First draft of a technology brief on technology roadmaps

Summary

➢   The TEC, at its 5th meeting, agreed to extend the mandate of the technology roadmaps (TRM) taskforce and gave the taskforce the task of elaborating the first draft of a technology brief on TRMs, to be completed for consideration by the TEC at its 6th meeting.

➢   The TRM Taskforce consists of the following TEC members: Mr. Kanat Baigarin, Mr. Albert Binger, Mr. Süfyan Emiroğlu, Mr. Omedi Moses Jura, Mr. Matthew Kennedy and Mr. Krzysztof Klincewicz.

➢   Contained within is the first draft of a technology brief on TRMs. The taskforce members, in preparing the technology brief, focused on the substance of the brief rather than elements such as the editing, formatting, style and presentation of the brief.

➢   The TEC may wish to exchange views on the draft technology brief and determine any necessary follow-up actions. In considering the technology brief, the TEC may wish to take into account the other technology brief prepared for its sixth meeting.

Technical brief of the TEC. Best practices for implementation of technologies for mitigation and adaptation

The Conference of the Parties by decision 1/CP.16 requested the Technology Executive Committee to catalyse the development and use of technology roadmaps or action plans at the international, regional and national levels through cooperation between relevant stakeholders, particularly governments and relevant organisations or bodies, including the development of best practice guidelines as facilitative tools for action on mitigation and adaptation. In 2012-2013, the TEC established a dedicated task force dealing with technology roadmaps (TRMs), developed an inventory of existing roadmaps, prepared a background paper based on the analysis of the inventory and organised an expert meeting to gather opinions about existing and possible actions.

Technology roadmap - definition

Roadmaps help identify policies and measures, instrumental in supporting project implementation, as well as identifying and addressing specific challenges. Their contents can be regarded as the basis for good planning practices in various areas, including technology implementation to enhance mitigation and adaptation to climate change. These guidelines could therefore be useful in other planning processes. The TEC members, experts and observers expressed the opinion that the process of developing roadmaps is as important as its tangible outcomes.

"A Technology Roadmap (TRM) serves as a coherent basis for specific technology development and transfer activities, providing a common (preferably quantifiable) objective, time-specific milestones and a consistent set of concrete actions; developed jointly with relevant stakeholders, who commit to their roles in the TRM implementation."

(Background paper on Technology Roadmaps, Technology Executive Committee, TEC/2013/5/5)

Do you have a good technology roadmap / technology action plan?

It should include:

- Common (preferably quantifiable) objectives;

- Time-specific milestones;

- Consistent set of concrete actions;

- Defined roles in implementation of specific actions (including stakeholders).

And:

- Be a coherent planning document;

- Relate to a selected category of technologies;

- Focus on stimulating implementation of these technologies;

- Result from co-operation or engagement with relevant stakeholders.

The roadmapping process involves:

- Reflection and rigorous analysis;
- Increased communication with stakeholders and consensus building;
- Resulting in specific, time-related actions;
- Helping attain desired objectives.

The actions may relate to policy frameworks, support mechanisms for the implementation of specific technologies, as well as development of markets, industries and underlying infrastructures. The roadmapping process belongs to a wide range of technology planning tools and practices. Some of these frameworks are descriptive, focusing on what we expect to happen (e.g. forecasts, scenario planning) and they usually do not assume the possible interactions with technology users or decisions if specific future developments are desirable. Normative planning tools outline what we want to happen (e.g. visions, backcasting, foresights, sensitivity analysis), including general outlines of a desirable future. TRMs are normative planning tools - they can be used to influence the expected developments, as they depart from the view of a desirable future and include specific steps towards the successful implementation of necessary actions. Private sector TRMs are usually prepared by technology companies, focused on technology development and the introduction of new product generations. Public sector TRMs are in turn linked to technology diffusion, including the necessary adjustments of existing technologies to local conditions, considering multiple existing technological options to best address specific gaps and scoping the desired implementations. Public sector TRMs relate to a broad category of technologies, including multiple alternatives, not merely one specific technical variant.

