Technology Assessment: Framing research questions and setting realistic goals

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**UNCTAD-DSI Hybrid Regional
Workshop on Technology Assessment
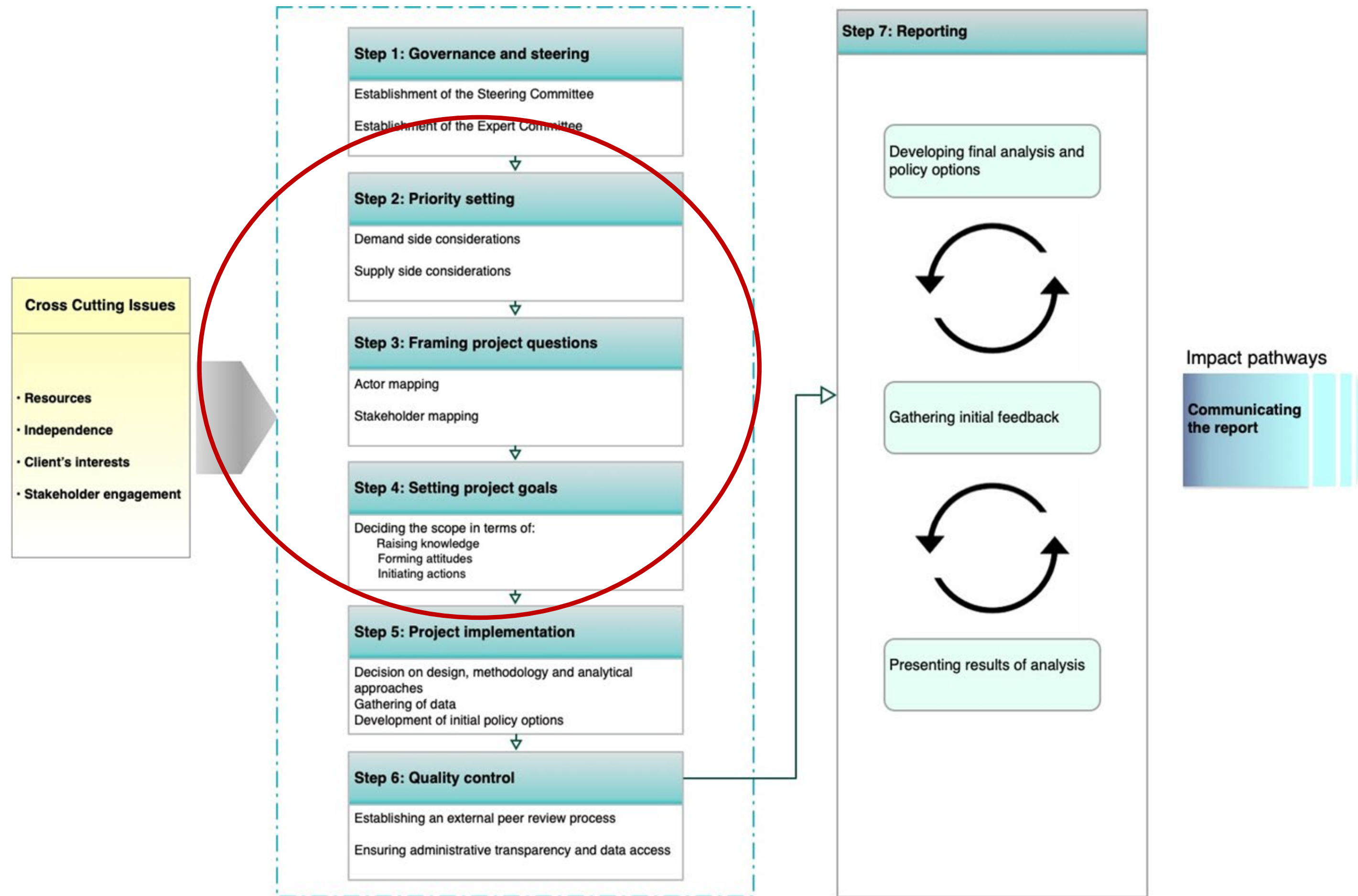in the Energy and Agricultural Sector in Africa**

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IDOS | German Institute
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and Sustainability

TA – Step by step: Overview

Priority Setting

Demand Side Considerations

Which social, economic or environmental challenges in the country call for technological solutions?

Supply Side Considerations

Which technologies and innovations emerging anywhere on the world may provide opportunities and risks for domestic development?

