EUROPEAN PARLIAMENT

Science and Technology Options Assessment

S T O A

PARLIAMENTARY TECHNOLOGY ASSESSMENT IN EUROPE

Draft

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EUROPEAN PARLIAMENT

DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT E: LEGISLATIVE COORDINATION AND CONCILIATIONS
SCIENCE AND TECHNOLOGY OPTIONS ASSESSMENT

PARLIAMENTARY TECHNOLOGY ASSESSMENT IN EUROPE

Draft

Abstract

The main objective of the study is to provide an overview and analysis of the dynamics in parliamentary technology assessment (PTA) in Europe since 2000. Technology assessment is a scientific, interactive and communicative process, which (products) aims to inform and contribute to the formation of public and political opinion on societal, ethical, legal and economic aspects of science and technology. Parliamentary TA is technology assessment specifically aimed at informing and contributing to opinion formation of members of parliament as main clients of the TA activity.

The overview and analysis is made along the lines of three types of characteristics that cover the most relevant aspects of PTA in Europe: the institutional setting of PTA, PTA practices and effects of PTA. These three interrelated characteristics refer to what PTA organisations are, what they do and what their main effects on parliament are.

AUTHORS
Jasper Deuten
Christien Enzing
Monique Nagle
Jon van Til
Erik Arnold

LINGUISTIC VERSIONS
Original: EN

ABOUT THE EDITOR
To contact STOA or to subscribe to its newsletter please write to:
stoa@europarl.europa.eu

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Summary

The main objective of the study is to provide an overview and analysis of the dynamics in parliamentary technology assessment (PTA) in Europe since 2000. Technology assessment is a scientific, interactive and communicative process, which (products) aims to inform and contribute to the formation of public and political opinion on societal, ethical, legal and economic aspects of science and technology. Parliamentary TA is technology assessment specifically aimed at informing and contributing to opinion formation of members of parliament as main clients of the TA activity.

The overview and analysis is made along the lines of three types of characteristics that cover the most relevant aspects of PTA in Europe: the institutional setting of PTA, PTA practices and effects of PTA. These three interrelated characteristics refer to what PTA organisations are, what they do and what their main effects on parliament are.

The methods that have been used are desk research and interviews with both representatives of national/regional PTA organisations and members of national/regional parliament.

The overview was given using three models of PTA organisations in Europe. This model was based on two dimensions – the PTA organisation is localised inside or outside parliament and with respect to its activities: it informs or it informs plus it organises public debates.

The three models are:

- The Parliamentary Committee model: A dedicated parliamentary committee is in the lead of technology assessments. These committees tend to invite experts to their meetings or organise workshops and conferences in order to gain scientific support for their deliberations and decision-making. Examples include France, Finland, Greece and Italy.

- The Parliamentary Office or Parliamentary unit model: Parliament has its own office or support unit for TA studies on request on parliament. Examples include the United Kingdom, Sweden and Catalonia. Because of parliamentary restrictions, the PTA office may be contracted out to an external (scientific) organisation. An example of this variant is Germany. The European Parliament is a special case, because it has an official parliamentary body (STOA) that contracts its work out to external TA organisations with whom the Parliament has a framework contract.

- The Independent Institute model: The TA organisation operates at a distance from parliament, but parliament is the main audience. Examples include Denmark, the Netherlands, Switzerland and Norway. Flanders is a special case, because the PTA organisation is closely associated with parliament. Typically, these institutes have missions that go beyond informing parliamentarians and also include stimulating societal debate.

Institutionalisation of PTA in Europe

Modes of institutionalisation of PTA in Europe are diverse. Each country – or in some cases region – has its unique setting, varying from an in-house activity of the national or regional parliament to independent organisations at arm's length from parliament. There are historical, political, cultural, and other reasons (see for instance Vig and Paschen, 2000) that explain when, why and how a PTA organisation was set up in a specific country or region and what its mission is. All have in common that they are an answer to the growing need in parliament to have an independent source of information on new developments in science and technology and their effects on the economy and society and to know the opinions of the relevant stakeholders on the issues at stake. This allows them to be better prepared for their task in directing and assessing policies in the field of science and technology.

The PTA organisations are grouped according to three institutionalisation models – parliamentary committee, parliamentary office and independent institute – mainly for analytical purposes. It should be noted that within each group there still are considerable differences between the PTA organisations. It can be expected that in the next period this richness of PTA institutions will even be enlarged when new countries will institutionalise PTA.

- The Parliamentary Committee model: A dedicated parliamentary committee is in the lead of PTA. The governance model is closely linked to the internal organisation on the functioning of the parliament. Examples include parliamentary committees in France, Finland, Greece and Italy.

- The Parliamentary Office model: Parliament has its own office or support unit for TA studies on request of parliament. Usually, these offices are inside parliamentary structures (e.g. UK, Sweden, Catalonia, European Parliament), but sometimes the office is contracted out to an external research organisation (e.g. Germany).

- The Independent Institutes model: The TA institute operates at a distance from parliament, but parliament is its main client. In most cases also other target groups are considered as client. Typically, these institutes have missions that go beyond informing parliament and also include stimulating public debate on S&T issues. Examples include Denmark, the Netherlands, Switzerland, Norway and Flanders.

No trends in terms of new development stages of PTA-institutionalisation in those countries where PTA was already institutionalised before 2000 could be identified. In these countries a process of consolidation can be observed.

Since 2000, PTA organisations were set up in Flanders (2000), Sweden (2007) and Catalonia (2008). Interestingly, two of these newcomers are PTA organisations at the regional level.

PTA practices in Europe: methods and topics

The overview of PTA methods used across Europe in this report shows that the scientific methods (mostly in terms of academics providing expert information on the specific S&T developments and their societal, ethical, legal and economic aspects) are in use in each country, often in combination with participatory methods. Most engaged in participatory methods are the countries with independent PTA institutes. This relates directly to the mission of these organisations as they not only inform parliament, but also stimulate public debates. Typical for the PTA organisations that follow the Parliamentary Committee model is that they apply scientific methods and combine this with a workshop, hearing, or seminar in which experts and stakeholders are invited to inform parliament. This gives the PTA activity an interactive character. The Parliamentary Offices mainly use scientific methods.

Since 2000, two main trends in the use of methods can be observed. The first trend deals with the use of participatory methods: in some countries this has decreased because of budgetary considerations, in other countries new participatory methods have been developed that target more efficiently the specific groups of stakeholder groups. The second trend is the introduction and growth in the use of a set of new types of methods such as forecasting benchmarking, macro indicator analysis, bibliometric studies and roadmapping. This trend can also be related to the broadening of the PTA activities in some countries: from an 'early warning' function (identifying possible negative effects, mostly providing input into new/ changed regulation or legislation) to a more strategic function (identifying also positive effects and thus providing also input in sector-specific S&T and innovation policies). The broadening even goes towards upstream and downstream aspects of STI policy-making (providing input in generic aspects of S&T and innovation policies, addressing for instance public R&DF infrastructure, quality of public R&D, technology transfer).

PTA organisations under the Parliamentary Committee or Parliamentary Offices model mostly involve experts, stakeholders and parliamentarians in their activities. The Independent Institutes tend to address a broader set of stakeholders as also the public (society at large) is involved.

The analysis of topics addressed in the PTA projects shows that almost all PTA-organisations have projects specifically aimed at Global Change and Energy. The same applies for Sustainability, Ecology & Environment, ICT and Human Health. When looking at the content of the projects in these categories, the Energy and Global Warming issue shows strong internal consistency. In the ICT domain, the effects of Internet are often explored in many countries. The Health topic is more diverse, as is the Sustainability, Ecology & Environment domain.

Effects of PTA in Europe

In this study the Hennen and Ladikas' (2009) typology of effects was used to map the main types of effects that the various PTA organisation have. This typology distinguishes between three types of impacts: raising knowledge, forming attitudes/opinions and initialising actions. This impact dimension is combined with an issue dimension that identifies S&T aspects, societal aspects and policy aspects.

A main conclusion from this study is that the main type of effect of PTA on parliament is in the dimension of raising knowledge. This corresponds to the fact that all PTA organisations have the function to inform parliament on S&T issues. PTA organisations with a broader mission that includes stimulation of public debate tend to have effects in the other dimensions as well, but these are often less direct and also less visible. Attribution of the effects of PTA-reports and meetings to parliamentary decision-making is a problem, because parliamentary decision-making processes have many inputs from many various sources and 'success often has many fathers'

Another conclusion is that the institutional settings of PTA-organisations (and the related missions) shape the type of impact these PTA-organisations can have. PTA organisations that are inside or closely linked to parliament have a direct access to members of parliament, which helps to get their message across to individual parliamentarians and parliamentary committees and to raise their knowledge on S&T issues. In turn, this creates conditions for changing attitudes and opinions, which might lead to changes in policy-making or legislation. The interviewees indicated that in practice the effects on decision making depend very much on the available resources for TA activities and the degree of involvement and stature of the responsible parliamentarians.

A close link to parliament also puts constraints on PTA organisations in terms of the questions that can be addressed, the methods that can be used and the effects they can have, especially on the dimension of forming attitudes/opinions and initialising actions. Independent institutes lack such a direct formal access to parliament, but have the advantage that they have more freedom in terms of the questions and target groups they want to address and the methods they can use. This implies that they have also been able to add new issues on parliamentary agenda.

Getting parliamentarian's attention is a challenge for most PTA organisations, not just the independent institutes. To capture the attention of politicians, it is never sufficient to have a formal channel that allows direct access. A good understanding of political decision-making processes and communication are also necessary to have an effect on parliament. One visible trend of the last decade is that most PTA organisations appear to have become more effective in getting the attention of parliament and to play a role in parliamentary decision-making processes as a result of learning processes and further professionalisation.

Overall, the trends that could be identified in this study confirm the conclusions Vig and Paschen (2000) have drawn on the main characteristics of PTA in Europe as compared to USA. In Europe, as compared to the USA, the concept and philosophy of TA is aimed at making TA more 'usable', more 'useful' and more 'democratic'. Summarising, they identified four main characteristics (Vig and Paschen, 2000). First, more attention is paid to the promising potentials and opportunities of S&T developments. In the early phase of 'traditional TA', the focus of most assessments was rather on the anticipatory analysis of the negative and undesirable effects of technologies. Since the 1980s, the 'awareness raising' function of TA became as important as the 'early warning' function. Second, 'problem-driven' or 'user-driven' assessments that respond to existing or emerging social, economic, resource, or environmental problems, have become more prominent, compared to the (classic) supply-side orientated technology-driven assessments. Third, it has become a main task of TA to provide support for strategic decision-making on S&T and for improving the legal and other framework conditions for innovation. TA is used to develop strategies that help to steer S&T towards innovations that respond to societal needs. TA stimulates a societally robust co-evolution of S&T and society. Fourth, participation of affected individuals and groups and the public at large has become more prominent. Non-expert participation aims to improve the cognitive basis, credibility, acceptance and conflict-resolving potential of TA studies. It contributes to the 'democratisation' of S&T policy.

1. Introduction

1.1 Background of the study

Scientific and technological developments play an important role in the progress of European economies: they contribute to increased industrial competitiveness, environmental sustainability, better health care, improved labour conditions, higher welfare, and solutions for many other societal issues.

Based on the idea that technological development requires specific policies, technology assessment (TA) started in the late 1960s as a tool to inform members of parliaments about possible unintended negative effects of new technologies. Since then, TA has strongly developed. The role of TA changed from having a general 'watchdog' function to a tool for policy analysis of emerging technologies; it evolved into an instrument that supported parliament - but also many other actors - in decision-making and strategy development on science, technology and innovation (STI).

Parliamentary TA in Europe has been initiated and developed first in northern and western parts of Europe and later also in Southern Europe. For the other parts of Europe where PTA is now being initiated or is in its first development stages it is very relevant to learn from the lessons of other European countries on how PTA can best be institutionalised given their specific national contexts (institutional, political and cultural). An overview and analysis of what the current situation is in Europe with a specific focus on institutional settings, methods, themes and effects of PTA might lead to insights for countries that want to start-up and expand PTA in their country.

Moreover, after many years of development of TA theory and practice there is a growing need for mutual-learning and strategic intelligence in Europe. This is due to a number of developments:

- Path dependencies:
  - Due to path dependencies such as institutional settings and legislative regimes, a variety of approaches to parliamentary TA (PTA) emerged in Europe during 40 years of TA at the political, societal and academic level. There is a need to map the practices and content of PTA in Europe;
  - Because of the rise of democratisation of society, both a need for reinforced scientific and technological education, as well as a need for civic debates on technology emerged;
  - A systematic approach towards technology requires an integrated approach of TA, research, education and cultural measures, requiring co-evolution of the broad European STI policy agenda and the PTA agenda.

- Institutional changes:

  - The tradition in PTA diversity in Europe is increasing, also because new EU member states have added new PTA practices and new PTA needs to the portfolio;

  - The European integration and the according common European policies ask for an integration of the European PTA communities;

  - A pan-European approach towards PTA would foster alignment between the activities at the EU and national levels;

- Changes in framework conditions:

  - The post-industrial era, i.e. the shift from manufacturing to a high-tech and knowledge-based economy sets new needs for PTA that require new methods;

  - Global problems (such as climate change, energy supply) could be solved with emerging technologies, which implies that international collaboration on EU level is an obvious step;

  - Increased international competition due to the emergence of the BRIC countries (Brazil, Russia, India and China) ask for a pan-European strategy.

These developments in path-dependencies, institutional changes and framework conditions and the emergence of new TA practices in Europe has reached a level at which it is necessary to re-consider reinforcement and development of new perspectives for pan-European co-operation. A major driver is the growing significance of S&T for the economy and society at large. The knowledge-based economy of today puts new and specific demands on the type of intelligence that is needed for informing parliamentary decision-making on science, technology and innovation. This study aims to provide a common basis for the process of formulating pan-European coordinated common activities.

1.2 Objective, research questions and methodology of the study

1.2.1 *Objective*

The main objective of the study as commissioned by STOA is:

> *to trace the evolution of parliamentary TA from the OTA-model to a future pan-European participatory TA and to deliver images of (P)TA future.*

The study consists of two main components. First, it will review the existing parliamentary TA practices within the EU member states. Secondly, it will identify ways of common reciprocal beneficial actions in order to develop a common vision of a future pan-European (P)TA. This report presents the outcomes of the first part of the study.

The main objective of this first part of the study is:

> *to provide an overview and analysis of the dynamics in PTA in Europe since 2000.*

The definitions of TA and PTA that are used in the study are:

- Technology assessment is a scientific, interactive and communicative process which (products) aims to inform and contribute to the formation of public and political opinion on societal, ethical, legal and economic aspects of science and technology.

- Parliamentary TA is technology assessment specifically aimed at informing and contributing to opinion formation of members of parliament; parliament as main client of the TA activity.

Contrary to the definition of Decker and Ladikas (2004), which only includes the social aspects, in this study TA addresses a broad range of questions related to S&T development. This has been summarised using the four interrelated aspects included in the definition: social, ethical, legal and economic.

1.2.2 Questions of the study

The review of PTA in Europe is made along the lines of three types of characteristics that cover the most relevant aspects of PTA in Europe: institutional settings of PTA, PTA practices and effects of PTA. These three interrelated characteristics refer to what PTA organisations are, what they do and what their main effects on parliament are.

For each characteristic central questions and a number of sub-questions have been formulated, to be answered in the study. These main questions and sub-questions are presented below.

The organisational setting of PTA

Main question:

- What are the main modes of organisational settings of PTA in Europe?

Sub-questions:

- What are similarities and differences between the ways PTA is organised in Europe?

- Have there been important changes in the organisational settings of PTA during the last period (see below for the different change aspects) and, if yes, which changes and how can they be explained?

The practices of PTA

Main questions:

- Since the start of PTA in Europe: what was the development / evolution in the methods used in PTA. Have new modes been developed and how can they be characterised?

- In what domains are European PTA activities complementary and can gain benefits from more coordinated efforts on the pan-European level?

Sub-questions:

- What have been the (relative) budgets for scientific studies, interactive projects, other new methods and communication and how has this evolved over time?

- Which types of stakeholders (actors that have an interest in/are affected by the development and application of T) have been involved in the PTA process and how has this evolved over time?

The effects of PTA

Main question:

- What are the main effects of PTA activities in Europe and how has this developed over time?

Sub-questions:

- Can a relationship be identified between the various organisational settings of PTA in Europe and the (types of) effects they generate? If so, how can this relationship be described?
- Can a relationship between the various methods applied in Europe and the (types of) effects generated be identified? If so, how can this relationship be described?
- To which extent and in which way do the various communication methods contribute to the generation of certain (types of) effects?

1.2.3 Methodology

The study was organised in a number of steps, each using a specific set of methods.

- Desk research: definition of study and study domain:

Based on desk research[1] a conceptual framework was developed that described the domain of the study, the research questions to be addressed and the conceptual models to be applied for analysing the data collected.

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[1] Desk research included scientific literature, website of PTA-organisations, documents produced by EPTA (associated) members, and other relevant materials (such as papers for conferences, documents produced by members of parliament, government).

For institutional setting the focus is on the (dynamics in the) governance structure of PTA's, their mandate/missions, funding arrangements and organisational set-up: i.e., who decides on the mission, the strategy and the (multi-annual) working programme, who is responsible for the strategic and operational management, who pays for the PTA projects, and what organisational forms are used. It addresses the role(s) of the PTA organisation vis-à-vis parliament, the government, and/or other audiences and clients.

