

Thirteenth meeting of the Technology Executive Committee

United Nations Campus (AHH building), Bonn, Germany
6-9 September 2016

Background paper

Proposed inputs for future technical expert meetings on mitigation

Findings of TNA and NDC analyses and inputs from the CTCN in order to identify possible relevant topics and issues for future TEMs

I. Background

1. COP 21, in its decision 1/CP.21, paragraph 111, requested the secretariat, in consultation with the TEC and relevant expert organizations, to organize regular Technical Expert Meetings (TEMs) focusing on specific policies, practices and actions representing best practices with the potential to be scalable and replicable. Subsequently, TEC 12 agreed on new mandates in the area of mitigation for its workplan for 2016-18.
2. As per activity 5 of its workplan for 2016–2018, the TEC is to suggest future topics and provide inputs on the organization of the TEMs on mitigation, based on an analysis of Technology Needs Assessments (TNAs), National Determined Contributions (NDCs), and inputs from the CTCN.
3. At TEC 13, the task force on mitigation will be invited to present an analysis based on the relevant findings in the TNAs, including Technology Action Plans (TAPs), on the relevant findings in the NDCs, and on inputs from the CTCN. The analysis was undertaken in order to identify technology themes, topics and issues relevant to the Parties of the UNFCCC, to be addressed in future TEMs on mitigation.

II. Objectives of the note

4. The results of this analysis, carried out by the secretariat, with guidance by the task force on mitigation, aim to help in identification of technology themes, topics and issues relevant to the Parties of the UNFCCC, to be addressed in future TEMs on mitigation.
5. This note aims at presenting the scope, approach and main results of this analysis and provides suggestions for a potential way forward.

III. Possible action by the Technology Executive Committee

6. The TEC will be invited to consider the findings, and agree on inputs to the SB Chairs and the secretariat for the organization of future TEMs on mitigation.



IV. Scope and approach

7. The analysis was conducted based on the relevant findings of three different sources¹: Data from the TNAs, including technology action plans (TAPs), relevant findings in the NDCs, and inputs from the CTCN.

8. For the results of TNAs, the analysis is based on the information contained in the TNA reports of 31 Parties not included in Annex I to the Convention submitted between 2011 and 2013. The mitigation TNAs included 115 TAPs, which contained all common elements of action plans, which were also analyzed to provide a comprehensive overview of technologies included in mitigation action plans proposed by Parties for implementation.

9. For the NDC part, the secretariat, as a depository, has a compilation of all NDCs submitted by Parties. It contains 189 NDCs submitted as of March 2016 and was the bases for the updated synthesis report on the aggregate effects of NDCs.² In the report, it was noted that several Parties³ outlined **priority areas with high mitigation potential** relevant to the implementation of their NDCs. For this analysis, these priority areas were used as a basis, but slightly adjusted to:

- Renewable energy (RE), see also synthesis report para 157;
- Energy efficiency (EE), synthesis report para 158;
- Sustainable transport (Transport), synthesis report para 158;
- Other areas of mitigation opportunities (including AFOLU, methane (CH₄), other non-CO₂ gases), synthesis report para 159.

10. The priority areas served as the basis for conducting the NDC analysis and identify possible relevant technology topics and issues, by using a bottom-up approach: For each main priority area (the four above), all sub-sectors and technologies (e.g. for RE: solar, smart grids, etc.) that were mentioned in the NDC were identified. After scanning all NDCs, various sub-sectors were created for each category or technology that was recurring more than once across all NDCs.

11. Before tackling the results of the analysis, it is important to note a few caveats to bear in mind with regard to this approach: Given that most NDCs are national in scope, focusing on national circumstances and wording, the identified categories varied in terms of scope and level of detail. Therefore, the “robustness” of identified categories and sectors across all countries is not optimal. Data coming from this identification yet presents useful information about Parties’ mitigation contributions and the most frequently mentioned areas for action. The classification along categories for a technology or sub-sector that was mentioned more than once, was made with some subjectivity to the regard that the description by countries in their NDCs may in some cases be provided sometimes generically, or may mean the same thing as for other countries, and reported differently. However, the commonly identified sectors were reported clearly and significantly.

12. For the CTCN part it should be noted that the secretariat received inputs from the CTCN based on their database on requests for technical assistance. For the analysis only mitigation and cross sectoral requests were considered. The thematic focus areas identified derives from a CTCN internal way of structuring its data and therefore cannot be compared easily with the data derived from both the TNA and NDC analysis. However, the most recurring requests in specific priority areas and sub-sectors may give an indication of the most important fields for needs of countries, hence may present potential topics or issues to be further addressed in the TEMs.

13. Overall, the results of this analysis should be seen as a qualitative indication of several countries’ areas for intended or planned actions and needs.

¹ See Annex for the reference sources.

² That updated report, requested by decision 1/CP.21, paragraph 19, was published on 2 May 2016 (FCCC/CP/2016/2) and is available at: <<http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf>>.

³ As per the updated synthesis report, the term “several” is used to indicate that 40-70% of Parties that submitted an NDC mentioned the issue in question.

V. Key findings

14. The sources of data for this analysis originate from three different inputs. Given these disparate sources, an effort was made to draw consistent conclusions that would facilitate discussion on next steps for the TEC. The analysis provides an overview of countries' intended or planned actions, as well as their identified needs and requests for technical assistance in the field of mitigation.

15. The commonly identified (sub) sectors provide an overview of the most important needs of countries and areas for action. As a result, this analysis suggest that these sub-sectors and needs may be among the most valuable topics or issues to be addressed in future TEMs. A detailed overview of the findings of the three inputs is given below.

