under the Paris Agreement cannot directly require introduction of domestic arrangements for specific actions, it <u>can encourage the introduction and operation of such domestic arrangements implicitly by providing an appropriate reporting template.</u>

Apart from international rules, introduction of a domestic PDCA (Plan-Do-Check-Act) cycle (Figure 2) could make a significant contribution to enhancing the performance of variety of

actions continuously. The PDCA-cycle could be applied to each specific action, to a package of actions, or to more general plans and programs. The MPG (Modalities, Procedures and Guidelines) of the enhanced Transparency Framework should include relevant elements to encourage Parties to do so.

Under the current arrangement, a Party is required to describe the *estimation* of emission reductions of each PaM in its national reports. In addition, as represented by Nationally Appropriate Mitigation Actions (NAMAs), it has been widely recognized that a GHG MRV process—annual quantification of GHG emission reductions with monitoring—is essential for *regular checking of the performance* of the action(s) related to GHG mitigation.

Basically, the PDCA-cycle is for continuous monitoring of the performance of each action against selected key performance indicators (KPIs)²

Box 1: An Example of a program with a PDCA-Cycle

Some successful examples can be mentioned, such as the Solar Home System (SHS) Program in Bangladesh. This program, operated with well-elaborated arrangements, has been developed step-by-step for several years of lessons/experiences, including monitoring and internal and external reviews/ evaluations, by its supervisory body IDCOL (a non-bank public financial organization).

The program has successfully installed around 4 million SHSs to date domestically. See M. Asaduzzaman, et al. (2013) for the program evaluation. This SHS program was registered as a CDM Programmes of Activities (PoA) (Ref. 2765) (CDM Website for PoA), integrating GHG MRV in its procedures. It is noted that the arrangements have been developed and operated in Bangladesh, categorized as a LDC.

of the action. Here, associated GHG emissions should be linked to the monitoring of the KPIs. In other words, GHG emission reductions should be described as a mathematical function of KPIs as its variables (GHG = f(KPIs)) in addition to several fixed parameters, e.g., emission factors.

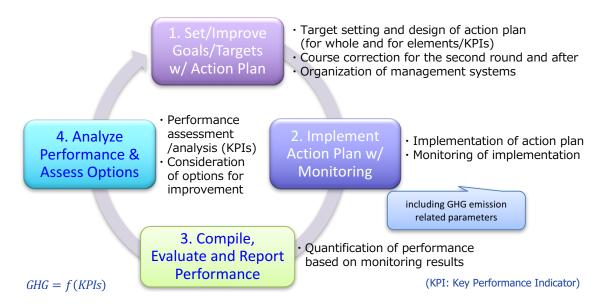


Figure 1: Schematic Figure of an Action's PDCA-related Processes

² For example, KPIs for the SHS Program in Bangladesh (Box 1 above) include the basic parameters such as the number of households which installed SHS, along with other relevant data such as the installation date, location and distributor, as well as the type of finance provided. KPIs also include the maintenance/operation status of each SHS, *etc*.

6

Therefore, GHG MRV could be utilized to enhance the achievement of the original non-climate (usually development) purposes of each action, in parallel with its secondary climate objective to reduce GHG emissions.

Means to encourage countries to introduce PDCA

In order to promote the introduction of the PDCA-cycle for key actions domestically, this paper proposes the following <u>3 means</u> for the Guidelines (MPGs) for preparing the National Reports, which correspond to items (c)–(e) in Table 1:

- (c) Requirement to identify key³ actions (PaMs, programs, etc.) and explanation of each element of their PDCA cycle backed by historic trends, etc. Even if a PDCA-cycle is not implemented or only partially implemented by a Party for some action, nevertheless, certain key existing elements still could be described. Moreover, the absence of some elements should be noted, and Parties should be encouraged to consider the possible introduction of the missing elements;
- (d) Requirement to provide information for the GHG MRV process of key actions, where "verification" could be a domestic review process of the performance of key actions; and
- (e) Strong encouragement to share the self-analyses and the lessons learned with other countries in a similar situation—especially lessons related to the actions with PDCA-cycle components.