With respect to PTA practices a distinction was made between the methods used in PTA (scientific and interactive)[2] and the communication activities to support PTA dissemination to clients and others. Also the content of the PTA activities were addressed: the specific technologies (such a nanotechnology, genomics) and/or the specific social or ethical themes (such as healthy aging, sustainability). Also, it included the stakeholders that were involved in PTA activities and the role of experts in PTA activities.

The effects are addressed by using a framework that distinguishes between three different types of outcomes and the specific aspects addressed in these outcomes.

The study domain includes PTA organisations in the following fourteen countries/regions: Belgium/Flanders (IST), Denmark (DBT), European Parliament (STOA), Finland (Committee for the Future), France (OPECST), Germany (TAB), Greece (GPCTA), Italy (VAST), Norway (NBT), Spain/Catalonia (CAPCIT), Sweden (PER, The Parliamentary Evaluation and Research unit), Switzerland (TA-SWISS), The Netherlands (Rathenau Institute) and United Kingdom (POST).

The conceptual framework was presented and discussed with the directors of the PTA-organisations, who gave their endorsement and agreement to cooperate[3].

- Interviews:

Starting from the research questions in the conceptual framework questionnaires were constructed for the interviews with the directors of the PTA-organisations and with the members of parliament. See Annex B for the questionnaires.

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[2] See also: Tran, Th.A. and T. Daim (2008) "A taxonomic review of methods and tools applied in technology assessment", *Technological Forecasting & Social Change,* Vol. 75, pp. 1396–1405.

[3] During the Directors meeting of the EPTA-network on May 10th in Copenhagen.

The study has not investigated which other sources of information – other than those provided by PTA organisations – are used by members of parliament for informing themselves on new scientific and technological developments and its (potential) societal, ethical, legal and economic aspects and formulation /commenting on options and actions in policy-making on STI. This would ask for a rather different approach, focusing on parliamentary decision making processes and the role of different sources of information, agenda setting and policy formation.

The interviews were conducted in the period mid May – mid August 2010 (see Annex A for the list of interviewees).

The preliminary results of the interviews were presented and discussed with STOA and the other EPTA-members in a workshop on 29 June 2010 in Brussels.

- Report:

A draft version of this report (issued on 30 September 2010) was checked by the directors of the PTA organisations for the information on their organisation. Based on their comments and corrections (received in the period May-July 2011) the report was finalised.

1.3 Content of the report

In Chapter 2 a short historical overview of evolution of PTA in Europe since the 1970s until 2000 is presented. Chapter 3 provides an overview of the current institutionalisation of PTA in Europe and the main changes since 2000. In Chapter 4 the methods applied in PTA activities are presented and the main trends that can be observed methods used by PTA's since 2000. In addition the chapter provides an overview of the main themes PTA-organisations have worked on for the last five years; also it describes where work of national and regional PTA-organisations shows convergence. Chapter 5 analyses the effects of PTA activities for parliament.

Disclaimer:

Technopolis Group has drafted this report. It is based on information and views provided by EPTA member organisations. However, the report does not necessarily reflect the opinions of EPTA member organisations.

2. History of PTA in Europe

In this chapter, a short introduction of the historical background of the emergence and institutionalisation of PTA in Europe is provided.

The historical roots of PTA in Europe lie in the United States were US Congress established the Office of Technology Assessment (OTA) in 1972. The US OTA model was transferred to Europe in the 1970s and 1980s.[4] National and supra-national governments in Europe began to show interest in PTA in the early 1970s, inspired by experiences in the US and Japan. The development of TA in Europe was, however, initially slow. There were institutional and constitutional barriers. For instance, European parliaments were in a relatively weak position to take the initiative to start PTA, compared with the US Congress' position vis-à-vis the Executive Branch. In Europe, it was not customary to provide staff and resources for initiatives like OTA. Parliamentary committees did not have sufficient political independence and constitutional authority to influence most policies and in some case constitutions did not allow to create new institutions attached to parliament or put limitations on parliamentary organisation. Unlike in the US, the separation of powers between government (the Executive Branch) and parliament (the Legislative Branch) is less clear in European parliamentary systems. The division is not so much between legislative and government as it is between majority party/parties and government on the one hand, and minority party/parties on the other hand. Governments (and corresponding majority/coalition parties tend to be hesitant to increase informational and other resources available for parliament, because they benefit the opposition as well. Vig and Paschen (2000: 13) conclude "if PTA was to develop in Europe, new kinds of institutional arrangements had to be worked out that, on the one hand, circumvented the normal rules of parliamentary politics, and, on the other, fit the particular opportunities available in each constitutional environment."

Besides institutional barriers, the concept of TA itself was not clear and because of different political cultures in Europe there was no common notion of the proper role of the state in shaping technological developments.

Interest in TA, however, increased in the 1970s and 1980s as a result of growing public concerns on new technologies (such as nuclear energy, recombinant-DNA, ICT) and the growing demand of non-governmental organisations for accountability and their participation in S&T policy-making. In addition, S&T became increasingly seen as drivers of the economy. Technology became a strategic factor for stimulating economic growth, improving Europe's competitiveness and solving societal problems.

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[4] See Vig and Paschen (2000), Smits and Leyten (1991) and Smits et al. (forthcoming) for an elaborate account of the history of PTA in Europe.

The function of PTA changed from 'early warning', to PTA as an instrument to help guide technological developments towards better ('societal robust') outcomes. Public acceptance and societal embedding of new technologies became of strategic importance of ensuring higher economic growth. Consequently, PTA was not only perceived as an instrument of parliament to scrutinise government's S&T policies, but also as an instrument to improve S&T and innovation policies. This notion of PTA fitted better in European political contexts. Indicative of this change of perception was that in some countries (e.g. The Netherlands), it was government that took the initiative to set up a (P)TA organisation.

In 1982, the Ministry of Interior of the Federal Republic of Germany hosted an influential conference on TA, which already foreshadowed the pattern of institutionalisation of PTA in Europe. One of the conclusions of the conference was that:

> *"It is considered neither feasible – as TA praxis shows – nor even desirable to prescribe a strict and uniform definition of the concept, the organizational form, the procedural steps, and foci of TA analyses. Rather, a variety of approaches and emphases is favoured in order to do justice to the different political cultures of the various countries and to the real diversity of problems to be studies."* (cited in Vig and Paschen, 2000: 15).

In the 1980s, European national parliaments discussed the concrete goals, functions, costs, and organisational structures of proposed PTA units. Political motivations for adopting PTA varied from getting more control over (nuclear) energy policy from the 'technocracy' of bureaucrats and experts (France); broadening the public debate on S&T policy to address public concerns over the societal impacts of new technologies (the Netherlands); to improving the understanding of S&T issues among members of Parliament (UK).

In some countries (France, UK, Germany) the debate of TA occurred mainly within parliaments themselves. This led to the establishment of PTA organisations that were designed to strengthen the informational (and political) resources of the members of parliament. In other countries (Denmark, the Netherlands) groups outside parliament (e.g. scientists, commissions, unions, NGOs, ministries) took the initiative as a result of concerns about societal impacts of new technologies. This led to orientations on broadening the societal debate of impacts of S&T and democratisation of S&T policy making, rather than on informing or 'enlightening' parliamentarians.

Because of these various origins and contexts, there emerged not one 'European' PTA model (Vig and Paschen, 2000). Rather, two main approaches emerged:

• Countries that were inspired by OTA's evolving TA concept as a method of expert policy analysis with a focus on providing unbiased 'scientific' information and advice to policymakers (e.g. UK, France and Germany);

- Countries that saw TA as a more general and 'open' process for involving the public in policy dialogues and building societal consensus on S&T issues (e.g. Denmark and the Netherlands).

Since the 1980s, PTA organisations were set up in various European countries. They were adapted to the specific national political cultures and parliamentary systems, which provide varying opportunities and constraints for parliamentary TA. Although the European PTA organisations did not get the strong constitutional position that OTA had in Congress, the European PTA organisations found different viable institutional niches in which they could operate. The institutional settings of PTA (see next chapter) shaped the type of work PTA organisations could/should undertake and the way in which this work could/should be done. In addition, different social values and concepts of TA were embodied in the design of PTA agencies, resulting in different functions.

2.1 Broadening of TA concept and method

During the 1970s, 1980s and 1990s, the concept and methods of TA broadened; a number of stages in the development of TA in Europe can be identified. The first stage was in the 1970s when TA emerged as a watchdog, based on the idea of anticipating on negative effects of technology (Smits and Leyten, 1991). The main function of these forms of what is now called 'traditional TA' or 'classical TA' has been promoting awareness of future technological developments and its potential (negative) societal impacts, and the development of policy options to anticipate them. TA was supposed to provide neutral and objective information as input into the political decision-making process. As experience with TA grew, it increasingly became clear that predicting the course of development of a technology and of its societal effects is problematic.

A second important stage in the development of PTA was taken in the 1980s: the notion of TA was broadened and its function evolved. Recognising the strategic role of technology and innovation as engines of growth in modern economies, TA became increasingly perceived as a means to better embed and integrate S&T in society. TA became a tool to help the various actors involved in technological development and innovation processes, both on the supply and demand side. In this period, the first PTA organisations were established in Europe (Van den Ende et al., 1998).

In the early 1990s, the toolkit of TA was further extended and links with S&T and innovation policy were strengthened (Smits et al., forthcoming). TA became recognised as a source of Strategic Intelligence for actors involved in innovation processes, both on the supply and demand sides. To make TA more relevant for innovation policy, new TA approaches emerged, including interactive TA and participatory TA. The development of TA occurred in a context in which innovation policy evolved from a linear model innovation to a systemic model of innovation. As a consequence, all actors involved in the development, diffusion and use of innovation became relevant for innovation policy-makers to take into account.

2.2 TA as strategic tool

Over the last few decades, TA has become more a strategic tool aimed at strengthening the position of specific actors (e.g. parliaments, governments, industry, users) in a complex multi-actor process of socio-technical decision-making. Strategic TA should provide relevant information (strategic intelligence) to help actors in developing their strategies. Discussions and debates with relevant actors, based on analyses of technological developments and their consequences, became an integral part of TA studies (Smits and Leyten, 1991). Concurrently with strategic TA, participative TA was developed which aimed at broadening the decision process (both in terms of content and of actors that are involved) about technological development, to shape the course of technological development in socially desirable directions. Alignment between technological and societal developments is the ultimate objective.

2.3 PTA organisations

The introduction of PTA in Europe not only manifested itself in national PTA organisations, but also at PTA organisations at the regional and European levels. In several European regions with a relatively large degree of autonomy in matters related science, technology and innovation policy, PTA organisations were established to support regional parliaments. Two examples that are included in this study are Flanders and Catalonia. At the European level, the European Parliament established its own Scientific Technology Options Assessment (STOA) unit in 1987 to provide expert, independent scientific assessments of technology options. Furthermore, the European Commission funded the European TA Network (ETAN) under the fourth EU R&D Framework Programme (1994-1998), to promote communication and debate at the European level between policy researchers and policy-makers on important S&T policy issues.

The PTA organisations in Europe established their own European Parliamentary TA (EPTA) network in 1990. The founding members were the PTA organisations in Europe from the UK, France, Germany, Denmark, the Netherlands, and the European Parliament. EPTA was set up to strengthen the links between TA organisations in Europe by promoting co-operation and exchange of ideas on TA across national borders. In addition, EPTA aims to advance the establishment of TA as an integral part of policy consulting in parliamentary decision-making processes in Europe.

Currently, there are 14 members and four associate members (Austria, Belgium, Council of Europe and Poland) (see Figure 1).

There is an increasing interest to participate in EPTA. MPs and institutes in the new member states want to be involved. However, full membership is restricted to PTA organisations that pursue TA activities and operate in Europe, are devoted to TA or related activities, serve parliament, have their own budget and secretariat and have competence regarding issues with an S&T component. One way of working together is through 'common EPTA projects'.[5]

Figure 1 EPTA members

The members of EPTA (14 members, 4 associate members) include:
- Austria: Institute of Technology Assessment
- Belgium: OSTC - Belgian Federal Office for Scientific, Technological and Cultural Affaires
- Catalonia (Spain): Catalan Foundation for Research and Innovation
- Council of Europe
- Denmark: Teknologirådet - The Danish Board of Technology
- European parliament: Bureau Scientific Technology Options Assessment
- Finland: Committee for the Future
- Flanders (Belgium): Institute Society and Technology
- France: Office Parlementaire d´Evaluation des Choix Scientifiques et Technologiques
- Germany: Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag
- Greece: Greek Permanent Committee of Technology Assessment
- Italy: Comitato per la Valutazione delle Scelte Scientifiche e Tecnologiche
- Netherlands: Rathenau Institute
- Norway: The Norwegian Board of Technology (Teknologirådet)
- Poland: The Bureau of Research
- Sweden: The Parliamentary Evaluation and Research Unit
- Switzerland: Centre for Technology Assessment at the Swiss Academies of Sciences
- UK: Parliamentary Office of Science and Technology

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[5] "EPTA projects are based upon the 'Joint EPTA Project Framework', which makes use of a bottom-up principle, according to which three or more members can initiate a project if it is open for active participation from other EPTA members. The project is decided on a Directors' meeting or Council Meeting after being contested by the boards of the members. The outcome of an EPTA project is the sole responsibility of the participating members." (http://www.tekno.dk/EPTA/about.php).

3. Institutional settings of PTA in Europe

This chapter provides an overview of the institutional settings of PTA in Europe, with a focus on the EPTA full members.[6] Section 3.1 introduces the three models for institutionalisation of PTA in Europe. Sections 3.2, 3.3 and 3.4 describe for each of the three models the institutionalisation of PTA in the various countries/regions (in 2010). Where relevant it is discussed how the political/parliamentary traditions, cultures and constitutional frameworks have influenced the specific institutionalisation of PTA in the country/region. Section 3.5 presents the most important changes in institutionalisation since 2000. Section 3.6 concludes with a discussion of the different institutional settings of PTA in Europe.

3.1 Models of PTA organisations

In the literature on TA and Parliaments, many classifications can be found in which similarities and differences between the heterogeneous mix of PTA organisations in Europe are captured. Most studies that have addressed the organisational set-up of PTA in Europe use a combination of dimensions, such as types of clients and sponsors, the actors that perform the PTA activity (external experts/consultants or by the staff of the PTA organisation itself) and by the extent of involvement of different types of actors in the PTA process. Cruz and Sanz (2005), for instance, construct their types considering the degree of inclusiveness of different types of actors in PTA organisations in the process of producing TA: parliamentarians, S&T and policy experts and the public. Consequently, they identify three types of PTA organisations, in which they observe the increasing involvement of more actors: a **political PTA model** with involvement of parliamentarians, a **technocratic PTA model** with additional involvement of experts, and a **societal PTA model** with involvement of social actors, mainly the public.

Another classification is used by Decker and Ladikas (2004) who identify three models of institutional settings, all of them imposing different influence on the methodology and impact of the institutions. The **parliament office** serves parliamentarians directly, and is set up as an internal office of parliament. The **scientific institute** is characterised with a more or less formalised link to academia, whether this is in the form of connection to a university, to the research councils or to an academy of science. The **public institution** may be set up in connection to the parliament or the government, or other constructions. It has a high degree of self-governing competencies, obligations towards the societal discourse as such.

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[6] Catalonia; Denmark; European Parliament; Finland; Flanders; France; Germany; Greece; Italy; the Netherlands; Norway; Sweden; Switzerland and the United Kingdom.

A third classification is used by the Austrian Institute of Technology Assessment (ITA) in which three different TA institutionalisation models are identified that differ in terms of: (i) clients and financial backers; (ii) study implementation (by the institute itself or by external bodies); and (iii) the extent of public involvement. The three models are: the **classic TA model** which is typified by the US OTA and is notable for close links to the legislative branch, expert orientation, high in-house expertise, and indirect involvement of the relevant interest groups; the **TA secretariat model**, which is typified by the Dutch Rathenau Institute and is financed by the executive branch, answerable to parliament, and institutionalised within the framework of the Academy of Science, with the task to organise and co-ordinate large-scale TA studies, usually carried out by or together with external experts; and the **participatory TA model**, which is typified by the Danish Board of Technology and is also closely linked to parliament, but is mainly focused on mediating general social discussion of technological development. The participatory TA model is characterised by its low level of in-house research and the high priority given to public participation.[7].

For the analysis of the institutional settings of PTA in Europe, the study focuses on the relation of the TA performing body (the PTA function) with parliament. One main classification dimension is whether the PTA function is organised within or outside parliament. This dimension is directly related to a second dimension: the mission of the PTA organisation. Distinction is made between PTA organisations that have as their main mission to inform or 'enlighten' parliamentarians in matters related to S&T and PTA organisations that have a broader mission that also includes stimulating societal debate on S&T and its impacts. Within the first group of PTA organisations (those within parliament), a further distinction can be made between the PTA function that is set up as a parliamentary committee and the PTA function that is set up as a parliamentary office or support unit.

Based on these two dimensions – inside/outside parliament and inform/inform plus stimulate societal debate – three main models of PTA organisations in Europe have been defined:

- The **Parliamentary Committee** model: A dedicated parliamentary committee is in the lead of technology assessments. These committees tend to invite experts to their meetings or organise workshops and conferences in order to gain scientific support for their deliberations and decision-making. Examples include France, Finland, Greece and Italy.