Aggregated results by "Priority area":

- TNAs (table 2): Energy, transport, land-use and agriculture, waste;
 - TAPs (table 6): Energy;
- NDCs (table 8b): RE, EE, transport, other areas of mitigation opportunities (including AFOLU, methane (CH₄), other non-CO₂ gases);
- CTCN (table 14): EE, RE, waste.

Most relevant sub-sectors identified in the priority area "Renewable energy" (RE):

- TNAs: Solar, biomass/biogas, wind, hydro, waste to energy, EE measures;
 - TAPs: Frequently identified RE technologies, mainly solar, biomass, wind, hydro;
- NDCs: Solar, hydro, wind, biomass, geothermal, electricity grid;
- CTCN: Decentralized power generation, micro/mini/smart grids, district energy.

Most relevant sub-sectors identified in the priority area "Energy efficiency" (EE):

- TNAs: EE measures were identified across all areas, high numbers for energy and transport sectors;
 - TAPs: Frequently identified EE technologies, especially for Asia and Latin America regions, were industry, lighting sector, and housing sector including public and residential buildings;
- NDCs: Domestic, industry, transport, buildings, lighting, energy conservation/loss reduction, power generation/fuel switch;
- CTCN: High number of requests, EE in industrial and domestic sector, waste heat recovery.

Most relevant sub-sectors identified in the priority area "Transport":

- TNAs: Fuel switch, modal shift, EE, infrastructure, behavioral change;
 - TAPs: Frequently identified technologies were biofuels, urban mass transport, non-motorized transport and electrification of existing railways;
- NDCs: Standards for vehicles and other regulations, alternative fuels, vehicle improvement, urban public transport, modal shift;
- CTCN: Efficient motors.

Most relevant sub-sectors identified in the priority area: Other areas of mitigation opportunities (including AFOLU, methane (CH₄), other non-CO₂ gases):

- TNAs: Forest management and sinks, improved agriculture and land-use, (bio)waste to energy, waste management;
 - TAPs: Frequently identified technologies were waste to energy production, including landfill biogas, municipal waste, and solid waste treatment;
- NDCs: Climate smart agriculture, forest management and land-use, waste management and landfills, recycling and waste water, (bio)waste to energy/biofuels;
- CTCN: Waste management, waste to energy.

VI. Possible way forward

16. As discussed in the objective of this note, the results of this analysis aim to help in the identification of common technology themes, topics and issues relevant to the Parties of the UNFCCC, that may be addressed in future TEMs on mitigation.

17. To recall the substance of previous TEMs, the following table provides the topics and content between 2014 and 2016 (table 1, below):

Social and economic value of carbon	Economic and social value of carbon associated with early climate action
Transport	Low-carbon transportation policies, technologies and opportunities
RE (III): supply	Follow up: recent developments of post-Paris agendas, activities and initiatives
EE (III): urban environments	Follow up: Recent developments of post-Paris agendas, activities and initiatives
RE (II)	Follow up: Most promising and feasible policies and options for renewable energy supply that could be implemented and scaled up
EE (II)	Follow up: Broader aspects of energy efficiency and urban environments
Non-CO2 gases	Good practice mitigation actions and existing incentives; Identify barriers for scaling up measures to address non-CO2 GHG emissions from a wide array of sources; Options to overcome such barriers
CCS	Views and experiences on options and opportunities to advance action on CCS; Explore barriers for scaling up action; Options to overcome such barriers
Land use	Unlock mitigation opportunities in land use in the pre-2020 period
Urban Environment	Stakeholders' experiences in capitalizing on opportunities that cities face in moving towards low-carbon pathways
RE (I)	Efforts and perspectives in scaling up the deployment of renewable energy technologies
EE (I)	Experiences on capitalizing on the potential of energy efficiency, lessons learned, challenges and plans for further scaling up energy efficiency improvements

18. The key findings of this analysis could be discussed in two ways:

- I: Deepening and reconsidering commonly identified (sub) sectors that were already a subject in previous TEMs, such as RE, EE, and Transport, for example with a more regional focus.
- II: Identifying (sub) sectors that derive from the analysis, but were not yet discussed in previous TEMs.

19. By comparing the commonly identified areas, sectors, and sub-sectors from this analysis with the topics already been discussed at previous TEMs, the following conclusions can be drawn, including a potential way forward:

Ia): RE, EE, transport: Issues have been addressed by several TEMs

- A potential way forward for the TEC is to suggest another TEM on this topics, with an in-depth focus, such as successfully implemented projects, accessing finance and the institutions offering support and technical exchanges, , project obstacles and how they have been dealt with, sharing lessons learned and best practices;

Ib): Land use, AFOLU: Issue has been addressed by at least one TEM

- A potential way forward for the TEC is to suggest another, more in-depth TEM regarding this topic such as sustainable (or "climate smart") agriculture, with a focus on co-benefits of such approaches for both adaptation and mitigation.

IIa): Waste and waste-to energy: Issue was only partly addressed by one TEM

- A potential way forward for the TEC is to suggest this topic, including its specific sub-sectors, for a potential round of TEMs in the near future, such as energy production from municipal waste treatment including grey water and landfills.

IIb): Fuel/fuel switch/(bio)fuels: Issue was only partly addressed by one TEM

- A potential way forward for the TEC is to suggest this topic, including its sub-sectors, for a potential round of TEMs in the near future, such as using biofuels in (public) transport.

