Briefing
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European Parliament

Forward-looking policy-making at the European Parliament through scientific foresight

The European Parliament's Science and Technology Options Assessment (STOA) Panel, supported by the Scientific Foresight Unit (STOA), decided two years ago to experiment with a process involving scenario development and assessment to explore possible future techno-scientific developments and their potential impacts, while backcasting possible future opportunities and concerns to options available to policy-makers today. This was achieved with the involvement of experts from a variety of backgrounds, together with stakeholders, using a multi-perspective approach. In this setting, various types of possible impacts are explored, which provide the foundations for imagined exploratory scenarios. From these scenarios we can learn about the possible challenges and opportunities arising from them. By communicating these challenges and opportunities to the Members of the European Parliament (MEPs), together with related legal and ethical reflections, the MEPs are provided with potential insights into how to anticipate future policy issues. The MEPs might thus be able to identify options for working towards the most desirable futures and avoiding undesirable futures, and even for anticipating undesirable scenarios. Therefore, foresight-based policy preparation can help the European Parliament stay well prepared for what might lie ahead, allowing informed, anticipatory action.

1. Context

In January 2015, STOA published a first outline for an approach 'Towards scientific foresight in the European Parliament'. Meanwhile, two scientific foresight studies have been completed and two are ongoing. Since the pilot study on 'The ethics of cyber-physical systems' (i.e. robotics), the added value of foresight was explored and the experience led to insights about the potential power of foresight approaches for policy purposes regarding techno-scientific trends. This briefing outlines the experience towards an improved foresight practice by learning.

2. What are relevant topics for foresight studies?

In the area of scientific foresight and technology assessment (TA), the selection of the most relevant topics is of the utmost importance: the topics have to be tangible issues for the European Parliament, with relevance for the European citizens and society at large. Various methods are used to select these topics. Most recently, STOA conducted a study entitled 'Horizon scanning and analysis of techno-scientific trends' to find exciting new topics for which it would be worthwhile to carry out in-depth analysis and identify policy options to anticipate the future.

3. What are the various steps of a foresight process?

'Foresight' is a proactive approach to help us understand what the future might bring, and to help us prepare ourselves. It is not about predicting the future, but about understanding what might happen in the future and how we could or should anticipate it. Foresight can help in taking strategic policy decisions. At the European Parliament, any Member of a parliamentary committee can ask for such a study to support them in their daily work. STOA's priority areas are in the first instance strategic and of a multi-disciplinary nature.

Although there is no single way to conduct foresight studies, at the European Parliament we work on the basis of the following steps, especially in the techno-scientific context:

- The starting point is exploring the current state of affairs. In the case of science or technology foresight for European policy purposes, this could be a TA study, or an in-depth report by a European agency or a specialised international organisation.
- The next step is the envisioning of possible future impacts by exploration of possible future developments.

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- Based upon these potential consequences of techno-scientific developments in the future, we build imagined future scenarios, which are then explored in-depth for opportunities and challenges.
- The last step we call *backcasting* towards preparedness for anticipation. This is important for the MEPs, as it can help them to decide what could or should be done today.

Apart from follow-up at political level, outcomes of the techno-scientific foresight studies could also inspire the public debate about how we can better anticipate the (unknown) future.

To summarise, STOA extends TA by focusing on possible long-term impacts of emerging technologies, building explorative scenarios taking into account envisaged impacts, exploring these imagined scenarios for possible future challenges and opportunities, and finally backcasting these challenges and opportunities to current policy.

3.1. Envisioning diverse types of impact

For a meaningful analysis of possible consequences of future techno-scientific developments, it is important to fulfil certain criteria. The main ones are to work with people from diverse disciplines, to involve relevant stakeholders, and to look into the forward trends from a wide variety of perspectives. Furthermore, unintended impacts as well as intended ones are to be considered, as well as hard (measureable) and soft impacts (not directly caused by the technology).

Multi-disciplinary and multi-stakeholder approach

For envisioning diverse types of impacts, STOA's foresight process uses social scientists (philosophers, sociologists specialised in science and technology etc.) to discuss the outcomes of the technical briefing papers with the technical experts, along with a wide range of relevant stakeholders. Together, they analyse possible impacts – in a facilitated brainstorming environment – in a multi-perspective way.

Multi-perspective approach

A multi-perspective approach is taken by systematically looking through different lenses. Therefore, the 'STEEPED' (Social, Technological, Economic, Environmental, Political (and legal), Ethical, and Demographic) scheme has been developed to ensure that no important societal facet is overlooked.