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[7] http://www.oeaw.ac.at/ita/ebene3/e2-1a.htm#institut

- The **Parliamentary Office** or **Parliamentary unit** model: Parliament has its own office or support unit for TA studies on request on parliament. Examples include the United Kingdom, Sweden and Catalonia. Because of parliamentary restrictions, the PTA office may be contracted out to an external (scientific) organisation. An example of this variant is Germany. The European Parliament is a special case, because it has an official parliamentary body (STOA) that contracts its work out to external TA organisations with whom the Parliament has a framework contract.

- The **Independent Institute** model: The TA organisation operates at a distance from parliament, but parliament is the main audience. Examples include Denmark, the Netherlands, Switzerland and Norway. Flanders is a special case, because the PTA organisation is closely associated with parliament. Typically, these institutes have missions that go beyond informing parliamentarians and also include stimulating societal debate.

In Figure 2 - which axes represent the two dimensions - the various PTA organisations are positioned. There are:

- four Parliamentary Committees: in France, Greece, Italy and Finland,

- five Parliamentary Offices/Units: in Sweden, UK, European Parliament, Catalonia and Germany,

- five Independent Institutes: in Denmark, The Netherlands, Switzerland, Flanders and Norway.

It is clear that the two dimensions are interrelated. PTA organisations inside parliament have as their main mission to inform the parliament, while PTA organisations outside parliament have a broader mission such as stimulating)public) debate. Germany is a special case, because it operates like a parliamentary office, but is placed outside parliament. Below, the German PTA organisation – and the others as well – are explained in more detail. It should be noted that classifications are always reductions of complexity and boundaries are not always clear-cut. Within the models, there is variety, as will be shown in the next sections.

Figure 2 Classification of PTA organisations
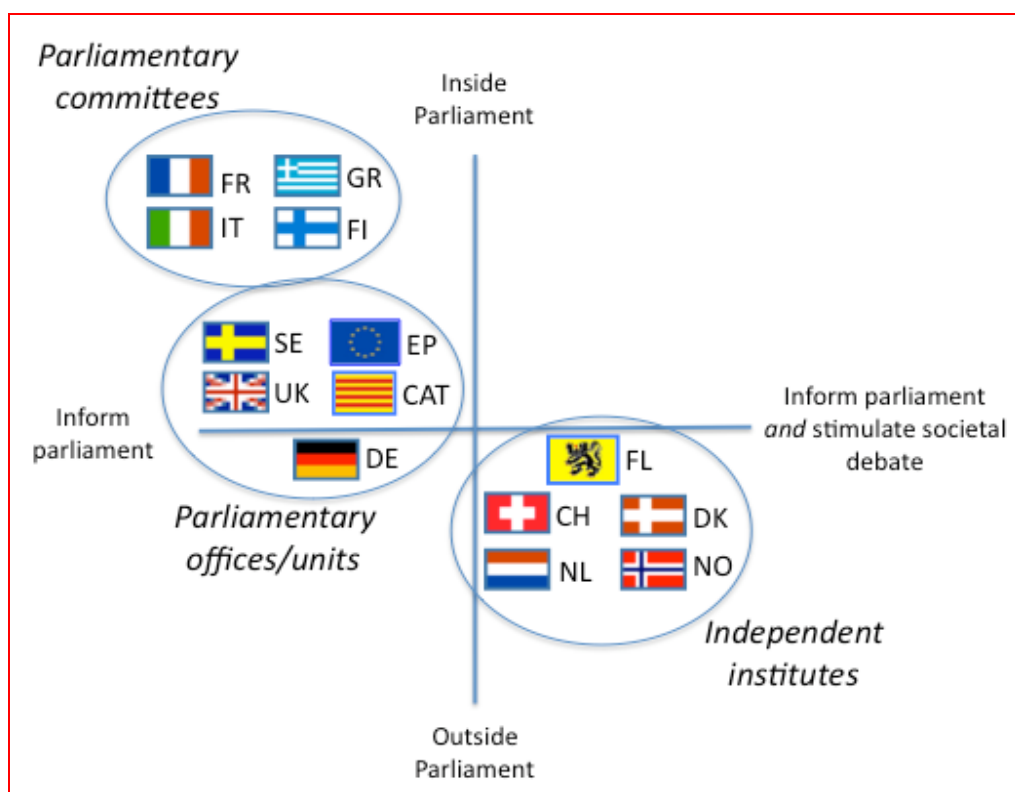
Source: Technopolis Group

Legend: CAT=Catalonia, CH=Switzerland, DE=Germany, DK=Denmark, EP=European Parliament, FI=Finland, FL=Flanders, FR=France, GR=Greece, IT=Italy, NL=The Netherlands, NO=Norway, SE=Sweden, UK=United Kingdom. Source: Technopolis Group.

In the following three sections the PTA organisations that subsume under the three models are described in terms of their missions, modes of operation, main audiences/clients, governance structures, staff and annual budgets. A summarising overview is given in Appendix D.

3.2 The Parliamentary Committee model

This section describes the PTA organisations that fit in the category of the Parliamentary Committee model: OPECST (France), the Committee for the Future (Finland), VAST (Italy) and the Greek Permanent Committee of TA (Greece).

3.2.1 *France*

The French (bicameral) parliament established the Parliamentary Office of Evaluation of Scientific and Technological Choices (1983) – abbreviated as OPECST in French – as a joint non-legislative committee of both Houses of Parliament. This unusual form was used because the constitution limits the number of committees that can be set up in the National Assembly and the Senate. OPECST is established by law and possesses its own internal rules of working. It draws its members from both Houses of Parliament. The Office has 36 parliamentarians (legislators) – 18 Deputés and 18 Senators. OPECST also has a Scientific Council to support its TA work. It is composed of 24 leading scientists from the French S&T community, selected and appointed by OPECST for a period of three years. The Office and the Council regularly work together, e.g. during public hearings, to validate OPECST briefs, or when members of the Council participate in piloting committees set up by the Office's rapporteurs (see below).

OPECST's mission is to inform parliament on the consequences of S&T options in order, in particular, to enable parliament to make 'enlightened' decisions. It helps to strengthen the information position of parliament vis-à-vis government, which traditionally has a strong position in the French political system. The mission goes beyond the 'early warning' function and is also oriented at ensuring responsible technological development and innovation. OPECST acts as an intermediary between the political world and the world of S&T by interacting with researchers (e.g. via hearings) and requesting authorised opinions from scientists and technologists. The institutional set-up fits with the French policy-making system, which is characterised by a tradition of centralised state planning and co-ordination in S&T.

OPECST conducts TA projects on topics that can be proposed by other parliamentary committees, political party groups, or any group of 60 representatives or 40 senators. OPECST's work programme is flexible and responsive to parliamentary proposals. After a matter is referred to OPECST one or more 'rapporteurs' are nominated, exclusively selected from the members of OPECST, who are responsible for writing a report on the given subject. The rapporteur starts with a feasibility study, which – if the results are positive – is followed by a study programme that leads to a report. Rapporteurs may carry out direct investigations on any organisation that is dependent on the State and have access to all relevant documents. If necessary, rapporteurs may even request to be given the prerogatives granted to parliamentary committees of inquiry. The rapporteurs can organise hearings (some open to the public and the press) and missions in France or abroad. They are assisted by parliamentary civil servants and, if need be, by a working group or steering committee made up of competent people from outside of parliament and/or free-lance experts and consultants for further investigation into specific items.

OPECST work is paid from parliamentary budget. It does not have a fixed annual budget.

3.2.2 *Finland*

In Finland, the (unicameral) parliament established a Standing Committee for the Future (1993), which deals with matters related to development factors and models, futures research and TA. It has a rather broad mission: to improve policy-making on the future. Specifically, its main task is to conduct an active and initiative-generating dialogue with the government on major future problems and means of solving them. One of its tasks is to assess the societal impact of technological developments. The Committee may contract out TA studies to research institutes to support its work.

The Committee for the Future is regulated by the parliamentary regulations that state that committees are appointed for the entire electoral period (four years) and that their composition reflects the relative strengths of the parliamentary groups. After each election, when the committees are formed, the members draw up a (flexible) work programme. This is fed by parliament's questions and information needs. The subjects of TA are chosen after hearing of other committees. The Committee for the Future has the initiative and the lead in TA work. TA activities (e.g. hearings, scientific studies) are being funded mostly by the budget of the parliament but they can also be partly or completely funded by independent research centres. The TA work is done under the surveillance of a steering group appointed for each project by the Committee for the Future. The steering group includes members from all interested committees. When completed the TA is discussed by parliament in a plenary session.

The Committee of the Future is supported by a staff of four civil servants (3 FTE) including two TA experts and two assistants. The annual budget amounts to 90,000 euro for commissioning studies and producing reports and does not include salaries and overhead costs.

3.2.3 *Italy*

In 1997, the Chamber of Deputies of the (bicameral) Italian parliament established the Committee for the Assessment of the Scientific and Technological Choices – abbreviated as VAST in Italian. It was set up as a (temporary) committee of the Bureau of the Chamber of Deputies rather than a new Standing Committee because of parliamentary regulations. VAST's overall mission is to improve S&T policy-making by co-ordinating all parliamentary activities (in the various Standing Committees) related to S&T. This is in line with its position as a committee of the Bureau of the Chamber of Deputies, which is responsible for the proper functioning of the Chamber. VAST also acts as an intermediary between the Italian university research and Italian industry. It mainly organises seminars, hearings and other forums to facilitate interaction and exchange of views between key persons from the worlds of Parliament, Government, Science and Industry.

The parliamentarians in the VAST Committee decide on the work plan. The Bureau of the Chamber of Deputies is responsible for the allocation of the budget for TA. There is no designated budget; it is based on requirements of the activities (mostly seminars). VAST has no permanent staff and there is no dedicated administrative structure for VAST. The small ad-hoc support staff (two part-time FTE) is brought in from the secretariat of the Standing Committee for Economic Affairs, Trade and Tourism.

3.2.4 Greece

The (unicameral) Hellenic Parliament established the Greek Permanent Committee of Technology Assessment (GPCTA) in 1997. Its mission is to support and improve parliamentary decision-making on matters related to S&T by providing background studies, organising discussions and giving strategic advice. As a 'special permanent committee' it is re-instituted at the start of each new parliamentary session. The members of the Committee of TA decide at the beginning of the new session on the work programme. They may adjust the work programme on an annual basis, depending on ideas and views from within Parliament or, via informal contracts, from external groups.

The Committee does not have its own (fixed) budget; all expenditures are paid by parliament as required. The secretariat has two staff members. The Committee is supported by the Directorate of Studies of the Greek parliament.

Lately, the Committee has not been very active, because TA was not given a high priority in parliament.

3.3 The Parliamentary Office model

This section describes the PTA organisations that fit in the category of the Parliamentary Office model: STOA (European Parliament), POST (UK), TAB (Germany), PER (Sweden) and CAPCIT (Catalonia).

3.3.1 The European Parliament

The Scientific and Technological Options Assessment (STOA) unit in the European Parliament's (EP) Directorate-General for Research was established in 1987. The so-called STOA Panel oversees the work of STOA at the political level. This panel has members from six of the permanent committees of the EP. It adopts an annual work plan of projects that are proposed by the committees. STOA has its own line in the annual budget of the EP to execute TA projects with the assistance of external contractors.

STOA aims to serve as a source of reliable and independent information and advice for the committees and members of the EP. The legislative work of the EP is done in the permanent committees (not in STOA). On the basis of a committee report, the EP comes to an official opinion on a legislative proposal from the European Commission in the form of a Resolution of the plenary session of the EP. STOA reports serve as a background or technical document for the relevant committee to make its own political report.

The official mandate of STOA in the new rules of 2009 states that the objectives of STOA are to contribute to the debate and the legislative consideration of scientific and technological issues of particular political relevance. To that end, STOA shall:

- Provide Parliament's committees and other parliamentary bodies concerned with independent, high-quality and scientifically impartial studies and information for the assessment of the impact of possibly introducing or promoting new technologies and shall identify, from the technological point of view, the options for the best courses of action to take;

- Organise forums in which politicians and representatives of scientific communities or organisations and of society as a whole shall discuss and compare scientific and technological developments of political relevance to civil society;

- Support and coordinate initiatives to strengthen parliamentary technology assessment activities in the Member States of the European Union, including creating or enhancing parliamentary technology assessment capacities in European countries, especially new Member States.

STOA's mandate is broader than providing information to parliament and also includes organising forums. In comparison with the Independent Institutes, however, the debates or more directly aimed at enlightening parliamentarians than stimulating societal debate as such.

The STOA working arrangement consists of a relatively small in-house team whose core management and research activities are in the conceptualisation, planning, coordination and monitoring of projects and a wider circle of external contractors who perform TA activities. The STOA team consists of a director, a head of unit and a permanent staff of eight persons (three administrators, two assistants and three secretaries). The annual budget amounts to 650,000 euro (2011).

3.3.2 *The United Kingdom*

In the UK, POST started in 1989 as a demonstration project and evolved into a permanent bicameral parliamentary office that works both for the House of Lords and House of Commons. POST functions as an in-house source of independent, balanced and accessible information and analysis of public policy issues relating to S&T. POST works exclusively for the two Houses of Parliament. The mission is to inform parliamentary debate. More specifically, POST aims to help MPs to examine S&T issues effectively by providing information resources, in-depth analysis and impartial advice. Informing parliamentary debate is done by:

- Publishing POSTnotes (short briefing notes) and longer reports;

- Supporting Select Committees with informal advice, oral briefings, data analyses, background papers or follow-up research;

- Informing both Houses on public dialogue activities in S&T;

- Organising discussions to stimulate debate on a wide range of topical issues;

- Horizon-scanning to anticipate S&T issues that are likely to impact on public policy.

POST's strategy is in essence determined by parliament, via continuous interaction with POST staff who have very wide-ranging links to the S&T community in the UK and globally. The POST Board sets the broad policy (e.g. the balance in the work programme between short and long TA projects, dissemination policy) and discusses the relative attractiveness of various proposals for studies. The POST Board oversees POST's objectives, outputs and future work programme. It guides POST's choice of subjects and the Board members also see all reports in draft. Indeed, all reports and POSTnotes are externally peer reviewed, and scrutinised by the Board before publication.

The Board meets several times a year. The Board comprises parliamentarians as well as non-parliamentarians:

- 14 parliamentarians drawn from the House of Commons (10) and the House of Lords (4), roughly reflecting the balance of parties in Parliament;

- Leading non-parliamentarians from the S&T community;

- Ex-officio board members (representatives of the House of Lords and the Department of Information Services of the House of Commons).

The combination of parliamentarians and non-parliamentarians in the Board is quite unique in the UK.

POST has nine permanent employees (the Director, six science advisors and tow PAs). At any one time there are usually 5-6 doctoral or post-doctoral fellows also working at POST (20-25 a year), through a highly-developed fellowships scheme sponsored by UK research councils, learned societies and charitable foundations. The POST advisers conduct analyses, drawing on a wide range of external expertise. POST has a very small consultancy budget and virtually all the TA work is done in-house. The overall budget is about 1.2 million GBP (ca. 1.5 million euro). This figure includes an estimate of the value of services (accommodation, computers, training, etc. provided centrally by the Houses of Parliament and the value of the fellowships. The director of POST decides on the budget allocation.

3.3.3 *Germany*

The Office of Technology Assessment at the German Parliament – *Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag* (TAB) – was established in 1989 as a scientific institution with the objective to advise the German Parliament and its committees on S&T matters. Since its foundation, TAB has been operated by the Institute for Technology Assessment and Systems Analysis (ITAS) of the Karlsruhe Institute for Technology (KIT)[8], based on a contract with the German Bundestag. TAB is an operational unit of ITAS. Periodically, the contract has to be renewed. TAB was created as a non-parliamentary bureau supplied by an outside contractor in order to comply with strict procedural rules of the Bundestag (which forbade to set up a new parliamentary committee). Since September 2003, the northern campus of the KIT has been cooperating with the Fraunhofer Institute for Systems and Innovation Research (ISI) in certain areas. In their co-operation with TAB, ISI offers complementary expertise in long-term technology forecasting (future reports), the analysis of international policies (policy benchmarking) and innovation developments (innovation reports).

TAB's mission is to supply the German parliament with information, providing a scientific basis for the decision-making process. TAB advises the *Bundestag* by analysing the potentials of new S&T developments and exploring the associated opportunities for the German economy; examining the societal and regulatory framework conditions of S&T development; analysing their potential impacts in a comprehensive forecast; and developing alternative options for action for parliamentary decision-makers.

The prime audience of TAB includes all members of parliament, parliamentary bodies, staff of the parliamentary political parties, and the Scientific Service of German Parliament. Secondary audiences include the federal and state ministries, companies, government agencies, research and educational institutions and interested members of the public.

TAB reports to the parliamentary Committee on Education, Research and Technology Assessment, which acts as its steering body and is responsible for deciding on TAB's work programme. Proposals to start a TA project can be submitted by all parliamentary committees or political groups in parliament to the Committee on Education, Research and Technology Assessment. The Committee decides by resolution which projects are to be conducted. Rapporteurs from one or more committees form a 'rapporteur group' with members from all political parties represented in parliament.