Annex

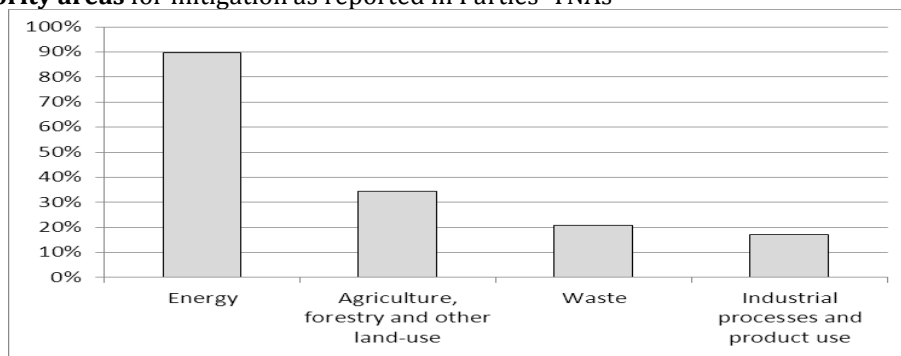
I. Analysis of TNAs (including TAPs)

A. Mitigation sectors and technologies in the TNAs of the Phase I Global TNA project countries

For mitigation, the **energy** sector was clearly the most prioritized sector, identified by 90 per cent of the Parties. Within the energy sector, the most prioritized subsectors were energy industries (82 per cent of the Parties) and transport (41 per cent).

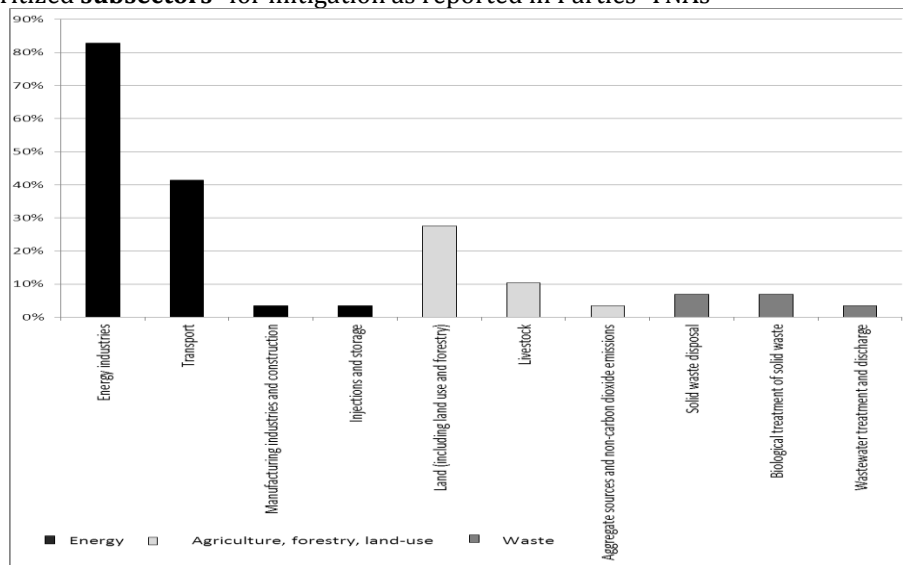
The **agriculture, forestry and other land-use** sector was prioritized by approximately one third of the Parties. Within the sector, the most prioritized subsector was **land use** (including LULUCF), followed by **waste** sector and **industrial processes and products**.

Table 2: **Priority areas** for mitigation as reported in Parties' TNAs



For mitigation, Parties identified a total of more than 300 different technology options in their preliminary lists (or long lists) of technologies within their prioritized mitigation sectors or subsectors. More than 120 different technologies were prioritized by Parties.

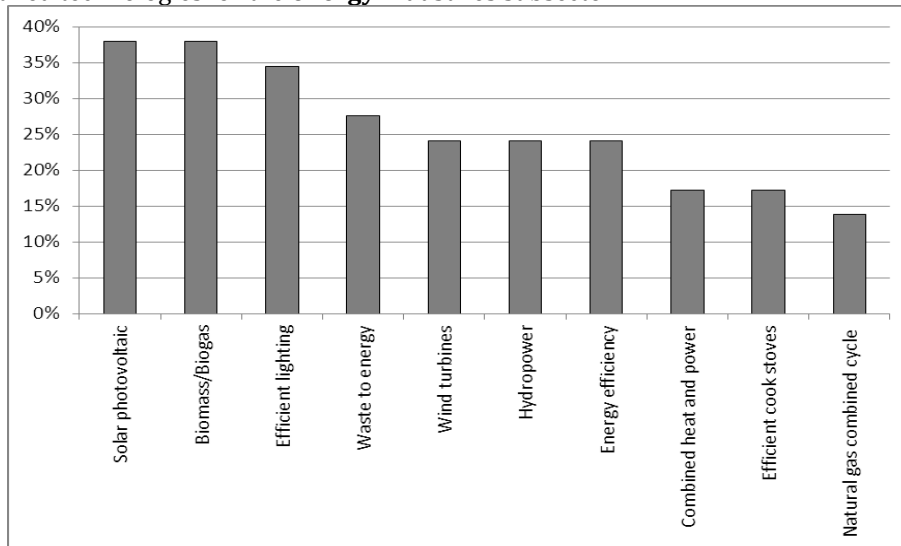
Table 3: Prioritized **subsectors**⁴ for mitigation as reported in Parties' TNAs



Within the **energy** sector, which was the most prioritized mitigation sector, the majority of the technologies prioritized for the energy industries subsector were related to electricity generation. Solar photovoltaic and biomass/biogas electricity generation technologies were the most prioritized technologies, prioritized by almost 40 per cent of the Parties that undertook mitigation TNAs (see table 4).