Although some actions may not include all PDCA elements, they may include some, e.g., KPI-based targets, but perhaps without feedback process. Considering the missing elements is a good exercise for capacity building (Objective (2)) and may bear fruit in the next review process.

In order to operationalize these means, reporting templates and related manuals⁴—how to describe and utilize the PDCA-cycle—should be developed and provided to the Parties to guide the process. GEF-supported Capacity Building Initiative for Transparency (CBIT) (GEF CBIT Website) should assist Parties to operationalize these means if requested.

4. Building countries' capacity by using the process of drafting reports to encourage self-analysis

Another idea to utilize the enhanced new Transparency Framework is for capacity building of

³ Key actions are those with large GHG emission reductions. Around 5–10 of the most significant key actions should be identified

⁴ We will prepare a template and a manual with several examples in the following IGES research reports.

the relevant Party's governmental officials.

Drafting the report is a good on-the-job training exercise for governmental officials to understand the status-quo and future prospects of their country (Objective (2)). This effect can be strengthened by the international expert review, which is already a part of the existing transparency arrangements. Nevertheless, this is not well recognized. Many people tend to consider preparing the report as a 'burden' rather than an 'opportunity'. Nevertheless, enhancing the capacity of the related governmental officials is crucial for the effective design and implementation of NDCs. Thus, it is important to change this kind of mind-set by encouraging government officials to be fully involved in the process in order to improve their capacity and deepen their understanding of the NDC.

Usually, each section of a national report is drafted by different people. Especially, the 'future projection part', which is the essential element of the NDC, is generally handled by experts, which makes that section almost a 'black box' to others. In order to address this, this paper proposes a simple but useful method—"factor analysis" using the Kaya-identity (explained in Box 2)—to help policy-makers (and others) to more easily understand the key characteristics of the emissions profile of their country, relating to both past emissions and future emissions projections. This simple analysis can be carried out by government officials by themselves as follows:

- (a) Requirement to use factor analysis as the common analytical tool. A commonly agreed template should be developed for the Parties to use to analyze their energy-related CO₂ profiles including both historical trends and future projections; and
- (b) Requirement to explain how the Party intends to meet its NDC targets.

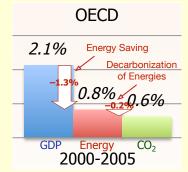
Box 2: Factor analysis using the Kaya identity

The Kaya identity is a simple method to factor the "annual variation (growth rate)" of the economy-wide CO₂ emissions into "growth rate of GDP", "growth rate of (Energy/GDP)" and "growth rate of (CO₂/Energy)". The latter two factors show the rates of "energy saving" and "decarbonization of energy" if they are negative.

These are easily calculated using a spreadsheet.

It is noted that the analysis can be applied to both historical trends (divided into several periods with milestones) and future projections.

Studying what happened in the past and what is expected in the future continuously by this analysis can deepen the understandings of the country's status as well as the NDC target.



Therefore, it is important for the MPG to include a requirement that the National Reports shall provide reasonable explanations of the past,⁵ present and future emissions trends, together with emissions under the BaU scenario. The MPG could specify a step-by-step process for the analysis, in the form of common template, so that governmental officials could undertake it easily. This exercise does not necessarily need to be done government officials. However, this exercise is intended to contribute to Article 11 of the Paris Agreement (on capacity building), so it could be supported by the CBIT led by GEF if government officials are involved.

Even if the government officials do not conduct the analysis themselves, there are still benefits to using this method. The work would also be easier for any outside experts who are hired to do the work. Also, the results would be more easily understandable to everyone (not just government officials), more transparent, and more comparable.

Basic factor analysis of economy-wide energy-related CO₂ emissions—with an explanation of trends of key parameters and milestone events—could be a good choice as the "common" analytical methodology for all Parties, since CO₂ from energy use is the dominant GHG in most countries, especially for the variation in GHG emissions. It can be noted that energy-related CO₂ emissions, rather than GHG emissions as a whole (summed up using GWPs), are more directly linked to domestic "development". The methodology can be applied to GHG emissions instead of energy-related CO₂ emissions, in theory. But this makes the meaning of each factor more unclear. On the other hand, sector-wise factor analysis can be possible, and this should be encouraged in order to gain a deeper understanding of each sector.