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[8] KIT was founded by a merger of Forschungszentrum Karlsruhe (a large-scale research institution of the Helmholtz Association) and Universität Karlsruhe. ITAS was part of the Forschungszentrum Karlsruhe,

This group prepares all the decisions to be taken by the Committee, from the decision to initiate a TA project by TAB to the approval of the final TAB-report. The Committee secretariat organises communication between TAB, the Committee and its TA rapporteur group.

Some of the scientific work is subcontracted to outside experts. Draft reports are peer-reviewed by advisory panels. TAB staff and director write the final reports. The director of TAB is responsible for the scientific findings of TAB. The reports have to be formally accepted by the Committee on Education, Research and Technology Assessment before they are published (as *Bundestag* printed papers). The reports are then discussed by other parliamentary committees and may become the subject of a proposed resolution and full plenary session debate. TAB reports must get a formal response from parliament.

TAB is fully funded by the parliament and there is a budget plan for each year. The annual budget is ca. 2 million euro. TAB employs 10 people, mostly TA experts.

3.3.4 *Sweden*

The (unicameral) Swedish Parliament decided in 2007 to strengthen the Parliamentary Evaluation and Research unit (PER) of the Research Service of the Swedish Parliament and ordered the unit to addresses TA related questions and requests from parliamentary committees. The mission of PER is to provide Parliament with high-quality background material so it can make evidence-based decisions.

The guidelines of parliament describe that the parliamentary committees can submit proposals and requests for TA to PER. In most cases an all-party steering group is assigned to provide guidelines for the reports and to ensure that they are carried out in accordance within the Committee's terms of reference. A group of experts is also assigned in order to scrutinise the content of the reports.

The committees themselves can also decide that a study be carried out by hiring experts or organise it in other ways. This is also taken from the TA budget of the Riksdag Administration. The Research and Evaluation Unit is responsive to questions from parliamentary committees, but also has some leeway in proposing focus points and methods. The unit is relatively new and has a small staff of two TA experts and one person for organising workshops, seminars etc. External experts may be hired for scientific support. The unit also has 2 temporary staff, (1 via a fellowship-scheme and 1 internship). The annual budget for TA activities amounts to ca. 400,000 euro.

3.3.5 *Catalonia*

In Catalonia, the Parliament's Advisory Board on Science and Technology (abbreviated as CAPCIT in Catalonian) was established in 2008 with the mission to co-ordinate all information and advice on S&T and its societal impacts that is needed by parliament. Nevertheless, the Parliament is not restricted to rely on CAPCIT as a sole source of information. Parliamentary bodies can obtain information on S&T also in other ways.

The objectives of CAPCIT are:

- To improve knowledge of parliament on S&T and their societal impacts and disseminating it among Catalan society;

- To channel participation from the main S&T institutions with regard to informing parliament on S&T issues;

- To co-operate and co-ordinate with institutions, bodies, professional associations, universities and other organisations and institutes that operate in the S&T fields;

- To promote shared responsibility with regard to public S&T policies;

- To provide information to Parliamentary committees and other Parliamentary bodies on request.

CAPCIT is attached to parliament, but unlike other parliamentary bodies, CAPCIT is a mixed body: its 18 members include parliamentarians and representatives of the Catalan S&T community. Members include 9 parliamentarians (six appointed parliamentarians, two members of the Board of parliament, and the president of parliament) and 9 representatives from the main S&T institutions of Catalonia. CAPCIT has no employees. A legal advisor of the Parliament acts as CAPCIT's secretary and is responsible for the operational functioning of CAPCIT. Other civil servants of the Parliament support the functioning and activities of CAPCIT when necessary.

CAPCIT can be considered a forum through which scientific institutions submit reports to members of parliament as the TA work is performed by S&T institutions. CAPCIT plays an important role in the communication of the work to third parties. The S&T institutions involved in conducting TA work are the main S&T entities of Catalonia: the Institute of Catalan Studies (IEC); the Catalan Foundation for Research and Innovation (FCRI); the Catalan Council for Scientific Communication (C4); and the Catalan Association of Public Universities (ACUP).

CAPCIT institutionalises this relationship between the Catalan Parliament and the S&T community in order to address the need of the parliament for information and advice on S&T and its societal impacts, using all the possibilities that the parliamentary autonomy and the Rules of Procedure offer.

CAPCIT analyses, studies and assesses the status of S&T in Catalonia, and issues an annual report on its progress. It drafts reports for parliament with recommendations and policy options. In addition, it may make proposals on how to mobilise external sources of information and expertise and on using participatory methods.

3.4 The Independent Institute model

This section describes the PTA organisations that fit in the category of the Independent Institute model: the Danish Board of Technology (DBT; Denmark), the Rathenau Institute (the Netherlands), the Norwegian Board of Technology (NBT; Norway), the Institute Society and Technology (IST; Flanders) and TA-SWISS (Switzerland).

3.4.1 *Denmark*

The Danish Board of Technology (DBT; *Teknologirådet* in Danish) was established by law in 1985 and made a permanent institution by law in 1995. Because the Danish constitution does not allow new parliamentary bodies, it was set up as an independent body that is formally under the Ministry of Science, Technology and Innovation. There are similar organisations in Denmark that have been placed outside parliament, and their main tasks are to ensure that independent, unbiased points of view (other than those of the government, experts and lobbies) are brought into the debate. The DBT was given an independent status to prevent TA from being politicised.

The DBT has a dual mandate: to carry out comprehensive TA studies and to further public debate and citizen participation of technological questions affecting society (in the Danish tradition of 'people's enlightenment'). The DBT secretariat conducts both 'expert assessments' through ad hoc multidisciplinary project groups hired by the DBT and 'participatory assessments', which involve members of the public. The overall mission can be described as to contribute with knowledge, constructive debate and solutions to existing and future problems and opportunities in the field between technology, society and the individual, with a local, national as well as international perspective.

The DBT has four tasks:

- To follow technological developments;

- To carry out investigations and comprehensive assessments on the possibilities and consequences of technology for society and the citizen;

- To initiate independent technology assessments;

- To communicate the results of the work to parliament, the government, to other political decision-makers in society, and to the Danish population in order to support and further public debate on technology.

Although the DBT is not organisationally attached to the Danish Parliament, it has a formal link to the Parliament's Research Committee. However, the DBT can work for any other parliamentary committee when requested. The DBT is required by law to meet with parliamentary committees and to respond to parliamentary requests for advice.

The DBT comprises a Board of Governors, a Board of Representatives and a secretariat. The Board of Governors consists of a chairman and ten trustees appointed by the Minister of Science, Technology and Innovation. The chairman and three trustees are appointed directly by the Minister, the others on the recommendation of various organisations[9]. The Board of Representatives is also set up by the Minister and consists of a maximum of 50 members that represent various social/institutional actors. The objective of the Board of Representatives is to serve as a room for open debate on current issues in relation to TA. This includes proposing new initiatives and discussing initiatives already launched by the DBT.

Each year an annual agenda (work plan) is developed that sets out which projects will be carried out in the coming period. The agenda is formed in four phases:

- All actors can give input to the agenda via the website of the DBT;

- The secretariat ranks the input and provides the Board compiles a short list of topics;

- The secretariat presents each idea in a short research proposal;

- The Board of Governors makes a final selection;

- The DBT then further develops the selected project to full project designs.

The DBT receives a fixed annual subsidy of around 10 million Danish kroner (ca. 1.3 million euro[10]) from the Ministry of Science, Technology and Innovation. Because of budgetary constraints, the DBT has sought other sources of income and also works for governments at regional (ca. 30%) and European (ca. 10%) levels. The secretariat employs 18 FTE, including one director, 12 project managers, 10-15 project assistants and 7 administrative staff.

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[9] The other members are appointed by the Minister on recommendation from one of the following organisations: the Industry and Trade Development Council, the Salaried Employees' and Civil Servants' Confederation, the Danish Confederation of Trade Unions, the Danish Employers' Confederation, a joint representative of the National Association of Local Authorities and the Danish Association of County Councils, the Danish Council for Adult Education and the Danish Research Councils.

[10] 1 DKK = 0.13 euro (August 24, 2010).

3.4.2 The Netherlands

The Rathenau Institute was established by ministerial decree in 1986 as an independent institute by the Minister of Education and Science. It was positioned as an institute of the Royal Netherlands Academy of Arts and Sciences (KNAW). KNAW has administrative (personnel and financial) responsibility.

As an independent institute, the Rathenau Institute (or NOTA – Netherlands Office for TA – as it was called initially) had the task of making proposals for a TA programme and its execution. In addition, the minister could be given solicited and unsolicited advice on issues relating to integration of S&T in society. Because the mission did not give a clear definition of who the principle client was, there was confusion among outsiders about the profile and role. As a result of an evaluation in 1992, NOTA's mission shifted from supporting S&T decision making with TA studies (contracted out to experts) to contributing to the societal debate and political opinion forming on S&T issues. Research and analysis became secondary. In 1994, this organisation was renamed the Rathenau Institute.

The current mission of the Rathenau Institute is to encourage public debate and assist political decision-making with regard to the social, ethical and political impact of modern S&T. Since 2004, it also studies the organisation of the science system and how that system responds to scientific, social and economic developments. The institute therefore has two key tasks:

- Stimulating public debate and the formation of political judgements on both the opportunities and the risks for individuals and society of S&T developments;

- Describing the Dutch science system, by investigating the dynamics of S&T. Research focuses on the organisation of the science system, its responses to scientific, societal and economic developments, and the resulting scientific advances.

The Rathenau Institute is an independent institute with its own Board. Parliament has no formal say or formal role in the governance of Rathenau. Members of the Board are nominated by the Board and appointed by the Minister, after consultation of the KNAW and the Scientific Council for Government Policy (WRR). The new charter (Instellingsbesluit) of 2009 allows Rathenau to appoint a 'Programme Advisory Council' which can assist the Board and management by identifying trends and placing on the agenda issues which fall within the Rathenau Institute's sphere of influence.

The Board decides on a two-year work programme, after consultations with involved institutes and organisations, including KNAW, WRR and the Minister of Education, Culture and Science. The Minister gives a formal position (opinion), which is sent with the work programme to the House of Representatives and the Senate.

The Board sends an annual report to the Minister with the activities of the previous year and describes how the position and comments of the Minister and Parliament have been taken into account. The Minister sends the annual report to the House of Representatives and the Senate.

The director of the institute is appointed by the KNAW, after consultation of the Board of the institute. The director is responsible for the executive management of the institute.

Rathenau is funded through a government contribution (structural grant) which is delivered via the KNAW. The Board is responsible for the institute budget, after approval of the KNAW. The Board also establishes the financial report, after approval of the KNAW. At least once every year, the Board has the institutional meeting with the Minister on the government contribution to the institute and on the preparation and execution of the work programme.

Although there is no formal connection with parliament, parliament is the prime designated audience, both the House of Representatives and the Senate. Rathenau aims to actively involve parliamentarians in (communication on) TA projects. To strengthen parliamentary involvement, Rathenau draws up "Messages to Parliament" in which the main outcomes and conclusions of TA projects are summarised for parliamentarians. Other target groups include government and policymakers within ministries, scientific institutes, the European Parliament and society at large (public, industry and societal organisations).

Rathenau employs 52 people, including one director, 16 TA experts, 17 Science System Assessment experts, 7 communication experts, and 10 management and support staff. The latter also work for two other institutes of the KNAW. The annual budget amounts to 5.4 million euro (4.9 million euro government grant); half is for TA, the other half for Science System Assessment.

3.4.3 Switzerland

TA-SWISS was established in 1992 as an independent organisation affiliated to the Swiss Science and Technology Council (SSTC). After a pilot phase during the first four years (when TA-SWISS was linked to the priority programmes of the Swiss National Science Foundation), TA-SWISS was given more autonomy in choosing the topics and in developing a work programme. Following a change of the research's Law, TA-SWISS is since 2008 a Centre of Competence of the Swiss Academies of Arts and Sciences.

TA-SWISS is primarily an advisory body for Parliament and the Federal Council. The Federal Government funds it. Its mission is to prepare analyses and gather opinions on the potential risks and opportunities of new technologies as independently and objectively as possible. TA-SWISS aims to support the political decision making process in relevant S&T issues.

TA-SWISS has the mandate to compile studies that examine the effects of new technologies on society and the economy. The aim of these expert reports is to identify opportunities and risks. For some of the topics chosen for its Studies, TA-SWISS also organises discussion forums to determine citizens' attitudes to controversial technologies. The results of both studies and discussion forums are passed on to political administrative and scientific authorities, and to public interest groups.

The Steering Committee of TA-SWISS is responsible for strategic management of the institute. Its members are nominated by the Executive Board of the Swiss Academies of Sciences after consultation with the Federal Department of Home Affairs (FDHA), the Federal Department of Economic Affairs (FDEA) and the Head of TA-SWISS. Members are from various backgrounds, mostly from the Swiss' S&T community. The Steering Committee's principal duties include: defining key thematic areas; selecting project authors and collaborators; selecting methods; selecting members of the support group; releasing reports; and maintaining links with politicians and organisations concerned.

The TA-SWISS Office is responsible for Operational management. Responsibilities include:

- Generating new ideas for projects;

- Handling expert reports;

- Holding discussion forums;

- Financial management;

- Organising events and public work;

- Co-ordinating activities with the Federal government and international TA institutions.

Expert studies are contracted out to external parties. Each experts project (study) has a support group for quality control with at least one member of the Steering Committee, independent specialised personnel and a balanced selection of people representing different interest groups.

TA-SWISS' annual budget amounts to CHF 1.4 million (ca. 1.1 million euro[11]). The TA-SWISS office employs six people, including one director, two scientific staff members, one public relations manager and two administration and finance staff members. In addition, there are two external co-workers.

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[11] 1 CHF = 0.76 euro (August 24, 2010).

3.4.4 Norway

The Norwegian Board of Technology (NBT, *Teknologirådet* in Norwegian) was set up as an independent body for TA by the Norwegian government in 1999, following an initiative by the Norwegian Parliament. The mission of the NBT is to assess impacts and options of technology in all areas of society, to stimulate public debate on technology and to support political decision-making processes. The tasks of the NBT include:

- To identify and analyse major technological challenges and aim to further a humane and sustainable technological development;

- To monitor international trends, developments and activities within TA and technological foresight;

- To actively stimulate public debate on technology related issues and thereby raise public awareness concerning the impacts and options of technology;

- To initiate reports and holistic assessments of the potential benefits and consequences of specific technologies for both individual citizens and the society at large;

- To communicate the results of its work to the Parliament, governmental authorities and the wider society.

The NBT has 14 (non-parliamentary) members appointed by the government. The members are appointed based on their broad insight in different areas of technology, innovation and societal issues. The NBT has a secretariat that is co-located with the National Committees for Research Ethics.

The Board sets its own agenda. A new core portfolio of TA projects (work plan) is formulated every two years after a strategy process within the NBT and broad consultation of various actors. Open consultation is complemented by consultation of experts, academics, NGOs and industry and by international orientation. While the Parliament does not make requests for specific projects, the NBT consults Parliament mostly through informal conversations. The NBT is expected to make an annual report to the Ministry of Trade and Industry. This report is distributed to a wide range of bodies and organisations.

The Board has an annual budget of approximately NOK 8 million (ca. 1 million euro). The work is organised in projects; the secretariat manages the projects and reports to the Board. The Norwegian Research Council acts as the supervising authority. The secretariat employs nine people, including one director, one senior executive officer, six project managers and one information manager.

3.4.5 *Flanders*

The Institute Society and Technology (IST) was established by decree in 2000 – until 2008 under the name viWTA[12] – as an autonomous, para-parliamentary institute associated with the Flemish Parliament. Its mission is to investigate the different aspects and effects of S&T development and to inform the Flemish Parliament about the societal debate and the controversies on S&T. Tasks of the IST include:

- Studying and analysing S&T developments,

- Structuring and stimulating the societal debate,

- Observing S&T developments at home and abroad,

- Conducting prospective research into these developments,

- Informing its target groups

- Advising the Flemish Parliament based upon these activities.

The overall objective of the activities of the IST is to enhance the quality of the societal debate and to contribute to a better-founded decision-making process. IST's main audience are the Members of the Flemish Parliament.

As an autonomous institute, the IST has its own Board of Directors and a Scientific Secretariat. The Board of Directors has 16 members (8 parliamentarians and 8 representatives of the Flemish S&T community). The Board is responsible for:

- Letting the Scientific Secretariat perform short preparatory evaluations;

- Contracting out longer, more elaborate evaluations and/or requests for advice to national or international experts;

- Organising a societal debate based on these evaluations;

- Formulating recommendations to the Flemish Parliament based on these evaluations (and the ensuing societal debate);

- Maintaining contacts with regional, national and international organisations that are involved in S&T choices;

- Making an annual analysis of the needs for R&D.

The Scientific Secretariat is responsible for the day-to-day activities. It coordinates the research and supervises the public participation. The IST can use ad-hoc committees of experts.

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[12] viWTA is short for het Vlaams Instituut voor Wetenschappelijk en Technologisch Aspectenonderzoek.

In addition to its general tasks, the IST may perform specific tasks at its own initiative or by assignment of the Flemish Parliament. The specific tasks on behalf of the Flemish Parliament are formulated according to the Regulations of the Flemish Parliament. For the specific tasks that are at the initiative of IST itself, the Scientific Secretariat draws up an annual work plan that has to be endorsed by the Board of Directors.