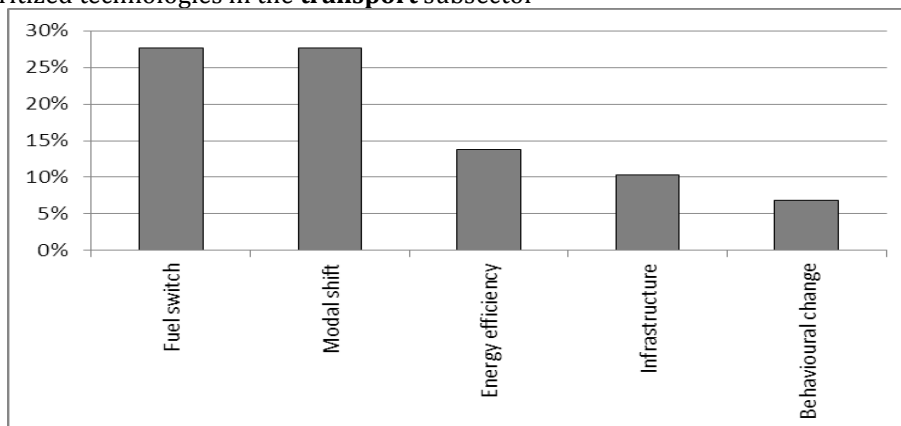
⁴ Most of the Parties that prioritized the industrial processes and product-use sector did not prioritize subsectors for that sector.

Table 4: Prioritized technologies for the **energy** industries subsector



For the **transport subsector**⁵ of the energy sector, over 25 per cent of the Parties prioritized technologies relating to fuel switching, such as electric or liquefied natural gas vehicles, and modal shifts, such as mass rapid transit road or rail systems. Table 9 illustrates the most commonly prioritized technologies for the transport subsector.

Table 5: Prioritized technologies in the **transport** subsector



For the **agriculture, forestry and other land-use sector**, prioritized technologies in the forestry subsector were quite diverse, with technologies prioritized across a wide range of sub-sectors. Such sectors included sink enhancement (afforestation or reforestation) and forest rehabilitation and restoration techniques. Prioritized technologies included optimal forest plantation, incentives to reduce deforestation and the promotion of sustainable community forest management. Further technologies that were included: bagasse combined heat and power; nutrient management and improvement; organic farming; classic, mini or no tillage; fertilizer dosing; and irrigation techniques.

⁵ It may be observed from the overview of prioritized technologies for transport that Parties mostly prioritized soft technologies, aimed at achieving behavioural change in relation to transportation and the improvement of infrastructure, both of which can be applied in the relatively short term.

B. Mitigation sectors and technologies in the technology action plans of the Phase I Global TNA project countries

As shown in tables below, **energy** was the dominant sector for mitigation technology action plans (TAPs) in all regions. In total almost 80 TAPs were produced by developing countries in energy sector. In the sector of **transport and agriculture**, TAPs were conducted in each region. **Waste management** was prioritized in Africa and Latin America regions. In all regions more than 70 *adaptation* TAPs were conducted in the **water** sector and more than 60 in **agricultural** sector.

Table 6: Regional distribution of sectors identified in TAPs

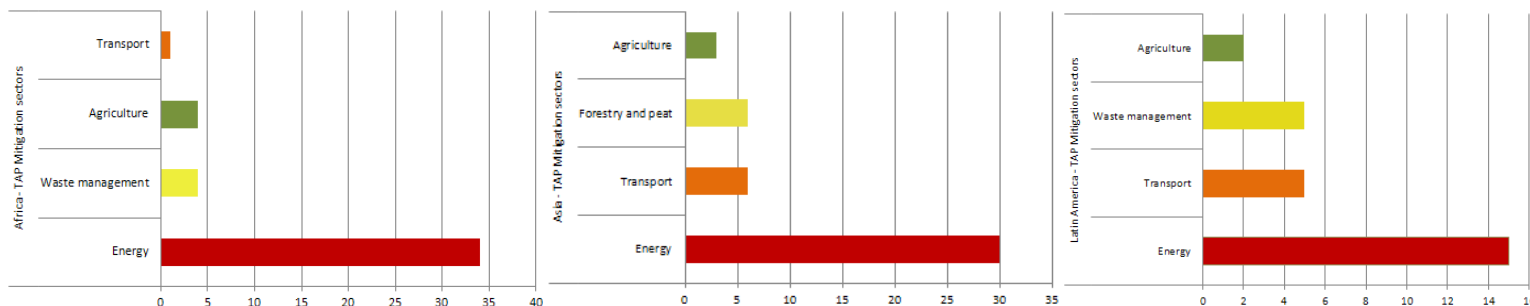
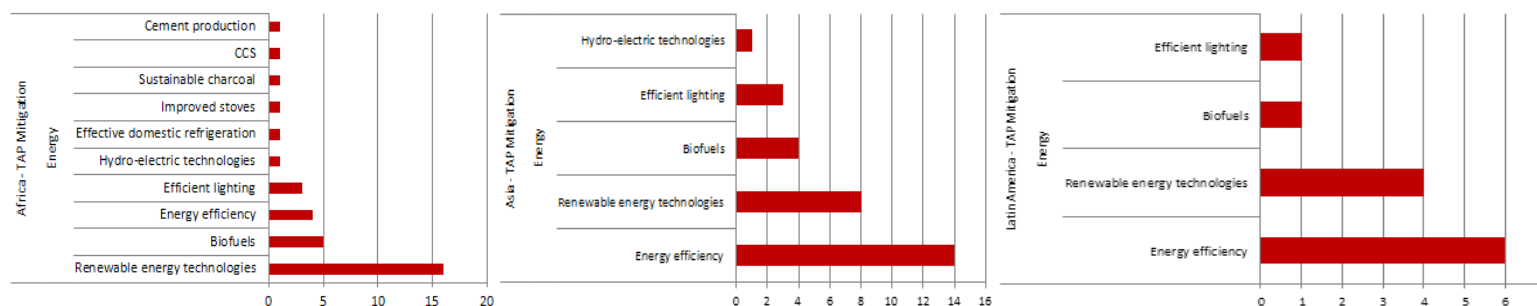