Roadmapping - specific actions shaping the future
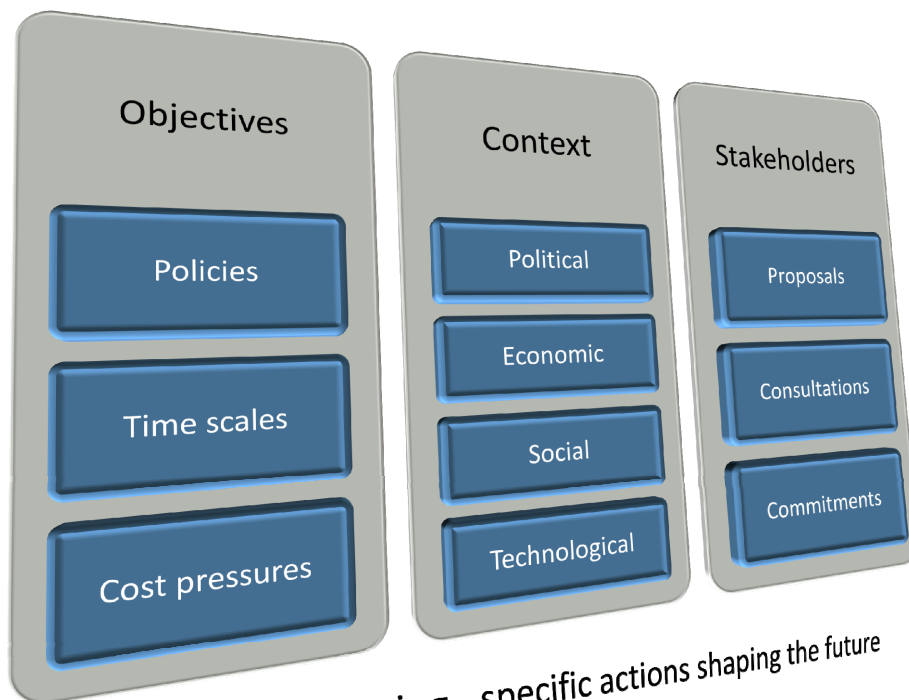
The TEC's background paper on technology roadmaps outlined **the following key purposes of TRMs**:

1) Provide coherent input to (inter)national technology R&D policy;

2) Provide a basis for national policy supporting the diffusion of technologies for adaptation and mitigation;

3) Act as catalysts for existing technologies to adapt to new markets;

4) Mobilise private sector interest in climate technologies;

5) Provide a common platform for international support;

6) Generally align actions of different funders and governmental institutions.

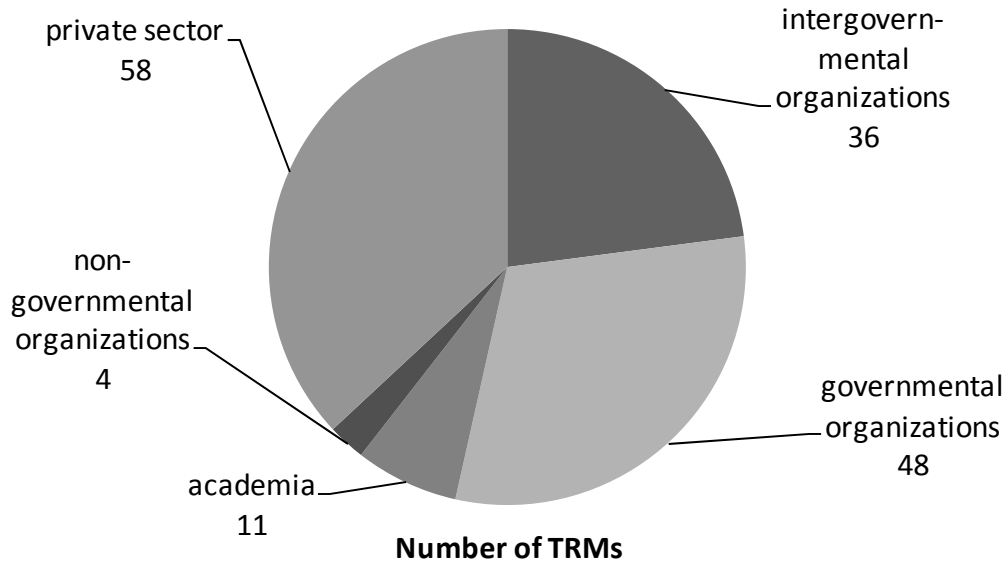Participants of the TEC expert meeting on technology roadmaps identified **the following key benefits of TRMs**:

1) Engage stakeholders, including private sector;

2) Are demand-driven, adjustable to national or regional circumstances;

3) Are knowledge-based;

4) Include priorities, timescales, ownership of solutions and costs;

5) Stimulate commitment and legitimacy of efforts;

6) Improve access to existing technologies.
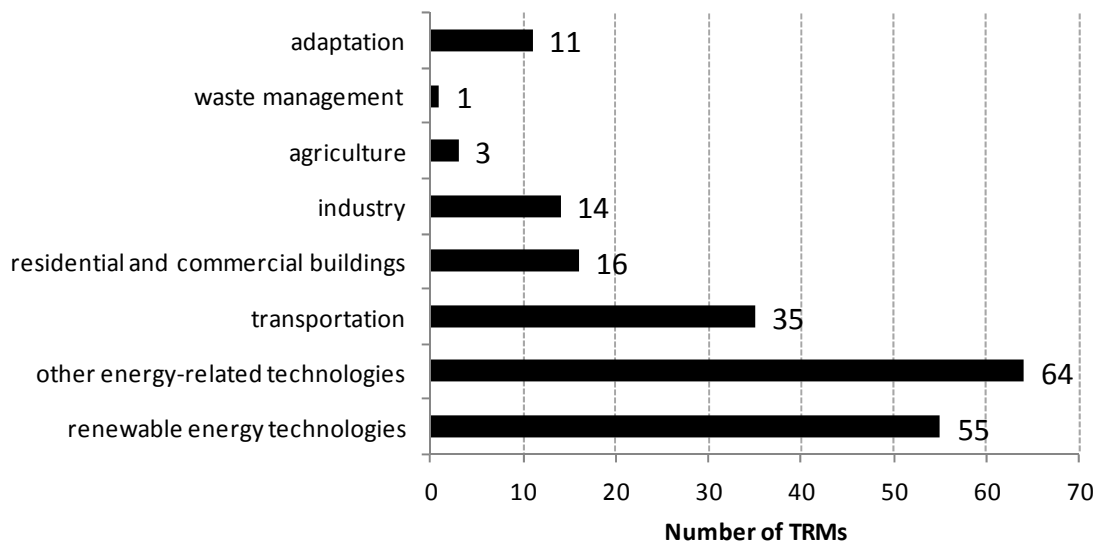
Existing technology roadmaps