Framing TA questions

Who are the actors directly involved in developing, regulating and governing a specific technology, which stakeholders may be affected or are lobbying for common goods?

Stakeholders may be trade unions, farmers' organizations, civil society organisations, consumer protection agencies

Actors can be mapped following the National innovation system approach, from the Macro level (Ministries), Meso level (public R&D institutions) to the Micro level (commercial and social businesses)

To what extent do actors of the NIS have access to international state- of-the art knowledge and research, if not, how can this knowledge be generated? (e.g. science advisors at embassies)

Demand and supply side framing of TA questions

Examples of demand-side framing of TA agenda

- Which technologies may help farmers in region A and B adapt to global warming and fluctuating rainfall patterns?

- Which technological and systemic changes may help reduce urban air pollution?

- Which technologies allow a sustainable intensification of food production to feed a growing population?

… etc.

Examples of supply-side framing of TA agenda

- Can green hydrogen help to decarbonize the transport sector in urban areas?

- How will changes in electrolysis technologies affect the global value chains for green hydrogen hardware?

- Will ChatGTP be a necessary tool for international commercial relations in ten years from now?

- How will gene editing (CRISPR-CAS9) affect agricultural production in ten years from now?

… etc.
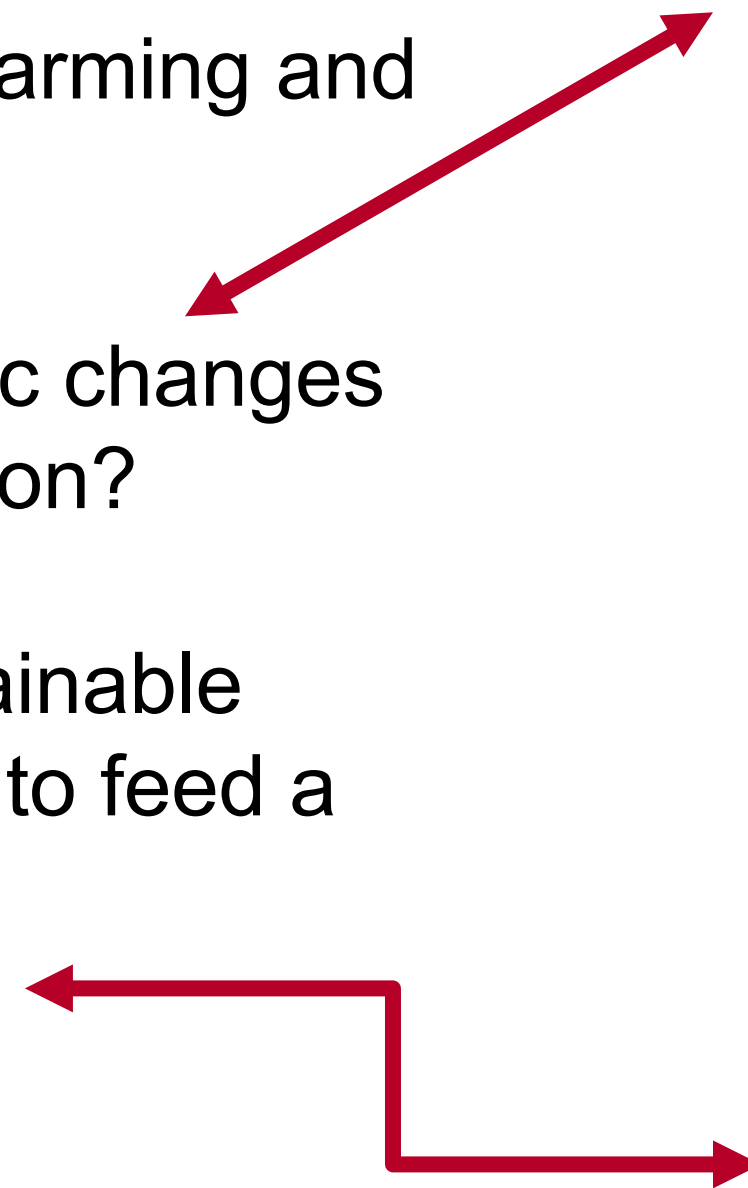
Innovations in Agriculture, opportunities and risks of artificial intelligence

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Drones powered by artificial intelligence pave the way to precision agriculture. How to assure benefits for smallholders?