Table 7: Regional distribution of sub-sectors identified in TAPs

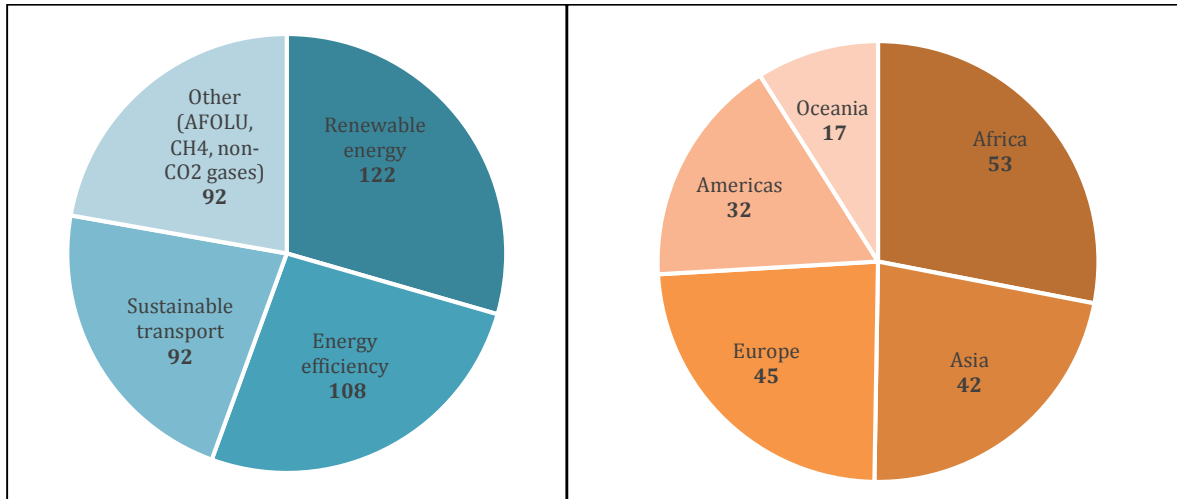


As shown in tables above, sectors and sub-sector of TAPs were quite similar in each region, and differences were minor. **Energy efficiency** TAPs were dominantly prepared in Asia and Latin America and together with Africa 24 TAPs were prepared in energy efficiency. In total 28 **renewable energy** technologies TAPs were conducted in all the three regions, making this sub-sector the most dominant in total prepared TAPs. Third sector mentioned was **biofuels**, in which 10 TAPs were prepared by countries.

II. Analysis of NDCs to identify possible relevant technology topics and issues to be addressed in future TEMs on mitigation

The analysis covers 189 NDCs contained in the compilation and synthesis report as of March 2016. This chapter provides concrete results and numbers of the analysis and presents the most relevant sub-sectors along the aggregated priority areas. The following graphs give an overview on the distribution along priority areas and the regional allocation of analyzed NDCs.

Table 8: a) Focus of identified actions along **priority areas**; b) Overview of **regional distribution**



Renewable energy

Overall, **122 NDCs (65% of the total number of NDC submitted)** identified actions related to renewable energy. For the purpose of this exercise, the identified actions have been further grouped along fields of actions related to **(a) the electricity system** and **(b) energy generation**.

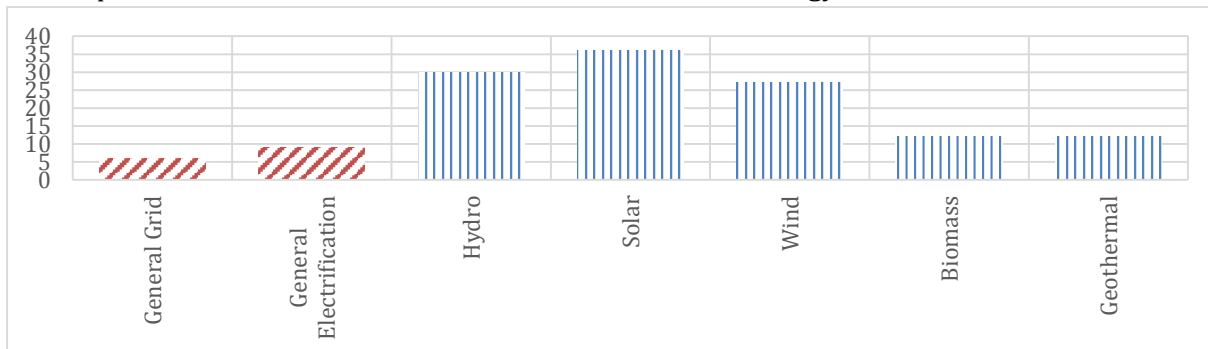
15 NDCs (8%) mentioned actions that can be grouped under **(a) electricity system**;

- 6 NDCs (3%) identified actions related to general grid improvement;
- 9 NDCs (5%) identified general electrification actions;
- Other actions identified were mini/micro/off-grids; smart grids; storage; rural electrification.

119 NDCs (63%) mentioned actions that can be grouped under **(b) energy generation**;

- 36 NDCs (19%) identified general actions related to energy from solar sources;
- 30 NDCs (16%) identified actions related to energy from hydro sources;
- 27 NDCs (14%) identified actions related to energy from wind sources;
- 12 NDCs (6%) identified actions related to energy from biomass and waste-to-energy sources;
- 12 NDCs (6%) identified actions related to energy from geothermal sources.