For means (b) above, the MPG should allow 'flexibility' for the Parties regarding the explanations. On the other hand, the explanations should be required to include not only the tracking of progress, but also how each Party intends to modify its actions, if its emission trend is below the expected profile to meet its NDC.

5. Strengthening transparency through enhanced comparability and consistency of the National Reports

As specified in the COP decision (1/CP.21), "comparability" and "consistency" are essential elements of the National Reports.

Requiring concrete and common/standardized methods—such as factor analysis and reporting of PaM-related analytical information proposed above—can enhance transparency with comparability and consistency among countries, and allow experts to assess them in an objective manner in the review process (Objective (1)).

⁵ Hopefully from 1973 (at least for developed countries) when many countries started energy conservation actions because of the first oil crisis. The starting date of the timeframe could be flexible, beginning from 1990 or from 2000 for countries with statistical limitations.

9

While this paper proposes that the contents of the reporting should be *common* for all countries, specific elements could be applied *flexibly* to different countries, by introducing shall-, should-, may- or encouraged categories for those elements, due to the limited capacity of some countries.

6. Sharing the lessons among countries

This paper proposes the MPG (especially the reporting guidelines) to require "lessons learned to be shared with other Parties". This reporting can strengthen the facilitative nature of the Framework. In addition, self-analysis of the lessons learned is a good exercise for capacity building (Objective (2)). Such self-analysis could help other countries to consider whether particular lessons shared are applicable or not, and what conditions are needed to make them applicable to a country, by analyzing the reasons for success and/or failure.

Workshops, along with SBI and regional ones, and awards for to those countries which have shared good lessons could make this approach more effective.

References and Relevant Web urls:

- Asaduzzaman, M. et al. (2013), "Power from the Sun: An Evaluation of Institutional Effectiveness and Impact of Solar Home Systems in Bangladesh", Bangladesh Institute of Development Studies, http://idcol.org/download/142a027cd04cd27767c88632160fae8f.docx.
- Briner G. and S. Moarif (2016), "Enhancing Transparency of Climate Change Mitigation under the Paris Agreement: Lessons from Experiences", OECD, Climate Change Expert Group Paper No. 2016(4). http://www.oecd-ilibrary.org/environment/enhancing-transparency-of-climate-change-mitigation-under-the-paris-agreement a634dc1f-en.
- Dagnet, Y. et al. (2017), "Mapping the Linkages between the Transparency Framework and Other Provisions of the Paris Agreement", WRI PACT Working Paper.

 https://www.wri.org/sites/default/files/mapping-linkages-between-transparency-framework-other-provisions-paris-agreement-exec-summary.pdf.
- Deprez, A. *et al.* (2015) "Transparency and the Paris Agreement: driving ambitious action in the new climate regime", IDDRI Working Paper No. 03/15.

 http://www.iddri.org/Publications/Collections/Idees-pour-le-debat/WP0315.pdf.
- Huang J. (2016a), "Post-Paris Transparency Under the United Nations Framework Convention on Climate Change", International Environmental and Resources Law Committee Newsletter Vol. 18, No. 3, July 2016 (p.17).

 https://www.americanbar.org/content/dam/aba/publications/nr newsletters/iel/201607 ierl.aut hcheckdam.pdf.
- Huang J. (2016b), "UNFCCC Climate Transparency: Lessons Learned", Center for Climate and Energy Solutions (C2ES) paper.

 https://www.c2es.org/docUploads/unfccc-climate-transparency-lessons-learned.pdf/.
- Jacoby, H.D. et. al. (2017), "Transparency in the Paris Agreement", MIT Joint Program on the Science and Policy of Global Change, Report 308.

 https://globalchange.mit.edu/sites/default/files/MITJPSPGC_Rpt308.pdf.
- SEI (2016), "Putting the 'enhanced transparency framework' into action: Priorities for a key pillar of the Paris Agreement", Stockholm Environment Institute, Policy Brief.

 https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-PB-2016-Transparency-under-Paris-Agreement.pdf.