The Bureau of the Parliament decides on the budget, which comes from parliament. The annual budget amounts to 1.5 million euro. The secretariat employs eight persons, including one director, five project managers, one communication and co-ordination staff member and one secretary.

3.5 Developments in institutional settings of PTA in Europe

This section highlights the relevant changes in the institutional settings of PTA in Europe for each of the three models, based on interviews with representatives of the PTA organisations and additional desk study.

3.5.1 The Parliamentary Committee model

In France, the institutional setting of OPECST did not change substantially since its foundation. Its mission was broadened by nine laws to include the assessment of the implementation of such laws, thus extending the original 1983 referral. Initially, the idea had been that external experts would make an objective assessment on the basis of which parliamentarians would draw conclusions. In practice, this division of work did not work. The rapporteurs (i.e. MPs) were given a more prominent role in the assessment work. As a consequence, the same persons are in charge of the scientific assessment as well as the decision-making process.

In Finland, the Committee for the Future started out as a temporary committee in 1993 and became a permanent committee in 2000 as part of a constitutional reform. In 1997, a subcommittee for TA was set up to support the organisation and co-ordination of TA activities for parliament, and, more specifically, to prepare the execution of the two parliamentary TA studies during the electoral period 1995-1999. In the next electoral period, the subcommittee was abolished again, because it was felt that the Committee for the Future as a whole should assume responsibilities for parliamentary TA activities. Since then, no specific TA unit exists within the Finnish parliament.

In Italy and Greece there were no significant changes in the institutional setting since their establishment in 1997.

3.5.2 *The Parliamentary Office model*

The rules and regulations of STOA were updated in 2004 in order to streamline the process and to enhance the effectiveness of the office. The membership of the STOA Panel was decreased from 20 to 15 members. According to the new STOA rules adopted by the Parliament's Bureau in 2009, the mandate was broadened with the objective to support and co-ordinate initiatives to strengthen PTA activities in the EU Member States. A new element in the rules is that the budgetary means made available to STOA via the EP's budget are managed by the DG for Internal Policies of the EU. The annual budget decreased from circa 1 million euro before 2000 to circa 0.6 million euro since 2004.

In the UK, POST developed from a demonstration project in 1989 into a permanent office in 2001, after it had demonstrated interest and demand from MPs. The mission of POST has not changed, although the balance between the (in-depth) TA function and the informational function (with briefing notes and assistance to parliamentary committees) has shifted more to the latter in the mid-2000s. Recently, it has more begun to move back towards in-depth studies. At the same time, the budget and staff of POST have increased over the years.

In Germany, the institutional set-up of PTA did not change since the establishment of the TAB. The budget remained fixed during the last decade, which means a gradual annual decrease.

The Scientific Offices in Sweden and Catalonia were established only recently and there are no major changes.

3.5.3 *The Independent Institute model*

In Denmark, the DBT was first established in 1985 and was re-established in 1995 as a permanent independent institution. The mission was broadened. Initially the DBT had a twofold task of initiating TA and to further public debate on technology. Since 1995, the aims are to follow technological developments, to carry out investigations and comprehensive assessments on the possibilities and consequences of technology for society and the citizen, to initiate independent technology assessments and to communicate the results of the work to parliament, government, other political decision-makers in society and to the Danish population in order to support and further public debate on technology. During the period 1985-1995 the organisational structure remained unchanged with a parliamentary Committee on the Board of Technology as the political link to parliament, an independent Board and a Secretariat (that grew from five to thirteen staffers). In 1989, the DBT got a written mission statement. In 1993 the DBT was evaluated which led to a new law. In this new law, the goals of the DBT remained unchanged, but a new advisory function to parliament as well as to the government was added. Also the organisation was changed.

One new element was the Board of Representatives. The parliamentary Committee of the Board of Technology was abolished; instead DBT got a standing committee (Committee on Science and Technology) as a direct link to the Parliament. Also the obligation to have annual meetings with relevant parliamentary committees was added. The budget was decreased in 2001. Since 2003, the budget is fixed – which means a relative decline because of inflation – which induced DBT to found additional external sources of income (e.g. governments at local, regional and European levels)

In the Netherlands, the primary mission of the Rathenau Institute changed from supporting political decision-making to contributing to societal debate and political opinion forming on S&T issues. The institutionalisation of PTA had four phases (Van Eijndhoven, 2000: 149):

- A pre-institutionalisation phase (until 1985), in which TA was discussed along with other issues related to social and ethical aspects of S&T, but generally with a strong bias against establishing a separate TA institution;

- The early period of NOTA (1986-1990) marked by conflicting views on who NOTA's client was and a strong bias within NOTA toward analytical research;

- The period 1991-1994 when parliament came to be viewed as the primary client and ways of more directly addressing parliament were explored;

- The period since 1994 when the importance of societal debate, including organising discussion meetings, came to be stressed more heavily.

Initially, NOTA's primary task was to operate as a planning and managing organisation for a TA programme. One of the secondary missions was to react to signals from parliament and the government regarding the integration of S&T in society and to provide an access for signals from society as a whole. In practice, the mission and the main client proved unclear and led to a variation of orientations within NOTA and confusion among outsiders. In 1990, NOTA decided to address parliament as its main client and to focus on project with relevance for political decision-making. After an evaluation in 1992 the name NOTA was change into the Rathenau Institute and the formal mission was changed into contributing to the societal debate and political opinion forming on S&T issues. Research and analysis became secondary, as a means to support the primary mission. Recently, the Senate (in addition to the House of Representatives) has been identified as a prime target group. Another major change was the establishment of the Science System Assessment department within the Rathenau Institute in 2004, which is aimed at analysing the dynamics of the science system.

In Switzerland, TA-SWISS began as a pilot project in 1992 and was linked to the priority programmes of the Swiss National Science Foundation. After this pilot phase, TA-SWISS was given more autonomy in developing its working programme. In 1999 TA was anchored in the research law. The Federal Council strengthened the independence of TA-SWISS by endorsing the Regulations of the Swiss Science and Technology Council (an advisory body to the Federal Council) in 2000 to which TA-SWISS is attached as an independent centre. In 2008, TA-SWISS was brought under the administrative roof of the Swiss Academies of Arts and Sciences, without main consequences for the mission and organisational set-up.

In Norway, the mission of the NBT remained unchanged, although there have been attempts to adjust the mission. For instance, the new government in 2000 wanted to orient the NBT more on innovation policy issues, but parliament did not want a re-orientation. It was agreed that the NTB would also include the opportunities (not just the negative effects or risks) of technologies. Another development is the increasing involvement of other ministries than the Ministry of Trade and Industry in TA projects. The structural grant has remained fixed over time which led the NBT to find more funding from other sources, e.g. the ministries and the European Commission.

In Flanders, after an evaluation the viWTA was renamed IST in a renewal of the decree by which the institute is established. The new decree brought the IST closer to parliament: parliament has the possibility to give short ad-hoc assignments to the IST. While the mission remained unchanged, the process to make the working programme was made changed to include a more transparent procedure for involving international sister organisations, Flemish S&T actors and parliamentary committees. The Institute also introduced principle of corporate governance with better separation between strategic and operational management.

3.6 Discussion of the institutional settings of PTA in Europe

The PTA organisations in Europe were all shaped quite differently. The differences were caused by institutional and cultural factors as well as specific political and institutional opportunities (e.g. changes of government or majorities in parliaments).

An important institutional factor is the specific parliamentary system in which PTA has to function. Different parliamentary systems create different parliamentary constraints and opportunities. For instance, constitutional rules and traditions of parliaments may allow or forbid the establishment of new institutions/permanent committees within parliament or the involvement of external experts in parliamentary committees. Also the level of centralisation of policy-making authority varies, depending on whether governments are characterised by one majority party or multiparty coalitions.

Parliamentary committees differ in their degrees of freedom to operate and their involvement in the design of policies. The availability of professional staff, informational resources and research services for members of parliament differs. Parliaments have different relationships with and access to external actors and information sources.

An important cultural factor that shaped the institutional settings of PTA is the national (or regional) political culture. Across Europe, the relationships between parliaments and governments and the nature of party systems and their relationship to governing differ considerably. In some countries (e.g. France, Germany, UK), parliaments are regarded as legislative assemblies which speak for the public. As a consequence, there is little need to involve citizens in parliamentary decision-making. In other countries (The Netherlands, Denmark) there is less emphasis on political elites and more on political equality, which corresponds to more active citizen participation in decision-making. Cultural differences can also be found in what constitutes a good decision-making process (e.g. pragmatic or technocratic) and in the need to create a consensus before a decision is taken. National styles in policy-making vary from informal, pragmatic, largely reactive and incrementalist approaches (e.g. in the UK) to more comprehensive, rationalist, top-down approaches (e.g. in France). Different countries show different degrees of responsiveness to stakeholders, emphasis on consultation of the public and reliance on scientific and technical expertise in policy-making.

Contingency and path dependencies are also influential. The origin stories of the early adopters of PTA in Europe help to understand part of the differences between modes of institutionalisation of PTA (Vig and Paschen, 2000). In one group of countries (France, UK, Germany) there was mainly an internal debate on TA within parliament, resulting in intra-parliamentary PTA structures designed to support parliamentary decision making-processes on S&T. In another group of countries (The Netherlands, Denmark), the debate was initially outside parliament with 'societally responsible' scientists, academics, special advisory committees, unions, societal organisations (NGOs) and government ministries as main participants. The debate was more concerned with the role of S&T in society and 'democratisation' of S&T. In these countries PTA structures were build outside parliament. In the first group of countries, PTA was primarily oriented at informing parliamentarians on the 'facts' of S&T and related policy options. In the second group of countries, PTA was more oriented at broadening technological development in terms of (ethical, legal and societal) issues to be taken into account as well as actors to be involved. "The emphasis was thus more on articulating 'post-materialist' concerns of the public and communicating them to parliaments and governments than on strengthening institutional capabilities of the parliamentary bodies themselves." (Vig and Paschen, 2000:367).

The combination of institutional and cultural factors and contingency and path dependencies explains the large degree of heterogeneity in the institutional settings of PTA in Europe.

Many national characteristics might provide part of the explanation for the existence of PTA organisations. This can size, wealth, degree of development, culture of public debate, level of development of interest groups, or cultural heritage, but also entry date to the EU, the degree and age of institutionalisation of the democracy, and the investments in S&T.

A main characteristic of countries with a PTA organisation is a relatively high level of economic development and technological sophistication; all of the early adopters of PTA in Europe have economies that are in innovation-driven stage. Figure 3 shows GDP per capita (in PPS) for 1995 – when PTA was still in an early phase of institutionalisation in most countries – for the European countries. It is clear that PTA was established in countries that have above EU-27 average GPD per capita.

Figure 3 GDP per capita in Purchasing Power Standards (PPS) (EU-27 = 100) – 1995 and year of establishment of PTA organisation
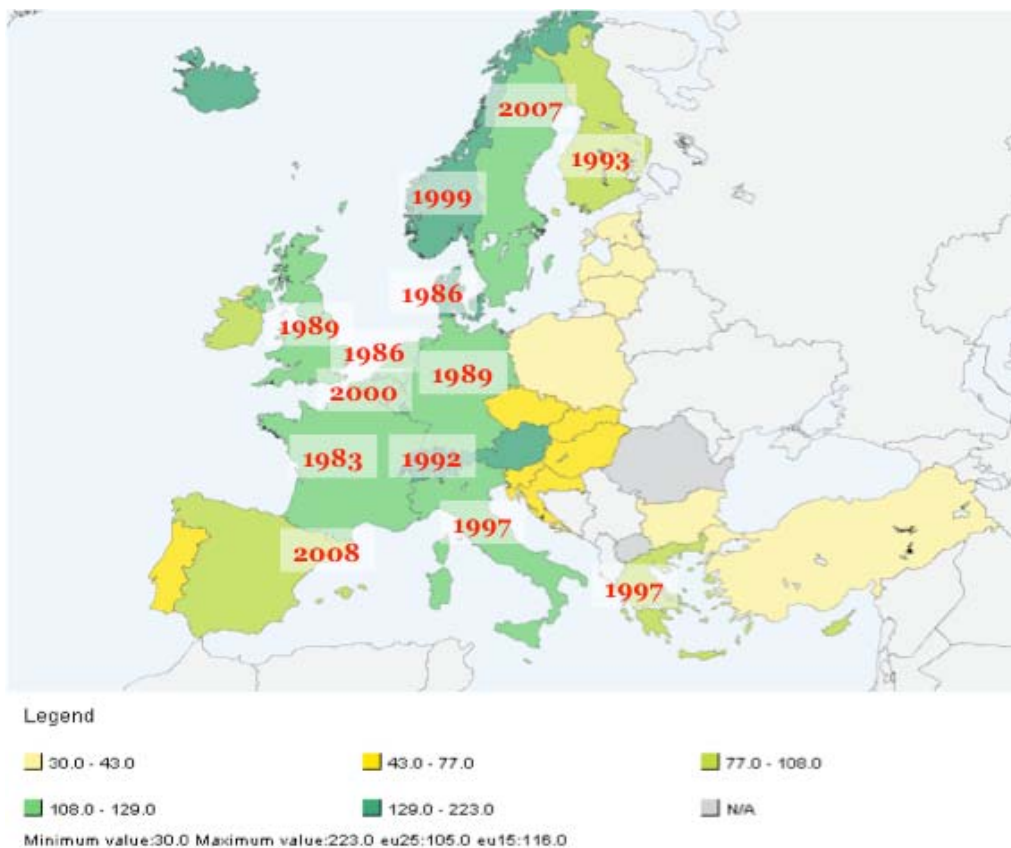
Source: Eurostat.

4. PTA practices in Europe: products and processes

This chapter elaborates on the process and products of TA. In the first section an overview and analysis of the methods used is presented. Second, the types of stakeholders that are involved in PTA practices are addressed. The third section provides an overview and analysis of the topics of the PTA studies in Europe.

4.1 PTA-methods used in Europe

PTA aims to contribute to the formation of public and political opinion and decision making on societal, ethical, legal and economic aspects of science and technology. In order to reach this goal, a number of different methods are used. PTA projects follow an interdisciplinary approach and use a variety of quantitative and qualitative methods depending on the specific goal of the PTA project.

This section starts with a short overview of the developments of methods of TA in Europe. Second, an overview is given of the current types of methods and products that are used in Europe. Third, the findings are summarised by describing the trends in TA methods that have been used since 2000.

The main and sub questions addressed in this chapter include:

2a. Since the start of PTA in Europe: what was the development / evolution in the methods used in PTA. Have new modes been developed and how can they be characterised?

- What have been the (relative) budgets for scientific studies, interactive projects, other new methods and communication and how has this evolved over time?

- Which types of stakeholders (actors that have an interest in/are affected by the development and application of T) have been involved in the PTA process and how has this evolved over time?

2b. At the moment, in what domains are European PTA activities complementary and can gain benefits from more coordinated efforts on the pan-European level?

When answering these questions, a classification of methods is used that groups them into two classes: scientific methods and interactive methods.

- **Scientific methods** are used for gathering and validating information about specific aspects of the technology, such as for exploring future social, legal and/or economic impacts of new technologies (for instance of synthetic biology). Decker and Ladikas (2004) mention as examples of scientific methods: expert interviews, expert discussion; modelling, simulation, systems analysis, risk analysis, material flow analysis (for understanding the socio-technical system to be investigated); trend extrapolation, simulation, Delphi method, scenario technique (for creating knowledge to think about the future); discourse analysis, value research, ethics, value tree analysis (for evaluating and uncovering the argumentative landscape); etc.

- **Interactive**, **participatory or dialogue methods** have been developed to organise social interaction in order to bring together the different stakeholders involved in and affected by a technology (mainly those belonging to the two main subcategories: producers and users, sometimes also public policy makers are involved) with many different purposes (such as: providing information, discourse and decision making). Methods used include: consensus conference; expert hearing; focus group; citizens' jury; future search conference; etc.

Decker and Ladikas (2004) also include **communication methods** as part of the PTA methods toolbox. They argue that these have become important PR instruments for PTA organisations in order to inform their financer (parliament) but also other that are (or should be) interested in PTA activities. In the analysis a distinction is made between the methods used in PTA (scientific and interactive)[13] and the communication activities to support PTA dissemination to clients and others.

4.1.1 *Overview of the use of PTA methods in Europe*

In the interviews with the directors of the PTA-organisations they have been asked which methods are used and their relative contribution of scientific versus participatory methods to the overall toolbox of the PTA-organisation.

Before going into more detail on the methods used in Europe, it is important to mention that when asked about the methods they use, nearly all interviewees emphasise that each PTA-assignment or question needs a tailor-made method. Each topic (a new technology or a new thematic issue) involves specific technological and societal, ethical, legal and/or economic aspects, stakes and stakeholders. Each question asked by the client of the PTA organisation or PTA organisation itself needs a specifically customised approach. As a result, it is hard to give a straightforward typology of methods, even at the level of individual projects. Many projects combine for instance scientific and participatory/interactive methods.

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[13] More information to be found in: Tran, Th. A. & Daim, T., 2008. A taxonomic review of methods and tools applied in technology assessment. Technological Forecasting & Social Change, Vol. 75, pp. 1396–1405.

Literature review or expert opinion for instance can serve as input for participatory methods, such as stakeholder workshops. For each TA project methods have to be carefully designed, in order to make it sensible and effective.