Table 9 provides an overview of identified actions on **renewable energy**:



A. Energy efficiency

Overall, **108 NDCs (57%)** identified actions related to energy efficiency. The identified actions were further grouped along the fields of **(a) sectoral approaches, (b) buildings, (c) lighting, (d) appliances, (e) policies, regulations and standards, and (f) actions in the power, energy and fuel sector.** Awareness activities and capacity-building actions as cross-cutting topics were also mentioned.

22 NDCs (12%) mentioned actions that can be grouped under **(a) sectoral approaches;**

- 11 NDCs (6%) identified actions related to the industry sector
- 11 NDCs (6%) identified actions related to the transport sector
- 9 NDCs (5%) identified actions related to the domestic area
- Another action identified was the services/commercial sector

19 NDCs (10%) mentioned actions that can be grouped under **(b) buildings;**

- 16 (8%) NDCs identified general actions related to buildings
- Other actions identified were building codes; public sector buildings

16 NDCs (8%) mentioned actions that can be grouped under **(c) lighting;**

- 16 NDCs (8%) identified general actions related to lighting
- Other actions identified were street lightning; LED

15 NDCs (8%) mentioned actions that can be grouped under **(d) appliances;**

- 13 NDCs (7%) identified general actions related to appliances
- 5 NDCs (3%) identified specific actions for stoves and cooking
- Other actions identified were air conditioning and district cooling

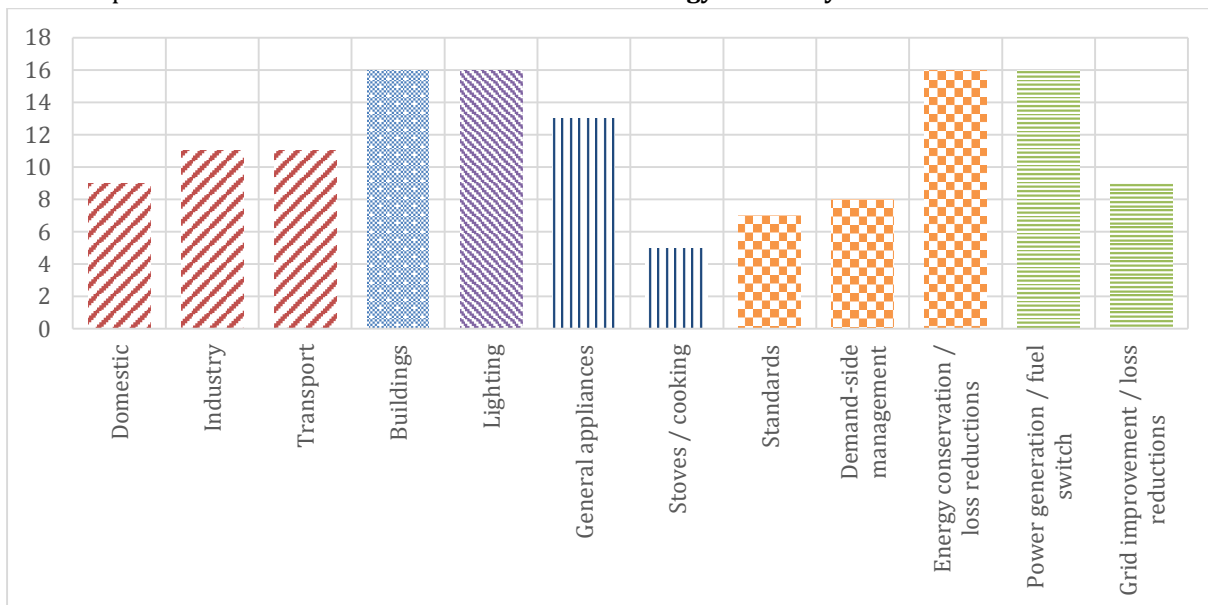
35 NDCs (19%) mentioned actions that can be grouped under **(e) policies, regulations and standards;**

- 16 NDCs (8%) identified actions on energy conservation / loss reductions
- 8 NDCs (4%) identified demand-side management
- 7 NDCs (4%) identified the establishment or improvement for standards
- Other actions identified were regulations; labelling; market-based mechanisms

22 NDCs (12%) mentioned actions under **(f) actions in the power, energy and fuel sector;**

- 9 NDCs (5%) identified actions related to grid improvement / loss reductions
- 16 NDCs (8%) identified actions related to improved efficiency in power generation / fuel switch

Table 10 provides an overview of identified actions on **energy efficiency:**



B. Sustainable transport

Overall, **92 NDCs (49%)** identified actions related to sustainable transport. The identified actions were further grouped along the fields of **(a) public transport, (b) individual transport, (c) energy/fuel switch, (d) policies and regulations.**

52 NDCs (28%) mentioned actions that can be grouped under **(a) public transport;**

- 11 NDCs (6 %) identified actions related to urban public transport (bus, metro, tram)
- 10 NDCs (5%) identified actions related to modal shift from road to mass transportation (freight and/or passengers)
- Other actions identified were railway construction; efficient public transport system

27 NDCs (14%) mentioned actions that can be grouped under **(b) individual transport;**

- 12 NDCs (6%) identified actions related to more electric and hybrid vehicles for private/individual use
- 15 NDCs (8%) identified the improvement, refitting and efficiency increase of traditional internal combustion vehicles
- Other actions identified were walking and cycling, including the respective network increase