Technology roadmapping is gaining in popularity and can be directly linked to the existing planning frameworks under the UNFCCC. In 2012, an analysis was conducted on behalf of the TEC of 159 English-language TRMs related to mitigation and adaptation technologies, which were available in public domain. The TRMs are available as part of a TRM inventory found at the TT:CLEAR website[1], and the results of their analysis were published as a background paper on technology roadmaps. The analysis discovered that the majority of existing TRMs focus on mitigation technologies and most of them were prepared in developed countries. The analysis also identified gaps in planning the implementation of technologies for adaptation. Many TRMs were also imperfect, missing some important elements of a good practise roadmap (see the following section). The graphs below offer an overview of authors, types of technologies and time periods, covered by the TRMs included in the dataset, analysed on behalf of the TEC.
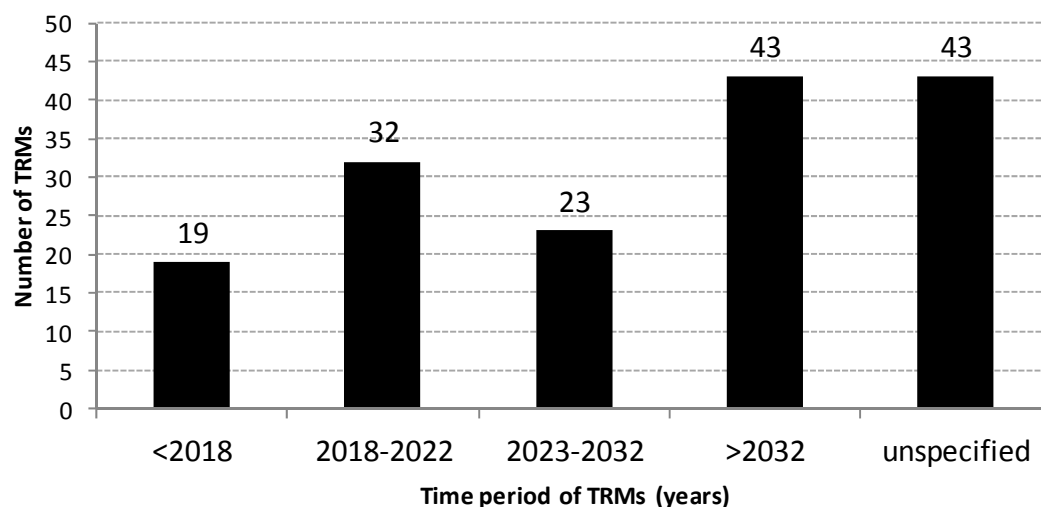
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[1] <ttclear.unfccc.int>

Authors of TRMs

- private sector 58
- intergovern- mental organizations 36
- governmental organizations 48
- academia 11
- non- governmental organizations 4

Number of TRMs

Technology types analysed in TRMs

Technology type	Number of TRMs
adaptation	11
waste management	1
agriculture	3
industry	14
residential and commercial buildings	16
transportation	35
other energy-related technologies	64
renewable energy technologies	55

Number of TRMs

Time horizon of TRMs


Good planning practices

The analysis of existing TRMs helped identify examples of good practices and prepare recommendations on how to improve technology planning processes. These good practices ensure that plans are not merely expressions of desires or lists of priorities, but include detailed implementation steps, resulting from an understanding of the present situation and the specific local context.

	Good practice	Rationale
1)	**Define a specific objective for your technology initiative**	*Make sure you know what exactly you are striving for*
2)	**Link the objective directly to the existing mitigation or adaptation efforts**	*Avoid duplication or fragmentation of efforts* *Verify if the proposed actions contribute to the climate change-related objectives*
3)	**Make the objective measurable**	*Use quantifiable parameters to increase accountability, e.g. amount of energy produced from a specific renewable source*
4)	**Outline the actions / milestones that are necessary to attain the objective**	*Make the roadmap more tangible (or practical or concrete or realistic) by showing gradual progress from the current status to the desired levels, and demonstrating that specific actions are needed to attain the objective*
5)	**Make the objective and actions time-related**	*Provide realistic timelines, with deadlines stimulating implementation efforts*
6)	**Indicate the expected roles of specific stakeholders for each milestone**	*Ensure the engagement of stakeholders and their willingness to support the implementation, make them responsible for specific actions*
7)	**Estimate resource requirements**	*Make the roadmap more tangible (or practical or concrete or realistic) and legitimate , as the specificity is likely to attract investors and donors*
8)	**Document the process used to develop your plan and utilize empirical data sources**	*Make the plan credible and evidence-based*
9)	**Use visual schemes, outlining implementation milestones**	*Graphical presentation helps communicate the plan and streamline the proposed actions*

The successful use of technologies for mitigation and adaptation purposes might require specific steps, extending beyond the actual technology acquisition and implementation projects. These driving forces are outlined in the graph below and encompass policy frameworks, markets, industries, infrastructure and support mechanisms. Necessary actions, identified in the roadmapping process, often encompass new policies and measures, which are to be developed. Examples could include proposals for government policy changes, new or amended legislations, as well as the introduction of government incentives, such as subsidies, tax exemptions, removal of import duties, setting technical standards or carrying out awareness campaigns.

