The Circular Carbon Economy Technology Roadmaps: A Methodology for Net-Zero

Noura Y. Mansouri, KAPSARC, +966561174065, noura.mansouri@kapsarc.org

Fateh Belaid, KAPSARC

Aljawhara Alquayid, KAPSRC

Overview

The transition towards a low-carbon economy is a multifaceted challenge that necessitates a systemic approach to address the associated complexities. The circular carbon economy (CCE) was formulated under the Saudi G20 2020 presidency and endorsed by all G20 countries. It has emerged as a new approach for climate mitigation that seeks to transform the conventional linear economic model into a sustainable and circular one. Rooted in circular economy, the CCE rests on the three classical pillars of circularity, reduce, reuse, and recycle, but adds a fourth important dimension, remove. By shifting the focus from 'sources' of energy, to managing emissions from theses sources, the CCE promote economic growth while reducing greenhouse gas emissions, and by doing so, it enables countries to meet their climate and sustainable development objectives in a balanced approach that takes into account countries' national circumstances.

The development of technology roadmaps is an essential tool to identify the key technologies, policies, and investments required for a smooth transition towards a net-zero carbon economy. Technology roadmaps offer a strategic framework for planning and implementing technological advancements and market developments in a systematic and coordinated manner. By providing a clear and shared vision, technology roadmaps can facilitate stakeholder alignment and resource allocation towards a common objective, which is crucial for the transition towards a circular carbon economy.

While technology roadmaps have been widely studied in various fields, such as renewable energy, electric vehicles, and smart grids, their application in the circular carbon economy context is still in the nascent stages. A comprehensive and robust methodology for technology roadmapping in the circular carbon economy context is yet to be developed. This paper aims to address this gap by proposing a methodology for developing technology roadmaps for the circular carbon economy that is specific to the context and takes into account the interdependence of various technological and non-technological factors.

To this end, this paper reviews the existing literature on the circular carbon economy and technology roadmaps, critically examining their suitability for the net zero context. We also identify the stakeholders involved in the circular carbon economy and outline their potential roles in the technology roadmap development process. Additionally, we describe the proposed methodology for developing technology roadmaps for the circular carbon economy, highlighting the key steps, potential challenges, and resources required. This paper contributes to the literature by providing a rigorous and comprehensive methodology for developing technology roadmaps for the circular carbon economy, facilitating the transition towards a sustainable and circular economy.

Methods

The paper employs qualitative research methods including literature review from secondary sources. A historical account of technology development literature, the importance of technology roadmaps, the shift from technology innovation from a linear perspective to a circular perspective and systemic and multi-level view. The output would entail a methodological contribution, namely, the circular carbon economy technology roadmap (CCE-TRM).

Results

The United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty that aims to address climate change by reducing greenhouse gas emissions and promoting sustainable development. As part of its efforts to advance climate negotiations, the UNFCCC established the Technology Mechanism in 2010, which includes the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN).

In 2015, the TEC made a decision to incorporate technology roadmaps as a tool for advancing climate negotiations. The decision recognized the importance of technology in achieving the objectives of the Paris Agreement, and emphasized the need for a collaborative and inclusive approach to technology development and deployment.

Under this decision, technology roadmaps are seen as a means to identify and prioritize technology needs and opportunities, and to facilitate the transfer and diffusion of technology across countries and sectors. The decision also highlights the importance of stakeholder engagement and capacity-building in the technology roadmap development process, as well as the need for regular review and updating of the roadmaps to ensure their continued relevance and effectiveness.

The UNFCCC TEC decision to incorporate technology roadmaps for advancing climate negotiations reflects a growing recognition of the role of technology in achieving climate objectives, and highlights the need for a collaborative and inclusive approach to technology development and deployment. By providing a framework for the identification and prioritization of technology needs and opportunities, technology roadmaps can play an important role in supporting countries in their efforts to transition to low-carbon and climate-resilient economies.

According to the UNFCCC (2017), technology roadmaps can help developing countries to prioritize their technology needs and identify the most effective and efficient ways to deploy and transfer technologies that can support their climate goals. The IEA (2019) also notes that technology roadmaps can be especially important for developing countries, where resources are often limited and there is a need to make strategic decisions about how to allocate those resources most effectively. Additionally, the UNDP (2017) highlights that technology roadmaps can facilitate technology transfer and collaboration between countries, which can be especially important for developing countries that may not have the institutional capacity or technical expertise to develop and deploy new technologies on their own.

The International Energy Agency (IEA) has published a white paper entitled "Energy Technology Roadmaps: A Guide to Development and Implementation," which provides a comprehensive overview of technology roadmaps and their role in achieving energy and climate objectives. The paper outlines the key components of a technology roadmap, including a clear vision, targets, milestones, and actions, and highlights the importance of stakeholder engagement and collaboration in the roadmap development and implementation process.

Technology roadmaps can play a critical role in helping developing countries to meet their climate needs. These countries often face unique challenges related to their limited financial resources, technological capabilities, and institutional capacity. Technology roadmaps can help these countries to prioritize their technology needs and identify the most effective and efficient ways to deploy and transfer technologies that can support their climate goals.

One of the key benefits of technology roadmaps is that they provide a clear and structured framework for technology planning and deployment. This can be especially important for developing countries, where resources are often limited and there is a need to make strategic decisions about how to allocate those resources most effectively. Technology roadmaps can help these countries to identify which technologies are most important for achieving their climate objectives, and to develop a plan for deploying those technologies in a way that is both financially and technically feasible.

Another important benefit of technology roadmaps is that they can facilitate technology transfer and collaboration between countries. This can be especially important for developing countries, which may not have the institutional capacity or technical expertise to develop and deploy new technologies on their own. By collaborating with other countries and institutions, developing countries can gain access to the knowledge, resources, and technical assistance needed to implement effective and sustainable technology solutions.

Finally, technology roadmaps can help developing countries to attract international funding and support for their technology projects. Many international organizations and donor countries are increasingly prioritizing technology development and transfer as a key component of their climate finance strategies. By developing clear and comprehensive technology roadmaps, developing countries can demonstrate their commitment to sustainable development and their readiness to receive international support for their technology projects.

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