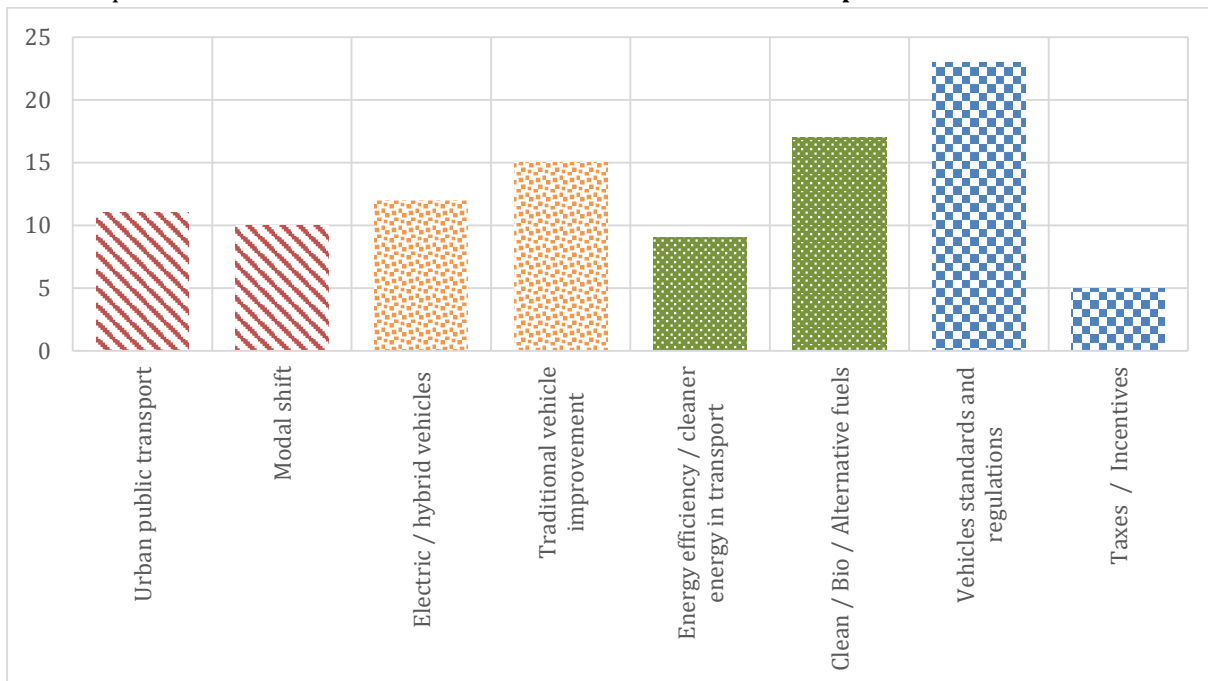
26 NDCs (14%) mentioned actions that can be grouped under **(c) energy/fuel switch;**

- 17 NDCs (9%) identified clean fuels/biofuels/alternative fuels
- 9 NDCs (5%) identified energy efficiency/ cleaner energy use in transport

30 NDCs (16%) mentioned actions that can be grouped under **(d) policies and regulations;**

- 23 NDCs (12%) identified actions related to vehicles standards and regulations
- 5 NDCs (3%) identified taxation/incentives actions
- Another action identified was improvements in traffic/transport management system

Table 11 provides an overview of identified actions on **sustainable transport:**



C. Other areas of mitigation opportunities (including AFOLU, methane (CH4), other non-CO2 gases)

Overall, **92 NDCs (49%)** identified actions related to other areas of mitigation opportunities. The identified actions were further grouped along the fields of **(a) climate smart agriculture, (b) ecosystem and land use, (c) waste management, (d) energy-related action.**

48 NDCs (25%) mentioned actions that can be grouped under **(a) climate smart agriculture;**

- 36 NDCs (19%) identified the general management of climate smart agriculture (CSA)
- 11 NDCs (6%) identified actions related to crop
- 16 NDCs (8%) identified actions related to livestock

23 NDCs (12%) mentioned actions that can be grouped under **(b) ecosystem and land use;**

- 15 NDCs (8%) identified actions in forest management,
- 19 NDCs (10%) identified actions related to general land use management
- Another action identified was the improvement of carbon sinks

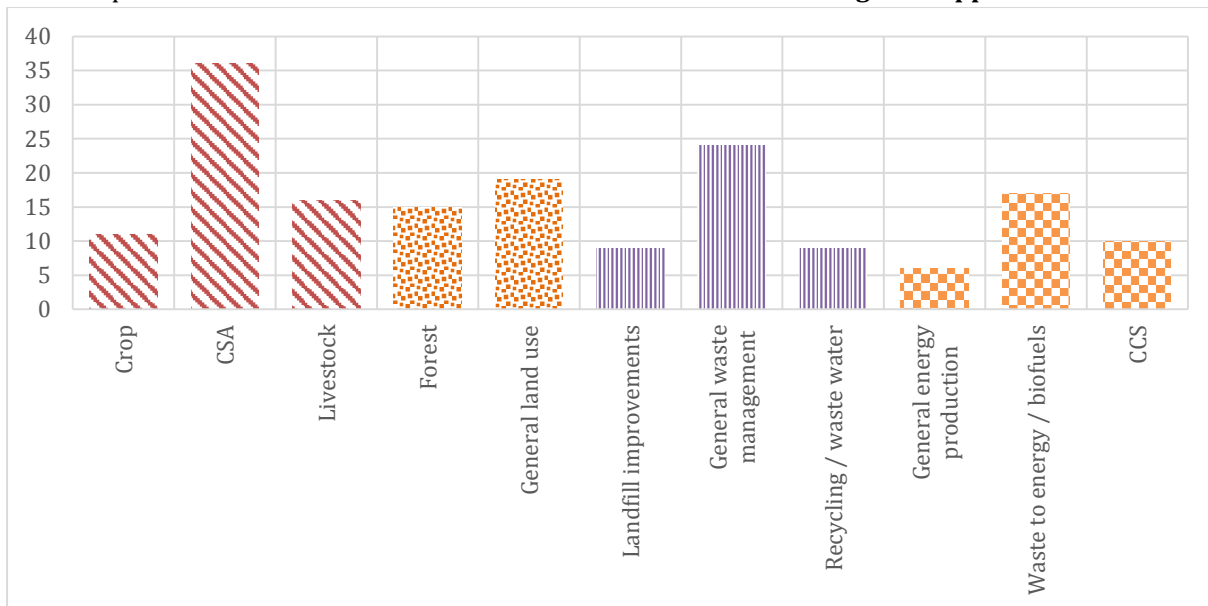
31 NDCs (16%) mentioned actions that can be grouped under **(c) waste management;**