Robots in harvesting of high quality products (sweet pepper) may threaten employment in the agricultural sectors (often women will be affected)

Agri-PV for agriculture and energy

Problem perception:

- Global warming threatens agricultural productivity, through excessive heat, droughts and torrential rains
- Power interruptions do not allow regular irrigation of crops

- Agri-PV: Combines PV energy generation with productive production of high-valued crops (berries, fruits, vegetables)
- Double usage of scarce land
- Protecting the plants from excessive solar radiation
- Giving shadow to livestock
- Usage of electricity for agricultural purposes (water pumping, cool storage, dehydration of fruits, etc.)
- TRL 6/7

Approach for defining TA questions and goals

- First, a **political decision** has to be taken about the overarching question and/or the sector(s) to be addressed by the TA exercise. This is clearly responsibility of the relevant line ministry, presidential office and / or parliament.

- The subsequent processes ("framing of research questions" and "setting realistic project goals) should be driven by a **steering committee** with the support of the **expert group.** The process should be participatory, which is not an easy tasks.

- The expert group will give prepare recommendations about both the research questions to be raised and the goals to be achieved. These could be based on existing policy papers, but should usually involve an interactive process with the stakeholders affected by the specific technology to be assessed.

In TA, various methods of qualitative social research may be applied. Which method will be used depends on the **concrete questions** related to the TA and, derived from this, the **range of stakeholders** to be involved. If you want to collect the opinion of business people in a certain sector about technology changes, an "online Delphi" may be the methodology of choice. If you want to know the hopes and fears of local communities towards a new agricultural technology, you might have to go out into the field and conduct Focus Group discussions with farmers of the same neighborhood, possibly in the respective local language.

In some cases, TA may include **several steps** of assessment : For instance, a Focus Group discussion may lead to a series of hypotheses on the acceptance of a certain technology. A representative survey in the possibly affected communities may follow, to falsify or verify the hypotheses.

The **time and resources available** will, additionally, affect the methods to be applied. An online Delphi survey can be conducted quite quickly and inexpensively. Organizing a series of FGD with local interpreters may be time-consuming and costly, but provide extremely important pieces of information.

All stakeholders should feel free to express their well-founded opinions on the issues at stake, even if this implies arguing against a government policy or a significant project. Any form of sanctioning should be excluded. "Safe places" for interactions must be organized (Chatham House rule).

No inappropriate considerations should shape the TA process, by e.g. strong opinion leaders who claim to represent the- common interest, but actually lobby for political groups or business interests. Most often, technologies are not free from political or business interests.