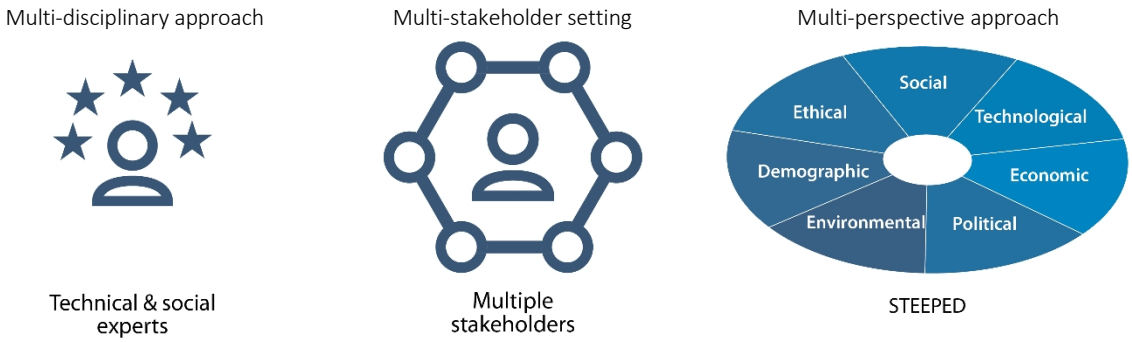
Box 1 - STEEPED (see graph)

We use the STEEPED scheme to ensure our research is credible and coherent.

This scheme is rather a checklist than a methodology. It provides seven different lenses though which one can look into the issue at stake, when looking at the impacts of techno-scientific developments, therefore ensuring that we cover all possible areas of interest or concern.

1. Social aspects cover changes in social and cultural values and lifestyles.
2. Technological aspects include how, and in which directions, technology is developing and the diversification of the use of techno-scientific devices.
3. Economic aspects cover issues related to conjuncture, employment, production systems, different distribution and trade systems, and consumption of goods and services.
4. Environmental aspects embrace interactions with our natural habitat and our biophysical environment, which is our planet. This category also includes the availability of natural resources.
5. Political/legal aspects describe developments or changes in various policy-making and legislative systems or forms of governance. This part covers law that could be considered adequate and appropriate, law that might be considered for updating, as well as reflections about missing legislation.
6. Ethical aspects cover individual preferences about the diverse values embedded in the broader society.
7. Demographic aspects entail various aspects of society, looking at the society as 'inclusive', being a collection of a varied set of social groups based upon parameters such as age, gender, religion, origin, profession, education, income level, etc.

With this method, we can discover a diverse range of opportunities and challenges that arise from techno-scientific developments, for different types of players in society.



Types of impacts relevant for policy

Possible impacts could be envisioned via facilitated brainstorming, for instance through systematically posing 'what if?'[1] questions and with a focus on soft impacts[2] (those impacts that are not easy to measure – for example, affecting health, environment and safety – and for which it is not easy to assign responsibility). These could be very helpful in a professionally driven workshop, facilitating the collective imagination of the plausible soft impacts on human actors, their values and their activities.

In the case of the STOA robotics project, the goals of such impact-envisioning brainstorming sessions have been described in the robotics study[3] as follows: (1) to articulate the vision behind a technological development (promises, values); (2) to explore soft impacts by imaginatively investigating how current stakeholder practices might be affected in unintended ways, including how the prevalent meanings of normative concepts (like human, (dis)ability, healthy, security, risk, etc.) could be destabilised; and (3) to explore impacts which are far removed in space and time.

3.2. Explorative scenario building and assessment

The possible long-range consequences are the basis for building a set of diverse possible scenarios, which are to be considered as imagined futures.

Such scenarios are written in close cooperation with professional scenario developers. Exploratory imagined scenarios can be developed by different methods (for example, deductively and based on a selection of two influential factors, or inductively). Ideally, three or four scenarios could describe diverse worlds covering the identified impacts.

Once the scenarios are clear, they are explored. This could be done with the same multi-disciplinary and multi-stakeholder group as for the envisioning of the impacts, or with a smaller subset of this group. The aim is to explore in this setting the diverse scenarios, which represent possible envisaged future worlds, and to examine how it 'feels' to live in such a world, detecting opportunities and concerns. The same as in the impact envisioning process, the purpose is not to strive towards consensus, but to end up with an open list of views.