Related to this matter, a large number of interviewees also indicated that their methods are still under development. Examples are the trial or emergence of participatory methods in some countries (Sweden, Switzerland, UK). A number of PTA-directors indicated that methodological development is an integral part of their activities (Flanders, Denmark, Norway, The Netherlands, Switzerland). However, in other countries not much experimenting takes place. In those cases, the client often defines the method in the project proposal. In Germany for instance, the committee that commissions the studies already states the methodologies in the project demands[14].

Finally, the EPTA network plays an increasingly important role in disseminating the knowledge on and experiences with TA methodologies. Except for the more informal meetings of the network where experiences are exchanged and new methods introduced, the EUROPTA project is an example as it focuses on the use and methods of participatory methods.

Figure 4 provides a summary of the use of methods in Europe. In the figure the relative use of each group of methods has been indicated as follows: 0 method is seldom used; + method is used, together with other methods; ++ method belongs to the core methods; +++ only this method is used.

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[14] In Germany, PTA is commissioned by the Parliament to a research institution, i.e. the Karlsruhe Institute of Technology. This public research institute develops also methods and methodologies on their own account.

Figure 4 Overview of PTA methods used in Europe

PTA model	Country/ Institution	Description	Scientific Methods	Participatory Methods
Parliamentary Committee	France *OPECST*	Primarily use of scientific studies and reports. In addition to this, public hearings are organised, as well as visits managed by rapporteurs and organise public events (50-50). The rapporteurs lead hearings and visit and communicate and promote report conclusions. Most of the visits (and also public hearings) have a focus on experts.	+++	+
	Finland *Committee for the future*	The main methods used are scientific; there has been experimenting with participatory methods, but constraints in resources often hinders ample use. Main methods are scenario building, expert interviews and Delphi methods, expert hearing, roadmaps. Incidental use of focus groups. Increasing use of flexible and less informal methods. Also experiment with a discussion over the internet.	+++	+
	Italy *VAST*	Main methods are scientific studies, such as impact assessments of decisions regarding scientific subjects and round tables (seminars) Most of the seminars and hearings are held with representatives of technological organisations and institutes.	+++	+
	Greece *GPCTA*	Primarily use of scientific studies, with addition of elements of participatory methods.	+++	+
Parliamentary Office	European Parliament *STOA*	Commissions its study to TA institutes via a framework contract with KIT, which executes the assignments jointly with selected partners from the ETAG[15] network. STOA projects are predominantly scientific studies, but also encompass participatory studies such as civilian surveys.	++	+
	United Kingdom *POST*	Predominant use of scientific methods: mainly expert analysis. Methods used moved away from early warning to providing balanced analysis of public policy issues. Broader involvement of scientific disciplines such as economics, social sciences, etc.	+++	0
	Germany *TAB*	Strong scientific methods: involvement of lay people is not desirable as Parliamentarians are representatives of the people. Research is supported by TAB, but supportive institutions (i.e. ITAS, FhG-ISI) carry out in-depth research. TAB integrates the TA work and then analyses and appraises it and to look for inconsistencies and expert dilemmas. After this they identify options for Parliamentary actions.	+++	0
	Sweden *PER*	Scientific studies are commissioned and conducted with help of external reviews. Methods include reviews of literature with input from experts. Frequent use future oriented expert work.	+++	0
	Catalonia	CAPCIT only requested scientific studies; S&T institutes conduct these studies. Methods are assessment of scientific options by experts and desk study. Issues on perceptions of society at large were also dealt with in scientific studies.	+++	0

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[15] ETAG-European Technology Assessment Group

PTA model	Country/ Institution	Description	Scientific Methods	Participatory Methods
Independent Institutes	Denmark *DBT*	By far the largest share of work is conducted with participatory methods. Although the Parliament is the main customer, DBT often targets society at large (see mission Ch. 2). Political cycle influences the methods used; after elections many Parliamentary hearings are organised. Mainly participatory	++	++
	The Netherlands *Rathenau*	Use all types of methods, depending on the needs for the study or project. In the early days, the institute primarily conducted studies. Use of both participatory as well as scientific methods from the start.	++	++
	Switzerland *TA-SWISS*	Both scientific methods and participatory/interactive methods are used. In scientific studies expert groups are involved for advisory or as a sort of steering group. In citizens' projects, citizens participate in the projects; MPs can keep in touch with the views and considerations of the people they represent. Lastly, projects are carried out to develop new methods, or to analyse or benchmark methods.	++	++
	Norway *NBT*	All methods are used and often combined, depending on question and issues. Expert groups include stakeholders from industry and NGOs as well as academic experts. Substantial emphasis is put on communication of results and societal debate through the media and public meetings.	++	++
	Flanders *IST*	All methods are used and often combined, depending on the assignment, question, or issues. Societal organisations are strongly organised and integrated in the Flemish system, as a result participatory studies are relatively easy to organise and important. Development of methodologies is also an important activity of IST.	++	++

Source: Technopolis Group, 2010

Legend: 0 method is seldom used; + method is used, together with other methods; ++ method belongs to the core methods; +++ only this method is used

4.1.2 *The type of PTA organisation and their methods*

Overall it can be observed that within Europe there are differences in the methodologies that are applied. Some PTA organisations primarily use participative methods, whereas others solely use scientific methods. It might need clarification that those organisations that primarily use scientific methods are however not conducting 'old-style' TA projects: the scientific projects often have a strategic focus, with strong emphasis on policy options. Moreover, the scientific studies tend to have a strong focus on 'societal issues' – often technological/scientific issues are approached from a socio-economic, legal or ethical perspective. The studies in the UK for instance are "socio-centred" and involve a broad scope of scientific disciplines, other than science and technology experts.

There is a significant difference in the use of participatory methods across Europe. Parliamentary Committees and Offices rely primarily on scientific projects, whereas the Independent Institutes are more engaged in participatory studies.

Countries with a PTA organisation following the *Parliamentary Committees model* take an intermediate position with regard to the balance between scientific versus parliamentary studies. The scientific studies constitute the largest part of the PTA-activities. In addition often a workshop, hearing, seminar and et cetera is organised that gives the PTA-activity an interactive character. The participatory studies of the Parliamentary Committees TA are often different from those of the Independent Institutes. The function of these interactive parts of the method is aimed to enlighten the Parliament, this in contrary to the independent institutes that have a broader mission: targeting society at large. The interactive methods of the Parliamentary Committees model have strong focus on the Parliament, and the interactivity is often organised in order to inform the Parliament. Interactive parts such as public hearings, in which citizens, industrial stakeholders et cetera are involved, are aimed at 'educating' the parliamentarians. In France and Italy, there are standardised procedures that make the Parliamentarians get in contact with the experts, users and society at large.

The *Parliamentary Offices* mainly use scientific methods, such as impact assessments based on literature review and input from expert panels. The European Parliament sometimes makes use of non-expert consultation that could be characterised as a participatory study. PTA organisations in Germany, UK, Catalonia and Sweden seldom make use of participatory methods. In the UK, POST has used participatory methods for a number of years. However, the last five years, the use of participatory methods has however diminished as they were too costly and the added value of this type of studies too low. Germany and Sweden only conducted scientific studies. In Germany, a reason for the low demand for participatory studies is that the parliamentarians (clients of TAB) do not feel a need to conduct participatory studies. They see themselves as representatives of the people: therefore involvement of 'other civilians' is not needed. Furthermore, it would in Germany be harder to conduct interactive studies, because it would be hard to represent the German, as it is a large and not too centralised country. Sweden just started with their PTA activities. In Sweden there is no demand for participatory studies until now; parliamentarians do not seem to feel a need for participatory studies. The Evaluation and Research Unit did start TA work only recently, so it is too early to discover any trends. In Catalonia only scientific studies have been conducted. The main methods are desk study and assessments by experts. As the studies are commissioned to S&T institutions, the experts are often closely involved to the work. Also TA work that investigates public perceptions make no use of participatory or interactive methods up, until now. Two institutions (Germany, Sweden) indicate that they would make more use of participative studies, if the clients would be more perceptive for this type of method.

The *Independent Institutes* more often use participative/interactive methods than the other institutes. Denmark used these methods already since the mid 1980' and the Netherlands followed after having contacts with Denmark about it. Other countries or regions - Switzerland, Flanders – more recently have started to frequently use participatory methods. Most Independent PTA organisations have an equally balanced method toolbox using both participatory methods and scientific studies, except for Denmark where participatory methods are the main methods used. Independent Institutes have a significant different aim with their studies. As was shown in Chapter 2, their mission is often broader than those of the other institutions; they work for the broad public, whereas the Parliamentary Committees and Parliamentary Offices put stronger emphasis on informing the Parliament. This might explain why Independent Institutes use participatory methods more often. Also when participatory methods are used; the use of the interaction is different. The Parliamentary Offices and Committees use participatory methods in order to gain knowledge of 'lay-experts'. For the independent Institutes, the methods are on top of this function also an entrance point to part of their audience. Examples of this difference are to be observed when comparing the interactive work of France and Italy with that of the Independent Institutes. In France and Italy public hearings are organised, as well as seminars that (may) include the broader public. These projects are however always aimed at Parliamentary decision-making. In the Independent Institutes, participatory projects also (may) have a large communication aspect. The methods are often focussed on inducing public debate or raising public awareness.

4.1.3 *Actor involvement in PTA-activities*

Closely related to the methods chosen by the PTA organisation, is the inclusiveness of the types of actors (experts, stakeholders, the public at large) that are involved in PTA-activities. Figure 55 summarises the inclusion of actors per type of organisation.

Sweden has a special place in the matrix, because they only just started. As they have carried out a small number of projects it is too early to typify the Swedish position in this matrix. However, until now most of the work included primarily experts – potentially broader stakeholder will take place in due time. Sweden has been positioned on the edge of two categories. Catalonia also started its operations recently, but until now there are no indications that a broader base of actors will be involved in the near future.[16]

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[16] A new legislature might however change this situation. Elections will be held by the end of November 2010.

Figure 5 Involvement of actors in PTA-activities
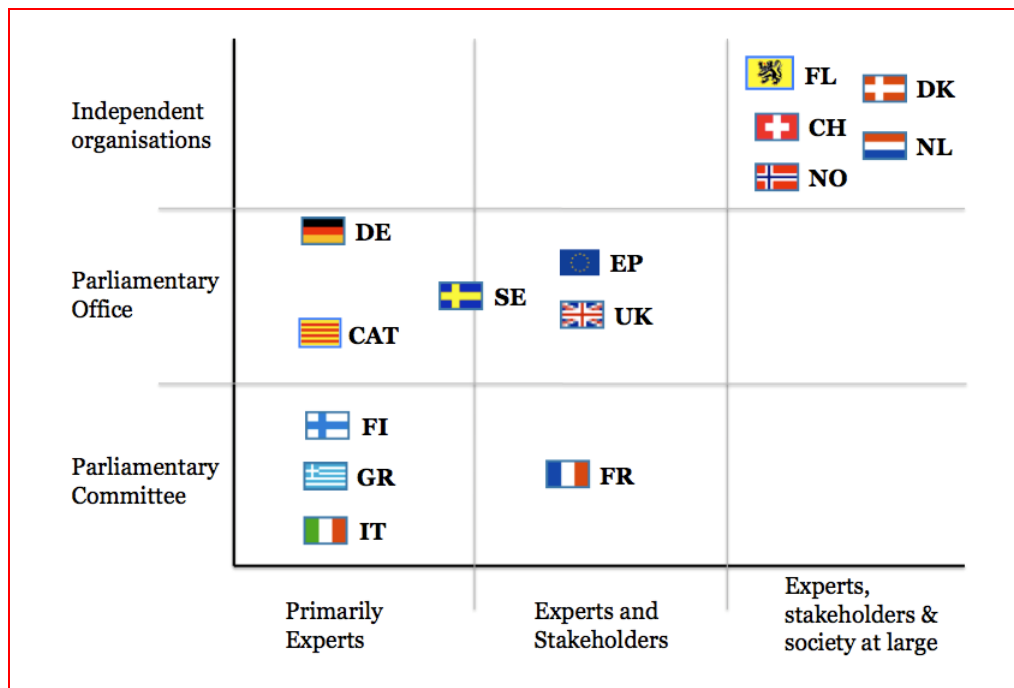
Source: Technopolis Group

In Figure 55 three categories of 'inclusion of actor types' have been used. The first category "*primarily experts*" consists of PTA organisations that nearly only involve experts in their projects. 'Experts' refers to academic scientists and engineers, including experts within the field of science, technology and innovation studies. Germany, Finland, Catalonia, Greece, Italy, and Sweden most often rely on the know-how of experts. It can be concluded that the PTA work in these countries mostly relies on the reflectivity of scientists and engineers. The MPs in these countries/regions use the PTA work primarily to gain information on a certain topic. Especially in Germany this often is a one-way exercise. TAB gathers scientific material and writes reports on this with policy recommendations. Scientists are thus a source of information, most of them of a technological or scientific nature. It is important to emphasise that both these PTA organisations have involved other stakeholders as well, but this does not happen on a regular basis.

The second category "*experts and stakeholders*" involves both experts and stakeholders. Stakeholders in this case are those actors that are directly involved in or will be affected by the subject of study and because of that they possess a certain level of expertise about the topic. Industry and NGOs are often-mentioned examples; they have a high level of expertise on technological developments and/or on the economic effects of specific socio-economic developments. Also, specific laypersons in the public that have a specific interest in the field may be involved in the study. Illustrating examples are people that live in areas that are being threatened by flooding (in the case of a study on flooding) or pollution.

The type of projects in which these actors are involved demands and allows more iteration between different expertises: those of the academic and lay-experts, the stakeholders and the MPs. A special type of interaction with stakeholders is the public hearing in which MPs get in direct contact with experts. A good example can be found in France, where a rapporteur guides a complete project, including the consultations with stakeholders etc. In France most studies are accompanied with (public) hearings, which are then based on the results of the studies.

A third category are those organisation that regularly involve "experts, stakeholders & society at larger" in their project. Not surprisingly, the Independent Institutes are the sole type of organisation in this category. The missions of these institutes are broader and therefore they tend to have a broader social focus (see Chapter 3) – they perform relatively more participative studies and involve a broader range of actors in their work. MPs are involved, as are stakeholders (most notably industry and NGOs) and society at large. The Independent Institutes have a broad systemic approach: assuming that all actors in the system (might) play an important role in technology development[17]. In this vein the actors are involved as debating partners and are sometimes also considered as potential users of a new technology whose demands have to be incorporated in the innovation process (user-driven innovation processes). Especially in participative project, the actors have a high level of involvement, often also in discussions on policy recommendations.

Both the Parliamentary Offices and Parliamentary Committees seldom include society at large in their studies. This is in line with their missions, which have a stronger emphasis on informing MPs, as compared to the Independent Institutions. A broader view on the opinions of citizens is less important for them than expert knowledge on technology and experiences of stakeholders. Nearly all Parliamentary Offices and Committees include MPs or governmental actors in their projects. An exception to this is Germany where generally MPs are not taking part. In addition to the MPs, all PTA organisations include experts in their projects. Also in the Independent institutes MPs are often involved in the project, for them it is even more important to have MPs involved as they are positioned on a distance from parliament

Overall it can be concluded that the inclusion of types of actors is closely linked to the goals of the specific projects (e.g. the mission of the organisation) and the choice for methods. Those organisations with broad participative/interactive projects (i.e. the Independent Institutes) typically involve the broadest set of actors in their projects.

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[17] Cf. the concept of co-construction of technology and society. The interdependence and influence of actors in a system are described in several concepts from different perspectives, see for instance positioning theory (Harré, R., Van Langenhove, L., (eds), 1999).

4.1.4 *Budgetary considerations in method selection*

When choosing a method, cost-benefit considerations are often made. Especially in countries where budgets have decreased over time this has had consequences for the methods used. A clear example of this is case of Denmark. The budgets in Denmark were drastically cut in the beginning of the 2000s, moreover, the budgets are fixed for a period of time, so in relative terms, the budgets have been decreasing due to inflation. As a result of the lowered budgets, the DBT has changed it working method for Parliamentary assignments[18]. The projects DBT carries out have become more strategically focussed. Under budgetary constraints, DBT forcefully developed from a public debater to a public advisor. As a result the projects in Denmark have become less costly and more efficient and had to take a certain level of depth for granted. These changes could be implemented rather easily as DBT could profit from their experience with different methods and a profound knowledge of methodological consequences. Overall in Denmark, the use of participatory studies did not diminish, but DBT selected other methodological tools out of the participatory toolbox. The studies are set up less broad and consequently involve fewer actors. Another example of the cost considerations are observed with regard to participative studies and was already mentioned above: in the UK the use of participatory methods have diminished due considerations of the cost set out against the added value.

Figure 6 gives an overview of the typical costs of studies carried out by DBT in Denmark. The table displays costs of studies in the Danish context (costs of one event without staff costs); costs of methods may vary considerably between countries. The costs shown should be considered as a proxy of the order of magnitude of the costs.

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[18] Please note that DBT also conducts studies for other clients; these studies often have larger budgets and depth. DBT was forced to search for additional resources in order to be able to conduct in-depth studies – and succeeded in this quest.