Delphi Surveys
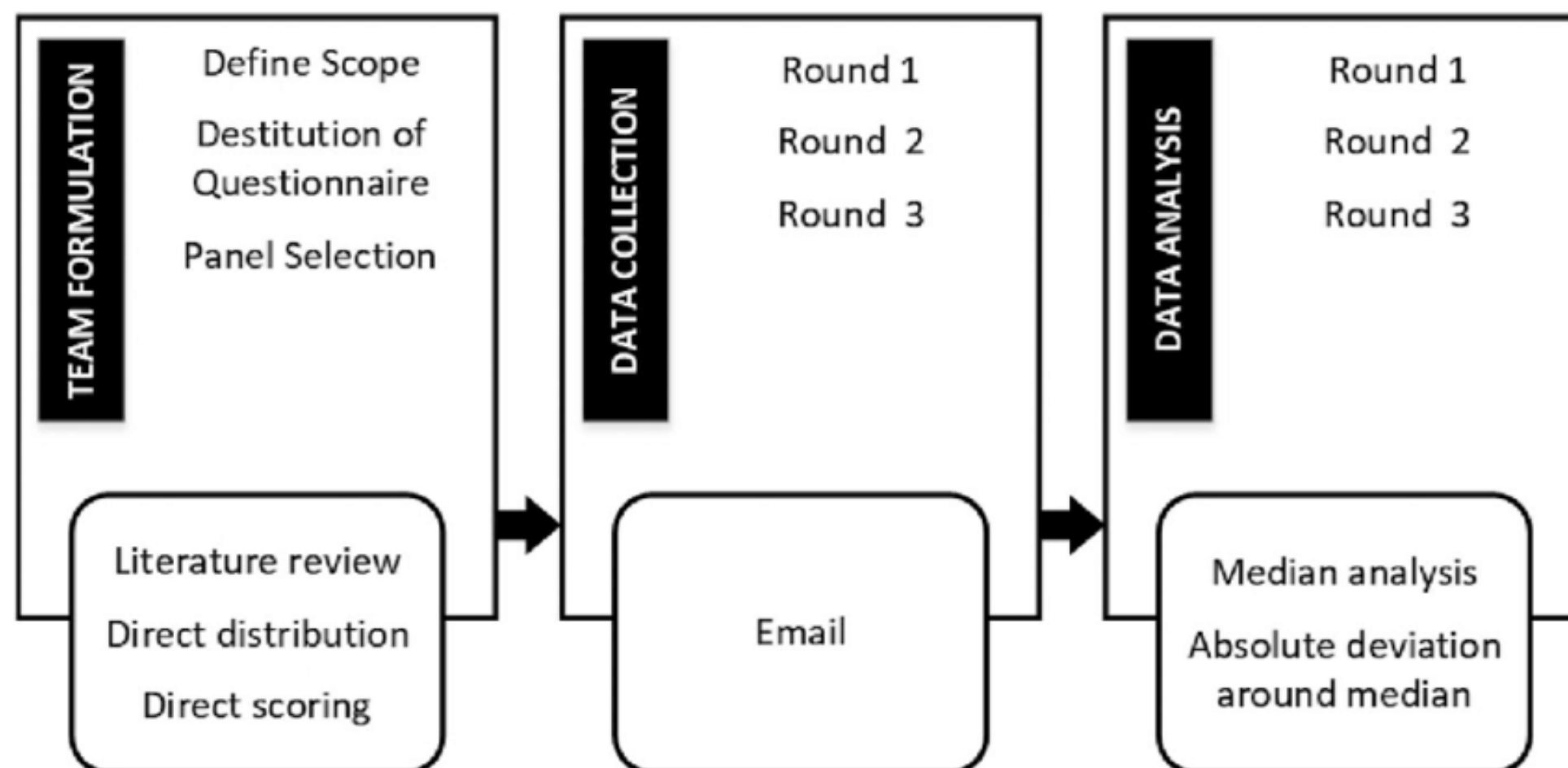
Delphi methods: The Delphi method is a forecasting process framework based on the results of several rounds of questionnaires sent to a panel of experts (i.e. people who have expertise in an area requiring decision making). Several rounds of questionnaires are sent out, and the anonymous responses are aggregated and shared with the group after each round. Real-time Delphi is an advanced form of the Delphi method. The advanced method is a consultative process that uses ICT to increase efficiency of the Delphi process.

Focus Group discussion

Focus Group discussion: People from similar backgrounds and experiences are brought together to discuss a specific topic of interest. The group is guided by a moderator or facilitator who introduces topics for discussion and helps the group to participate in a lively and natural discussion amongst themselves. Participants can agree or disagree with each other. This provides an insight into how a group thinks about an issue, about the range of opinion and ideas, and the inconsistencies and variation that exists in a particular community in terms of beliefs and their experiences and practice.

FGD can be done both as single events or as series of workshops, e.g. when groups of farmers in different regions are brought together to assess their technology needs for climate change adaptation. In the first case, TA may be rapid and inexpensive, in the second case, much more time and resources may be required.

Technology assessment had its origins in the 1970s as a research field with the primary purpose of assessing new and emerging technologies and identifying risks associated with them. Advising policymaking and legislation was the predominant purpose of TA in its early stages. In most countries of Europe and Northern America, TA offices were (and still are) institutionally located in the parliaments.

TA has developed as a discipline from one that originally followed one primary objective (policy advice) based on analytical methods from the natural and social sciences and engineering, to one that now encompasses a broader field pursuing multiple goals and applying a diverse set of methods, including communication and dialogue techniques.

TA functions today as a service providing policy options to govern technological development paths and instigating public debates based on the analysis of values and the inclusion of a wide array of stakeholder input. Thus, the core of much of modern TA concerns the development of interactive processes that bring together STI, society and policy

Goal 1: Raising knowledge and filling knowledge gaps. Fast technological advancements requires significant efforts to fill knowledge gaps through scientific research and linking up to international research partners.

Goal 2: Forming attitudes or opinions: In democratic societies, awareness about risks and opportunities of technological development has to be taken out of "bubbles" of researchers and policy makers. Civil society has to be given opportunities to from and express their opinions.

Goal 3: Initializing action: In a fast changing world, the innovation cycle has to be shortened, in order to initialize action and manage mobilizing the power of technology to maximize benefits and minimize risks for the affected peoples

Thanks for your attention!

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