This thinking experiment results in lists of opportunities and challenges for the set of examined scenarios. These opportunities and challenges are clustered in coherent sets of related issues, or according to relevant policy areas.

3.3. Backcasting to the present, including legal and ethical reflections

To make sense out of this in the EP context, a 'backcast' is given to the MEPs, listing and describing possible future challenges and possible future opportunities relevant for considering action today, accompanied by legal and ethical reflections. These challenges and opportunities do not indicate what is desirable or undesirable, because, in a political environment, the judgement as to what are desirable or undesirable futures, is for the politicians to make.

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[1] Ravetz, J., 1997. The science of 'what-if?' *Futures*, 29(6), 533–539.

[2] Swierstra, T. & te Molder, H. F. M. 2012 *Risk and soft impacts.* Handbook of risk theory: Epistemology, decision theory, ethics, and social implications of risk. Roeser, S., Hillerbrand, R., Peterson, M. & Sandin, P. (eds.). Dordrecht: Springer, pp. 1050-1066.

[3] STOA study 'Ethical Aspects of Cyber-Physical Systems' (2016), Annex 3, p. 7.

In general, scenario-based foresight can be conducted for diverse purposes in different ways. In the case of the EP, the purpose of science or technology foresight is to help MEPs and parliamentary committees to be prepared well in advance for possible future developments, by making them familiar and comfortable with certain levels of uncertainty. As such, science or technology foresight supports them in anticipating future developments.

Findings in a foresight study could feed into the political as well as the public debate. As an example, in the case of the robotics study, Bill Gates reacted to the Legal Affairs Committee's draft legislative initiative report (rapporteur: Mady Delvaux, S&D, LU), which drew upon the STOA study. His reaction sparked the ensuing reflection by Robert Shiller, 2013 Nobel Prize winner, in his article 'Why robots should be taxed if they take people's jobs'.

4. The case of robotics

Box 2 illustrates the pilot project as a case where a foresight study on robotics, requested by an EP committee, was intensively used by several parliamentary committees and contributed to the EP legislative initiative resolution, through which MEPs called on the European Commission to propose rules on robotics and artificial intelligence.

Box 2: Steps and timeline of a scientific foresight study conducted by STOA on a request by a parliamentary committee

STOA Foresight study 'The ethics of cyber-physical systems', requested by the Committee on Legal Affairs (JURI)

- Starting point – state-of-the-art: Autumn 2015
- Envisioning impacts: January 2016
- Scenario building: February 2016
- Exploration of the imagined scenarios on future challenges and opportunities: February 2016
- Backcasting, legal and ethical reflections, elements for anticipating future challenges and opportunities: March-June 2016
- Regular updates about the study to the JURI Working Group on Robotics and Artificial Intelligence: 2015-2016
- Publication: June 2016
- Animated Infographic: February 2017

Towards EP resolution on civil law rules on robotics

- Draft report (rapporteur: Mady Delvaux, S&D, LU): 31 May 2016
- Between 12 October and 23 November 2016: Opinions of the Committees on Transport and Tourism (TRAN); Civil Liberties, Justice and Home Affairs (LIBE); Employment and Social Affairs (EMPL); Environment, Public Health and Food Safety (ENVI); Industry, Research and Energy (ITRE); Internal Market and Consumer Protection (IMCO)
- Vote in Committee on Legal Affairs (JURI), single reading: 12 January 2017
- Committee report tabled for plenary, single reading: 27 January 2017
- Debate in EP plenary: 15 February 2017
- Text adopted by EP, single reading: 16 February 2017 (T8-0051/2017)

5. Conclusion

Foresight, as applied by STOA, supports EP decisions through:

- Analysis of the consequences and impact of long-range techno-scientific trends, based upon our knowledge of today, in a multi-disciplinary and multi-stakeholder setting and in a multi-perspective approach;
- Imagined scenario development and assessment for future opportunities and challenges;
- Backcasting imagined futures, with their concerns and opportunities, to policy issues for consideration today;
- Reporting possible future challenges and opportunities to MEPs for possible anticipatory action, including some legal and ethical reflections.

Foresight is a fundamental path in policy-making, as policy-making is preparing for the future. The scenario-based foresight approach as used by STOA has the potential to inspire anticipatory policy-making and to support the EP's preparedness for future challenges and opportunities related to long-range trends in the field of science and technology.