Figure 6 Costs of stakeholder involvement in studies (excluding personnel costs)

Name	Stakeholder involvement	Method	Cost (k€)
Inter-disciplinary work groups	Scientific experts involvement	Expert-review of a TA problem and work of DBT	27-40
Interview meetings	Lay-experts or broad public involvement	Small-scale group interview and survey of about 30 people	4
Cafe Seminar	Small-scale communication to society	Small-scale informal forum, dialogue views and opinions	4
Citizens' Summit	Broad public consultation/involvement	Representative group of citizens give input (voting, opinions) on a TA issue	27-54
Citizens' Hearing	Panel of citizens	Small-scale group of citizens give input (voting, opinions on a TA issue)	14
Future Panel	Longer range debate, involving MPs	Multiple discussions, seminars and hearings involving a group of experts and MPs	81
Citizens' Jury	Obtaining citizens' attitudes	Citizens' express their attitudes and opinions on an image of a TA issue	54
Hearings of the Parliament	Expert consultation by MPs	A panel of MPs interacts with a panel of experts to solve policy-related questions	20-34
Voting Conference	Obtaining lay-experts opinions and verdicts	Voting of politicians, experts and citizens. Simulation of the actor system	13-27
Consensus Conference	Group discussions of lay people	Consensus building with a large group of people lacking specific knowledge on the topic	81

Source: Danish Board of Technology, 2010.

The costs in Figure 6 are all related to PTA-activities that have a certain level of participation of stakeholders. Involvement of experts and stakeholders obviously increase the cost of projects. The more actors included, the higher the costs. Other determinants of the costs are the geographic scope, the fees and stipends for actors[19], the venue, the length and the facilities offered during the PTA-activity (Slocum et al., 2003). The Future Panel method for instance lasts one to two years; the process comprises an introductory seminar, four hearings and a concluding seminar.

On top of that, participatory studies ask for a solid preparation; they require background material, often based on expert consultation, literature review, or deskwork. So, interactive and participative methods tend to be more costly than scientific methods. On the other hand, participative/interactive methods appear to be an efficient way of obtaining specific information and knowledge. The knowledge and insights obtained through a participative study are not the same as scientific study.

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[19] Compensations differ on the basis on the level of involvement of the actors (incentives to participate) and on how high-level the actors are.

Participative studies involving a broad group of stakeholders are better suitable to address issues regarding the plurality in society, such as inadequate or non-existent social norms, uncertainty and anxiety in society. Participatory processes in policy making can more effectively address issues such as positioning of actors (e.g. lack of trust, agendas at stakeholder level), perceptions of actors and legitimacy of governance.

4.1.5 Trends

In Chapter 2 the historical development of PTA is presented. It was described that parallel with the development or broadening of PTA also the toolbox with methods used was enlarged. In the first wave of PTA, methods were aimed to signal negative effects of technologies for society. Therefore the main method used in this period was impact assessment. Experts were asked to reflect on and explore societal consequences of their work in science and technology. PTA work was focussed on questions concerning issues of specific technologies. The studies often addressed a societal aspect of a technology; such as nuclear energy and safety issues (human, environment), ICT /automation and employment issues. The questions raised were predominantly answered by means of expert consultation and desk study.

A second stage in the development of PTA, was the use of PTA as a strategic tool (rather than a neutral and objective input) for policymaking and strategic decision-making. This changing role of PTA also had its influence on the methods used. In its role as a strategic tool for decision-making, PTA increasingly involved the relevant stakeholders. This trend, from 1980s onwards, gave rise to the participatory methods, predominantly in countries where PTA institutions had relatively large autonomy (i.e. Denmark and The Netherlands).

It should be noted that the use of participatory methods, did not replace the scientific methods (studies). This can be illustrated with a quote from the EUROPTA report on Participatory TA. It concludes on this matter that "*Participatory TA should not be seen as competing with classical expert TA, but rather as a necessary complementary element thereof*" (EUROPTA, 2000). The methods used in participatory TA (such as the much broader involvement of different actors), merely is complementary to the more classical TA methods.

Given this evolution in the development of PTA methods; the PTA-directors have been asked for the trends in the use of methods by their PTA organisations since the last decade. Figure 7 on the following page displays the results.

Figure 7 Trends in use of PTA-methods

PTA model	Country / Organisation	Trends
Parliamentary Committee	France OPECST	No significant change over time
	Finland Committee for the future	Flexible use of methods, innovative and informal sessions, brainstorms. Small increase of use of participatory method, but mainly scientific methods. Experiments with use of Internet.
	Italy VAST	No trends visible
	Greece GPCTA	No trends visible
Parliamentary Office	European Parliament, STOA	More use of participatory methods
	United Kingdom POST	The use of participatory TA has diminished the last five years. Participatory methods are costly and were considered less productive.
	Germany TAB	Innovation studies and benchmarks are added to toolbox. The studies in which these methods are used feed into innovation policy development rather than on technological options assessment.
	Sweden PER	Started 3 years ago; too early to identify trends. A recent assignment had a more participatory character; there might be a shift towards more participatory studies.
	Catalonia CAPCIT	No trends yet visible. CAPCIT has been started only recently. Changes might occur due to new legislature after this year's elections (November 2010).
Independent Institutes	Denmark DBT	No large shifts in type of methods. Methods are combined and adapted to the specific situation and purpose of projects. Pressure on resources has led to fewer participatory methods in the Board's own work plan, which is compensated for by more participatory methods used in externally financed projects (mostly EU, regions, municipalities). A tendency towards stronger strategic and policy focus, and less generic studies
	The Netherlands Rathenau	Since 1990s more emphasis on stimulating formation of political judgement and public debate. Role of communication has become increasingly important.
	Switzerland TA-SWISS	Citizens' projects have become increasingly important; they better fit in the current TA-SWISS strategy. After a period of scepticism towards participatory work, these methods now are generally accepted and belong to the core methods.
	Norway NBT	Emergence of participatory methods. If possible (resources) and valuable (nature of the study) Norway conducts participatory studies. Increasing emphasis on communication.
	Flanders IST	Increased use of participatory studies. A shift from scientific to participatory work.

From Figure 7 it can be observed that the dissemination of the use of participatory methods seems to have fully taken place since its take-off in the early 1980s. Denmark and The Netherlands started to work with participatory methods from the start of their organisations. From then on, participatory methods have spread across many other PTA organisations. In the last decade many PTA organisations have experimented with participatory methods and the use of these methods have increased; especially in Switzerland, Norway and Flanders.

In some PTA organisations participatory studies are seldom used at the moment. These include:

- In the UK, participatory methods have been tested and applied. The participatory studies appeared to be relatively costly and not of too much added value in the British situation. As a result, the participatory methods diminished from POST's toolbox.

- In Sweden and Germany the clients (Parliaments) do not have a need for participatory studies. In Germany this is probably due to the representative function that parliamentarians perceive to have. As result it seems that they do not see the added value of a study that includes the opinions of other citizens from society as they feel they already represent it. In Sweden a similar argument could be used by MPs, or it is a lack of awareness of the possibilities of participatory TA.

Another trend in the use of specific methods since 2000 is related to the broadening of the PTA function. From an early warning function (identifying possible negative effects), also the strategic function was included (identifying also positive effects and thus providing also input in S&T and innovation policy making). The strategic types of studies do not focus on the social issues related to a specific new technology (such as nanotechnology, systems biology) or a specific theme (such as sustainability, privacy), but these type of studies aim to provide strategic intelligence into parliamentary decision making processes on STI-issues. This also refers to the democratisation of decision making on STI by contributing to a better (societal, public) utilisation of new developments in science and technology. Methods in this area include most participatory methods, but also forecasting, benchmarking, macro indicator analysis, roadmapping, and strategic innovation policy studies.

Some PTA organisations broadened their scope even further and also addressed more generic S&T and innovation issues. Their studies addressed issues such as the national research infrastructure, the quality of the national public research, or patenting. Examples of countries where PTA organisations were already active or have extended their activities also in this direction include Germany, the Netherlands, France and Catalonia, The German TAB works on the basis of a framework contract. Recently, Fraunhofer ISI (FhG-ISI) has been added to this contract, due to the foundation of a bundling research institute in Karlsruhe. Because of the competence of FhG-ISI the innovation studies and benchmarks have grown rapidly in the last years. Also projects in the realm of innovation studies are now conducted, such as a study on demand-oriented/user-driven innovation. In The Netherlands the Science System Assessment department of Rathenau maps and analyses the developments in the science system in The Netherlands.

The knowledge produced is aimed at a broad scope of actors and is also aimed to produce strategic knowledge for science policy making. In France, these types of studies that feed STI policymaking have become rather common. An example is a project that explored the European Disease[20] and possibilities to deal with it in STI policy. Another example is a project dedicated to the future of the patent system (France and Denmark). In Catalonia a study has been conducted on the use of fiscal incentives for the promotion and consolidation of R&D.

4.2 Content of the PTA projects

4.2.1 Topics for 2009/2010

In the interviews with the directors of TA organisations they were asked which are the most important topics their organisations are working on at the moment: S&T fields and socio-economic issues. Figure 8 on the following page displays the results.

At first glance, the most important topic addressed by nearly all PTA organisations is the problem of Global Warming; this is clearly a common field of interest. Please note that in Figure 8 Global Warming is often not literally mentioned. Often where 'energy' is mentioned; this most often deals with Global Warming as well as energy supply in European Countries is strongly depending on the use of fossil sources – thus emitting greenhouse gases.

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[20] i.e. the paradox that although Europe's high scores on science indicators, there are relatively low scores on innovation indicators.

Figure 8 Important current topics for the national/regional PTA organisations

Country/Region	Current topics
France *OPECST*	Energy, Environment, Emerging technologies, Life sciences
Finland *Committee for the future*	Energy technologies, Nanotechnology, Education, Welfare & poverty, Climate change, Forests
Italy	Aerospace, energy policy
Greece	ICT, GMO, safety, Climate Change
European Parliament *STOA*	Transport, nanotechnology, ICT, Energy, European patent system
United Kingdom *POST*	Biological Science, Health, Physical Sciences, ICT, Science Policy
Germany *TAB*	Biotechnology (incl. gene tech), Environment, Energy, Health, Sustainability, Innovation barriers
Sweden *PER*	ICT, Renewable fuels, Aging, Climate change, Fish populations, Social welfare
Catalonia *CAPCIT*	Limited number of studies. Studies were on GMO, a health topic and nanotechnology
Denmark *DBT*	Renewable energy, Sustainable transport, ICT, Synthetic biology; Obesity, Water supply
The Netherlands *Rathenau*	Biotechnology, synthetic biology, converging technology, nanotechnology; Usable body, resource dependency, security & privacy
Switzerland *TA-SWISS*	Life Sciences and medicine, ICT, nanotechnology, climate change/mobility (biofuels), Social and cultural TA
Norway *NBT*	Aging and telecare, nanotechnology, synthetic biology, cognitive enhancement, ICT; health, Sustainability & Climate change, security and privacy.
Flanders *IST*	ICT, Transport, Energy, Life sciences, Aging

Source: Technopolis Group, 2010

Also technologies that (potentially) lead to controversies such as nanotechnology, biotechnology and GMO are or have been on the agenda of most PTA-organisations.

Other domains that receive a lot of attention are ICT (security, privacy, data protection, ICT divide) and sustainability. The ICT-projects range from straightforward impact assessments of a certain ICT (e.g. the hazards of mobile phones) to societal issues such as the digital divide due to aging. Sustainability studies also have large national differences – some projects are about the sustainability of industry or transport (e.g. Germany and Flanders), while other projects focus on eco-systems and use of natural resources (e.g. Sweden and Norway).

4.2.2 *Overview of PTA-projects in the period 2005-2010*

All projects of the PTA organisations in the last five years (i.e. 2005-2010) have been mapped, using the ETPA project database as source[21]. The database gives information on the content of studies. Based on this information, each project is given a label (category). The two most important groups of categories are either grand societal challenges (energy and climate change, health, sustainable development, transport) or technologies (such as ICT, nanotechnology and biotechnology/life science). Additionally, two categories have been added that cover a relatively large group of projects: innovation policy and ethical issues. The remaining group (48 of the 384 projects) are part of smaller categories, such as: space, gender issues, labour market, history of science, polar research, etc.

See Figure 9 for the distribution of projects across the group of eight largest categories for the period 2005-2010. In Annex E, the overview is given per year.

Figure 9 Overview of PTA projects of EPTA members; the nine largest categories (2005 - 2010); The contributions of individual countries are visualised in Appendix E.
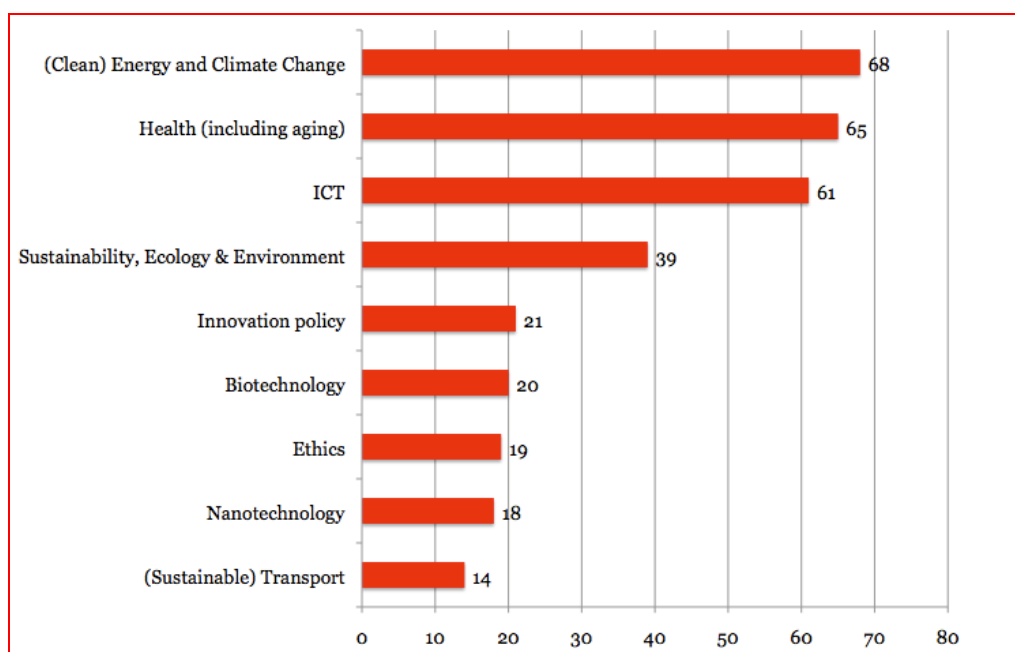
Source: Technopolis Group 2010

Based on EPTA project database: http://www.eptanetwork.org/

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[21] We are aware that the list of projects in the database is not exhaustive, i.e. the PTA organisations have carried out projects that are not listed in the database. The database gives an indication of the projects carried out by the PTA organisations.

Reading the figure one should keep in mind that:

- *(Clean) Energy and Climate Change* includes all projects that focus on energy supply, renewable energy and climate change. As carbon dioxide emissions are a key issue in studies on power supply, this societal challenge is combined with projects on energy. Other societal issues of importance are depletion of energy sources and dependence on oil-producing countries.

- *Health (including ageing)* includes all projects on health issues such as the medical technologies, nutrition issues, the health care sector, therapies, and controversial issues such as fertility research and technology, vaccines. Also ageing is included in this category, as it is part of health issues in a broader sense.

- *ICT* refers to all projects that target the (societal issues related to) ICT. A main topic in this field is the impact of Internet on numerous societal activities (e.g. legislation for the Internet, e-democracy, data-protection and privacy issues related to the accessibility via ICT)

- *Sustainability, Ecology & Environment* consists of projects that deal with eco-systems, ecology, from a natural resources perspective, but excluding fossil fuels.

- *Innovation Policy* includes those projects aimed to gain insight in the STI-system of a country and studies that explore issues relevant to innovation. This includes all softer STI policy issues often aimed at competitiveness of a region/country, or the performance on STI indicators. Examples are projects on IPR, taxing, human resources and innovation barriers.

- *Biotechnology* refers to those projects that deal with the field of biotechnology. Important issues are GMO, biometrics, synthetic biology and ethical issues specifically targeted on biotechnology.

- In the *Ethics* category, all projects are taken up that deal with ethical issues of technologies (other than those immediately related to biotechnology and ICT). Important issues include privacy issues, animal welfare and ethics of science.

- *Nanotechnology* refers to all projects that specifically deal with nanotechnologies. Main issues are risks and opportunities of nanotechnologies; also a number of public debates.

- *(Sustainable) Transport* concerns primarily projects on the sustainability of transport. Other transport issues (such as underground transport – which also has a sustainability aspect) are also taken up in this category.

All countries have projects that are specifically aimed at Global Change and Energy, except for Finland. Sustainability, Ecology & Environment is subject of projects in 13 of the 14 PTA organisations, ICT and Health by 11 PTA organisations. When looking at the content of these categories, the energy and global warming issue is strong internally consistent. In the ICT domain, the effects of Internet are often explored in many countries. Also nanotechnology TA assignments are often alike, issuing either public debates or technological opportunities and risk. The health topic is more diverse and national regulatory differences in health are large, as is the Sustainability, Ecology & Environment domain.

Hot thematic issues at the moment, such as nanotechnology and global warming, might offer interesting entrance points for pan-European projects (see Appendix G).

5. Effects of PTA activities

5.1 Introduction

This chapter presents an overview and analysis of the effects of PTA activities on parliament.

Three types of effects of PTA are distinguished:

- **Outputs**: this is the direct result of the PTA activity. Typical outputs are the results of the PTA studies and (interactive) processes laid down in reports, publications, presentations, but also the participatory process itself is an output.