Technology planning relies on an assessment of the availability of and associated requirements for skilled personnel, and implementation projects usually incorporate capacity building components. Planners should also take into consideration actions addressing interrelated domains, which enable the uptake of technologies, e.g. the introduction of novel energy generation technologies will require corresponding changes to the necessary infrastructure for supply, storage or distribution of energy. Important actions relate to the measurement of the results of technology projects and documentation of lessons learned, which will be shared with stakeholders to stimulate further action.

Successful roadmapping requires a clearly defined and measureable objective. More TRMs exist for mitigation than for adaptation technologies, as emission reduction efforts are directly quantifiable, while adaptation is more context-specific, linked to the local vulnerability assessments and resilience requirements. Public sector TRMs are best suited for guiding the implementation of existing technologies, but could also be used to direct further developments of technologies, as long as the stakeholders involved in the preparation and implementation of a TRM have directly influence over these developments.
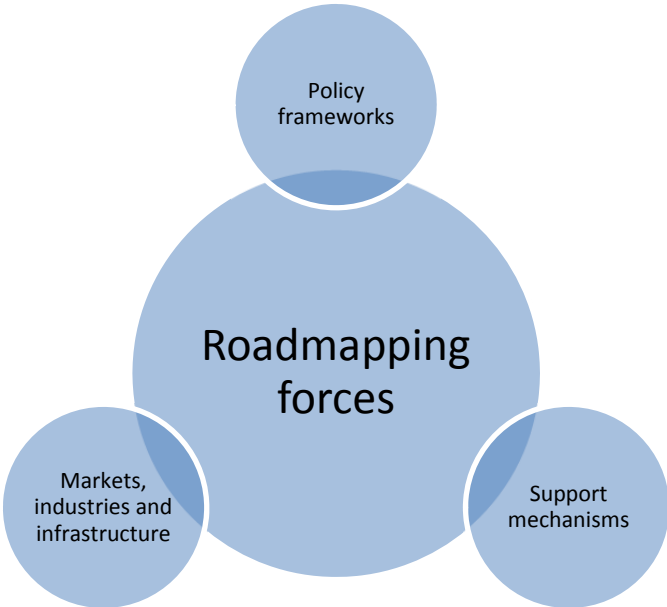
Roadmapping and other planning documents under the UNFCCC

Technology Action Plans (TAPs) are planning documents, which guide the implementation of the results of **Technology Needs Assessments (TNAs)**. TRMs could provide a ready-to-use structure for individual parts of TAPs, translating the outcomes of TNAs into concrete, time-related actions related to a selected group of technologies. Roadmapping techniques could be used in TAPs or accompany the already prepared TAPs and specify steps towards the desired implementations. The realistic and

rigorous planning efforts are likely to increase the probability of funding the initiatives, by convincing potential investors and donors that the authors of a given TAP understand the complexity of the technology acquisition and implementation processes and that national stakeholders are committed to the plan.

Nationally Appropriate Mitigation Actions (NAMAs) and **National Adaptation Plans (NAPs)** are policy documents and encompass actions which extend beyond the realm of climate technologies. The benefits of TRMs are clear if national efforts are to be facilitated by the implementation of specific technologies. Roadmapping techniques support structured planning efforts, with specific actions, milestones and actors, thus complementing more generic strategies or policies.

TRMs are useful tools, offering synergies with other planning documents under the UNFCCC. The challenges that we need to address as a global community as we respond to climate change is how best to utilize what we have in terms of technology roadmaps as well as roadmapping knowledge and skills in order to optimally package and implement NAMAs and NAPs, that would not only effectively contribute to the reduction of global level GHG emissions, but also increase the resilience of communities and the Earth to the impacts of climate change.

Read more:

- Background paper on technology roadmaps. Technology Executive Committee, TEC/2013/5/5
- Handbook for Conducting Technology Needs Assessment for Climate Change. UNDP. November 2010
- Inventory of technology roadmaps available on UNFCCC TT:CLEAR website

+ TEC contacts, TT:Clear address etc.