Relevant CDM and Non-UNFCC Websites

- CDM Web for PoA (Ref: 2765):
 http://cdm.unfccc.int/ProgrammeOfActivities/poa/db/ZSI6WP0ODGRQ8UYKXB3MHTL957JVAE/view
- GEF CBIT Web: https://www.thegef.org/topics/capacity-building-initiative-transparency-cbit.
- Partnership on Transparency in the Paris Agreement: https://www.transparency-partnership.net.

Relevant UNFCCC Web-sites

| Paris Agreement, 1.CP/21 | Outline and essence of the Paris Agreement: http://unfccc.int/paris agreement/items/9485.php Decision 1/CP.21 including the Paris Agreement and relevant COP Decisions: http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf | |
|--|---|--|
| National Reports and Review/ Assessment (Current Arrangements) | Overview of the current National Reports and relevant review/assessment process: http://unfccc.int/national_reports/items/1408.php National Communications and Biennial Reports by Annex I Parties: http://unfccc.int/national_reports/national_communications_and_biennial_r_eports/items/10267.php International consultation and analysis for non-Annex I Parties: | |
| Transparency Framework | Information on APA agenda item 5 (Transparency Framework): http://unfccc.int/meetings/ad hoc working groups/items/10163.php Informal Note by the Co-Facilitators: http://unfccc.int/files/meetings/bonn may 2017/in-session/application/pdf/apa2017 i5 informal note by the co-facilitators_pdf | |
| Training of Experts (Current Arrangements) | Training Programmes for the Review of Information submitted by Annex I Parties: http://unfccc.int/national_reports/expert_training/training_programmes_for_experts/items/2763.php Training for the technical analysis of BURs submitted by non-Annex I Parties: http://unfccc.int/national_reports/expert_training/training_for_the_technical_analysis_of_burs/items/9279.php | |
| Guidelines (Current Arrangements) | Guidelines for the preparation of National Communications: http://unfccc.int/resource/docs/cop8/07a02.pdf Guidelines for BR and BUR, and Modalities and procedures for IAR and ICA: http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf Composition, modalities and procedures of the team of technical experts under ICA: | |

| | https://unfccc.int/files/meetings/warsaw_nov_2013/decisions/application/pdf/cop19_tte_ica.pdf | |
|-----------------------------|--|--|
| NDCs | Outline of the NDC: http://unfccc.int/focus/items/10240.php NDC Registry: http://unfccc.int/focus/ndc registry/items/9433.php Information on APA agenda item3 (NDC) http://unfccc.int/bodies/apa/items/10128.php | |
| APA Submission Portal | Submissions by Parties or groups of Parties on the APA (Ad-hoc Group on the Paris Agreement) agenda items are compiled here: http://www4.unfccc.int/submissions/SitePages/sessions.aspx?showOnlyCurrentCalls=1&populateData=1&expectedsubmissionfrom=Parties&focalBodies=APA | |
| Tasks arising from 1/CP.21 | Tasks arising from 1/CP.21 with the relevant bodies and timelines: http://unfccc.int/files/bodies/cop/application/pdf/overview_1cp21_taskspdf Negotiation progress tracker as of Oct. 12, 2017 (ver. 12): http://unfccc.int/files/paris agreement/application/pdf/pa progress tracker_200617.pdf | |

Acknowledgements:

The author thanks Mark Elder, Hideyuki Mori, Hironori Hamanaka, Kiyoto Tanabe and other IGES colleagues for their valuable comments and inputs to this paper.

Institute for Global Environmental Strategies (IGES)

http://www.iges.or.jp/, http://pub.iges.or.jp

2108-11, Kamiyamaguchi, Hayama, Kanagawa 240-0115, Japan

Phone: +81-46-855-3700

The views expressed in this discussion paper are those of the author and do not necessary represent those of IGES.

©2017 Institute for Global Environmental Strategies. All rights reserved.