- 24 NDCs (13%) identified actions in general waste management
- 9 NDCs (5%) identified actions related to landfill improvements
- 9 NDCs (5%) identified actions related to recycling, including waste water

32 NDCs (17%) mentioned actions that can be grouped under **(d) energy-related action;**

- 6 NDCs (3%) identified actions on the general management of energy production
- 17 NDCs (9%) identified actions on (bio)waste to energy, including biofuels
- 10 NDCs (5%) identified actions related to carbon capture and storage (CCS), its planning and/or implementation
- Other actions identified were improvements in the domestic and industrial sector

Table 12 provides an overview of identified actions on **other areas of mitigation opportunities**

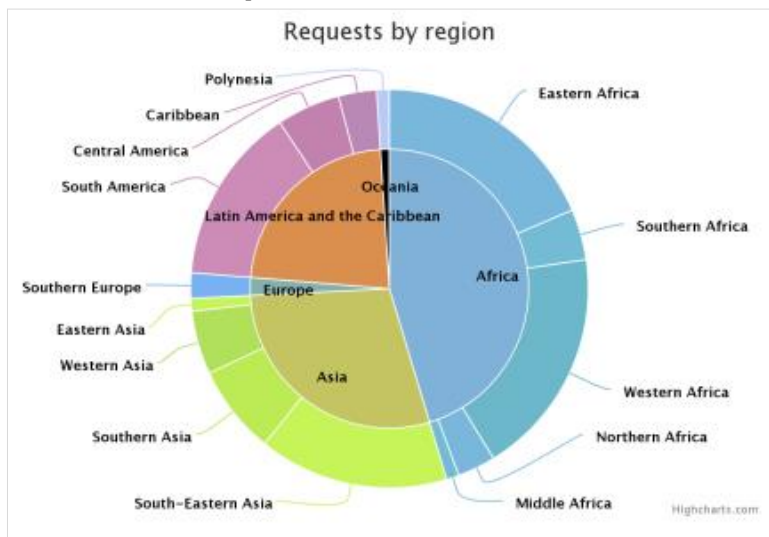


III. CTCN: Analysis of the technical assistance request data

For the analysis of CTCN input on technical assistance requests (TA), the CTCN secretariat kindly submitted the following data⁶:

- Total number of TAs received: 132
- Number of mitigation based request: 40.9%
- Number of cross sectoral (both mitigation and adaptation elements) request: 28.8 %

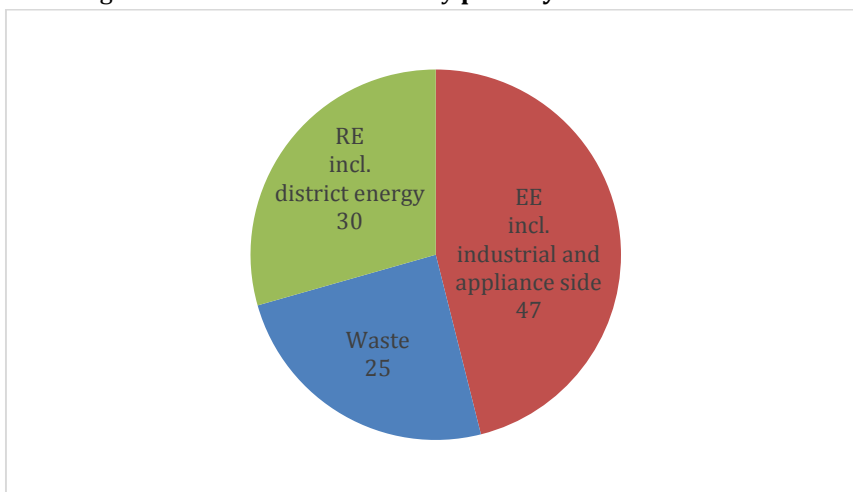
Table 13: **Geographical distribution** of requests for TA:



The request for TA can be broken down into priority areas, similar to the exercise for TNAs and NDCs. The analysis of the CTCN data resulted in the following results:

- Number of TA requests analyzed for identification of thematic priority area : 54;
- Mitigation : 36; Cross sectoral :18;
- Focus area: Industrial EE 28%, Consumer Goods (Appliance EE) 19%;
- Focus area: Waste 25%;
- Focus area: RE 22%, energy services (incl. district energy) 8 %.

Table 14: Requests for mitigation and cross sectoral TA by **priority area**:



⁶ For this analysis only mitigation or cross sectoral requests for technical assistance were considered.

References

- FCCC/CP/2016/2 Aggregate effect of the intended nationally determined contributions: an update. Synthesis report by the secretariat
- FCCC/SBSTA/2013/INF.7 Third synthesis report on technology needs identified by Parties not included in Annex I to the Convention. Note by the secretariat
- CTCN portfolio overview <<https://www.ctc-n.org/technical-assistance/request-visualizations>>