- **Outcomes**: the use of the outputs by parliament. These can vary from raising the knowledge of members of parliament, to forming attitudes and opinions, to initialising actions.

- **Impacts**: these are the effect of outputs and outcomes on the broader environment and in the longer term. This can include impacts on the scientific community (natural and social sciences), on R&D investment decisions by industry, and broader socio-economic impacts due to improved societal embedding of new technologies.

The analysis focuses on the outcomes: the changes and benefits to parliament[22].

Here a classification is used that was first introduced by Hennen et al. (2004). They distinguish between three types of outcomes: 1) Raising knowledge; 2) Forming attitudes and opinions on S&T issues; and 3) Initialisation of actions. For each category they list a number of effects, divided across three different types of aspects: scientific/technological aspects, societal aspects and policy aspects. This matrix of three categories by three aspects holds nine groups of effects. Within each of these nine cells the authors have included examples. Figure 10 shows an updated version of the matrix by Hennen and Ladikas (2009). The approach of Hennen et al. (2004) includes all actors that are involved in the process of societal debate concerning S&T issues. In their definition, TA can lead to "any change by relevant actors in the process of societal debate on technological issues".

In this study, the focus is on the outcomes for parliament. Not only the societal but also the ethical, legal and economic aspects of science and technology are included. For that reason the effects of PTA are defined as: "any changes with regard to the state of knowledge, opinions held and actions taken by parliaments that concern social, ethical, legal and/or economic issues of science and technology".

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[22] We will not analyse the effects on governmental decision-making or public decision-making in general.

Hennen and Ladikas (2009) provide an elaboration of each category in which – more explicitly than in Hennen et al. (2004) – the use of TA in terms of decision-making in the realm of public S&T and even innovation policy is made[23].

Figure 10 Typology of effects of PTA

Impact dimension Issue dimension	I. Raising knowledge	II. Forming attitudes/opinions	III. Initialising actions
Technological/ scientific aspects	Scientific assessment a) Technical options assessed and made visible b) Comprehensive overview on consequences given	Agenda setting f) Setting the agenda in the political debate g) Stimulating public debate h) Introducing visions or scenarios	Reframing of debate o) New action plan or initiative to further scrutinise the problem at stake p) New orientation in policies established
Societal aspects	Social mapping c) Structure of conflicts made transparent	Mediation i) Self-reflecting among actors j) Blockade running k) Bridge building	New decision-making processes q) New ways of governance introduced r) Initiative to intensify public debate taken
Policy aspects	Policy analysis d) Policy objectives explored e) Existing policies assessed	Re-structuring the policy debate l) Comprehensive-ness in policies increased m) Policies evaluated through debate n) Democratic legitimisation perceived	Decision taken s) Policy alter-natives filtered t) Innovations implemented u) New legislation is passed

Source: Hennen and Ladikas, 2009: 54.

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[23] For instance: new orientations in established policies: TA can bring about reorientation towards new long-term objectives and adoption of new aims and strategies in policy-making (Hennen and Ladikas, 2009: 60), or: facilitating the introduction of new technologies that address certain societal problems by inducing appropriate R&D programmes. In this case: "*TA attempts to balance the needs of society with those of the market in terms of the effects of new S&T developments. Innovation should be both viable and socially constructive, and R&D policy requires knowledge about the available spectrum of technological solutions as well as relevant social needs and demands.*" (ibid, p. 61)

The following description and illustration of the three dimensions of effects is provided (Hennen and Ladikas, 2009) [24]:

1. 'Raising knowledge' is the most basic effect of TA. Classic TA has always focused on providing policy-makers with reliable scientific information (cf. the OTA model). When PTA became institutionalised in Europe, this classic function of TA was broadened with providing knowledge on the socio-economic context of S&T developments, social conflicts involved in the implementation process and policy options to steer technology development that take stakeholder views into account. With regard to the TA function of scientific assessment, two effects can be identified: technical options assessed and made visible; and a comprehensive overview of consequences given. With regard to the TA function of ƒsocial mapping an effect is making the structure of the conflict transparent thus promoting a consensual decision-making process that should eventually enhance the legitimisation of the final policy. With regard to the TA function of policy analysis, effects include an exploration of policy options with regard to their viability, social acceptability and possible side effects in relevant policy areas; and an assessment of existing policies.

2. The active use of TA knowledge in debates results in effects in terms of 'forming attitudes' or influencing attitude structures in the debate. TA can have these effects only when it becomes actively involved in public debates and moves beyond the classic TA function. Examples of such effects are setting the agenda in the political debate, stimulating public debate and introducing visions or scenarios into the debate. TA may also have a mediation function in the debate, which may lead to effects in terms of improved self-reflection among actors, solving deadlock cases in debates by providing neutral, non-political grounds for dialogue (blockade running) and promoting processes that establish mutual trust amongst stakeholders in a technology debate (bridge-building). Finally, TA may have the function to restructure the policy debate (via attempts to offer new policy options by introducing additional analytical knowledge and improving the ability of actors to reflect on vested interests and established perspectives). Associated effects include a broadening of policy debates, providing a framework for effective policy debate and enhancing the legitimisation of decision-making (via 'democratisation').

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[24] The three dimensions should not be seen as a process continuum in the sense that actions can only be initialised after knowledge has been raised and attitudes have been formed. TA activities can directly target any of the three levels.

3. The ultimate aim of TA is to have effects in terms of 'initialising actions'. This effect is indirect, as TA has no mandate to take part directly in decision-making. However, TA may have lead to a reframing of the debate. When TA activities make clear that an S&T issue is so complex that further elaboration is required, TA may lead to a new action plan or initiative to disentangle controversies and unravel uncertainties about new developments in order to start a comprehensive policy debate. It may lead to policy actions such as funding R&D programmes on less understood aspects of the technology, setting up expert committees for review of new evidence, requesting public engagement processes, etc. In a similar but more radical vein, TA can lead to a redefinition of policy views on new technologies, reorientation towards new long-term objectives and/or adoption of new aims and strategies in policy-making.

With regard to societal aspects, TA can also lead to initiatives to restart debates at a new level of inclusion of relevant actors or to apply new procedures of negotiation or bargaining among relevant actors (cf. participatory or bottom-up approaches to policy-making). An effect may also be that public debates are intensified and broadened in terms of content and participants).

Finally, the most direct type of effect is a decision taken. Attribution is, however, difficult because TA is only one of the influencing factors in political decision-making processes. With regard to the policy aspects Hennen and Ladikas (2009) mention three effects. First, evaluation of policy alternatives may lead to conclusions and recommendations on which policies should be implemented. Second, TA may lead to socially sustainable R&D and innovation programmes. Third, TA may have a direct influence on the final outcome of the legislative process.

This classification of three outcome categories was the starting point for the investigations in this study.

The main research question to be answered for this part of the study was: *What are the main effects of PTA activities in Europe and how has this developed over time?*

In addition two sub-questions are formulated that explore the relationships between on the one hand types and size of effects and on the other: 1) PTA-models (institutional setting) and 2) PTA-methods (scientific, interactive, communication) that have been used.

5.2 Characterisation of main effects of PTA in Europe

As can be concluded in the previous chapters, PTA is institutionalised in various forms throughout Europe. Missions and TA practices vary across (and within) the three models of institutionalisation – parliamentary committee, parliamentary office and independent institute. Also governance structures are different for each PTA organisation, especially with respect to the role of parliament in determining their own work programmes. Moreover, the financial and human resources that are available for PTA are different. As a result of this diversity, PTA organisations make different emphases on the type of effects they want to achieve.

As La Porte (2000: 264) notes in a international comparison of PTA practices, "it matters a great deal that there are differences in political culture, institutional arrangements, interest group representation, competitive position in the international economy, and consequently in the kinds of questions that analysts think political leaders want asked and answered."

5.2.1 Effects of PTA-organisation

In Figure 11, the characterisation is summarised of the main type of effects that PTA organisations have or, at least, intend to have, for each of the three institutionalisation models based. This characterisation was done based on desk research and interviews with PTA organisations.

While reading the results of this study and especially this part on the effects of PTA, the reader should keep in mind that this study is not meant to give an evaluation of the effectiveness of PTA organisations. The main focus of the study is on providing an overview and analysis of the types of effects of PTA in Europe.

Figure 11 PTA organisations' main type of effects

Country	Main type of effects
The Parliamentary Committee model	
France	The work of OPECST – as an internal parliamentary body – aims at having direct effect on legislative work or budgetary debates within parliament. OPECST's reports are written for and by parliamentarians (*rapporteurs*) who use inputs from experts. Reports need to be formally endorsed by OPECST before they are published as official parliamentary reports. Since its establishment in 1983, OPECST has become an integral part of parliamentary affairs regarding S&T decision-making. OPECST functions as a bridge between parliament and the S&T community, bringing in knowledge on S&T into parliamentary decision-making. In line with its mission, to inform Parliament on the consequences of S&T options in order, in particular, to enable Parliament to make 'enlightened' decisions, the main type of effect of OPECST's work is raising knowledge on S&T issues, with the ultimate aim of 'initialising actions' in the S&T policy domain, especially new legislation.
Finland	The work of the Committee for the Future aims to have its main effect in terms of improving the debate between parliament and government on impact of S&T on society and issues of the future in general. Raising knowledge of parliamentarians on the longer-term impact of S&T policy decisions is the main type of effect. MPs' knowledge is raised on the subjects of actual TA studies and on the meaning and significance of technology assessment as such. Forming attitudes and opinions and initialising actions are less visible and more indirect. Although the Committee for the Future's working programme is based upon requests and needs of other standing committees, it remains a major challenge is to create a sense of urgency and to grasp the attention of MPs in other standing committees – who tend to be absorbed by their day-to-day businesses and tend not to have long-term S&T impacts on society as a priority. The Finnish political system is characterised by dualism, where the government develops policies quite independently from parliament. Standing parliamentary committees do not play an active role in the development phase, and the Committee for the Future is no exception to this rule. This dual system explains why the Committee for the Future is mainly focused on improving the position of parliament in its debates with the government. Secondary (intended) effects include improving debate within parliament and public debate on S&T issues. But these effects are less prominent and less visible. Experience shows that the composition of the Committee influences its impact. For instance, the impact is higher when influential (senior) MPs have a seat in the Committee.
Italy	As a committee of the Bureau of the Chamber of Deputies, VAST's overall mission is to improve S&T policy-making by co-ordinating all parliamentary activities (in the various Standing Committees) related to S&T. The Committee's main activity is organising seminars and hearings as a way of spreading awareness on S&T developments and on problems associated with S&T governance. It acts as a bridge between parliament and the S&T community. The main (intended) effect is raising knowledge of MPs on S&T issues and possible options for S&T policy. Effects in terms of forming attitudes and opinions of MPs and initialising action within parliament are less prominent and less visible.
Greece	The Committee has not played a prominent role in parliament. Especially with the financial and economic crisis, TA is not high on the priority list of parliamentarians. In practice, the Committee has not been very active in performing TA studies. Moreover, MPs tend to see TA as only one among many options to inform their decision-making. Effects appear to be limited, and at the level of raising knowledge rather than initialising actions.
The Parliamentary Office model	
European Parliament	STOA has the mission to serve as a source of reliable, independent information and advice for the committees and members of the EP. STOA reports serve as background or technical documents for the relevant permanent committees to make its own political report. The main effect of STOA is in the dimension of raising knowledge.
United Kingdom	POST functions as an in-house source of independent, balanced and accessible analysis of public policy issues relating to S&T. The aim is to inform parliamentary debate. The main type of effect is raising knowledge, mainly with scientific information but also information on the socioeconomic context and stakeholder views. POST views itself as a service provider to parliament and recognises that TAs should not go too far into policy development, which is the role of the select committees.

Germany	TAB's main mission is to supply the German parliament with information and advice on S&T development, providing a scientific basis for the policy-making process. In line with this mission, the main type of effect is on raising knowledge of parliamentarians on S&T issues. In turn, this helps to make better decisions (and actions and legislation). There is evidence that TAB reports are used in parliament and have led to resolutions. The secondary effects of changing attitudes and opinions and initialising actions differ from case to case and depend on how the (timing of) TAB reports resonate with political issues and interests. TAB reports need to be delivered and accepted by the Committee on Education, Research and Technology Assessment before they are published (as *Bundestag printed* papers). The German TA reports are then discussed by other parliamentary committees and may become the subject of a proposed resolution and full plenary session debate. TAB reports must get a formal response from parliament. Because reports are published, also other audiences (e.g. Federal and *Länder* ministries) may use TAB's report, contributing to raising their knowledge as well.
Sweden	The Swedish Parliamentary Evaluation and Research (PER) unit within the Research Service of parliament has only started since 2007. Its main effects are in terms of raising knowledge of MPs and contributing to their understanding of S&T issues. This is in line with the mission of the unit a providing scientific evidence for parliamentary decision-making. In practice, some studies did have second order effects in terms of changing attitudes and opinions, e.g. on the (im)possibilities of bio-fuels. However, attribution is precarious since the TA studies are usually only one among many inputs into decision-making within parliament.
Catalonia (Spain)	As a parliamentary body, CAPCIT is responsible for co-ordinating all information and advice on S&T needs of the Parliament of Catalonia. This function leads to effects that are mainly on the raising knowledge dimension.
	The Independent Institute model
Denmark	The DBT has a broad mission and its intended effects are on all three dimensions – raising knowledge, forming attitudes and opinions (not just of parliamentarians) and initialising actions. While the main target groups are parliament and government, the DBT goes further than carrying out TA studies to support political decision-making and also encourages and supports public debates on S&T, which fits in the tradition of public enlightenment. In this tradition the population is informed – in the case of TA on the consequences of S&T – in order to enable them to take (bottom-up) action within the democratic rules of the game. The effects of the DBT on political decision-making thus also go via a 'detour' of public enlightenment, where various target groups form opinions and can put S&T issues on the agenda and create political urgency and legitimacy for political S&T decision-making. Communication methods and media coverage are crucial to get the message on the political agenda. Because of this detour – via public debate and communication of results to politicians – attribution of impact is not easy. Denmark has a tradition where politicians are used to deliberate with stakeholders and the public before decisions are taken, therefore the indirect approach might be more effective than the direct targeting of politicians via publication of TA reports. The DBT tries to actively involve parliamentarians in its activities and has recognised the importance of good communication with parliament in order to have effect.

The Netherlands	The Rathenau Institute has a broad mission and its intended effects are on all three dimensions – raising knowledge, forming attitudes and opinions and initialising actions. The ultimate intended effect is initialising actions by politicians and policy-makers within ministries, i.e. better S&T policy. The guiding principle is (sustainable) co-evolution of technology, policy and society. The dual mission of the Rathenau Institute is to inform policy, debate and political decision-making by doing and publishing TA studies and to stimulate debates between the various parties that are involved in and/or affected by S&T developments. Debates aim to get different actors to talk with each other and to share knowledge. This contributes to trust building between parties. It also helps to get different stakeholders (including politicians and policy-makers) to recognise relevant new developments at an early stage. Via communication and reports, the S&T issues are brought to the attention of parliament and the government (and other actors as well). By involving parliamentarians in TA projects and the presentation events around new reports, the Rathenau Institute aims to raise interest and to invoke debate in parliament, which in turn contributes to better decisions and policies. To get the attention of parliamentarians the Rathenau Institute has made communication and interaction with parliament (especially the Standing Committees) an integral part of its TA work. The Rathenau Institute targets not only the House of Representatives, but also the Senate and the ministries. For example, the Rathenau Institute has played an important role in (organising, preparing) various experts meetings of the Senate, which resulted in better-informed debates with the government – in some cases resulting in the minister having to withdraw/adapt proposed legislation. For the ministries, the Rathenau Institutes is invited to participate in (or organise) round table meetings on selected S&T issues.
Switzerland	TA-SWISS intends to have effects on all three dimensions – raising knowledge, forming attitudes and opinions and initialising actions. The main effect is probably in terms of raising knowledge, although TA-SWISS is also active in stimulating public debate. As an independent and relatively small organisation it is a challenge for TA-SWISS to get the attention of parliamentarians and be heard in a multitude of lobbying parties. An independent neutral status is considered crucial to have any effect. Otherwise it becomes too easy to be earmarked as a politically biased organisation. Specifically for Switzerland, TA-SWISS has to operate in a political context were citizens may challenge any law voted by federal parliament through referenda. Public acceptance of new technologies is often problematic in Switzerland which does not stimulate politicians to put much effort in developing new S&T policies.
Norway	The NBT has effects on all three dimensions – raising knowledge, forming attitudes and opinions and initialising actions. The first dimension is especially important in TA projects on new S&T topics. In line with its broad mission, the NBT's activities should also influence attitudes and opinions, and eventually lead to actions. For this, good and professional communication is necessary to put an issue on the agenda. Parliament is the main target group, and receives recommendations first, but also the government and other parties are addressed. There is ample evidence that reports of the NBT are used in policy, e.g. in issues related to eHealth and telecare, nanotechnology and privacy.
Flanders (Belgium)	The IST is an independent institute, but is closely associated with parliament with MPs (and non-MPs) on the Board. Consequently, its main effects are on decision-making processes within parliament. The effect of raising knowledge is intended in every TA project. With regard to forming attitudes and opinions, the IST is focused on setting and structuring the agenda on selected S&T issues. With regard to initialising actions, the IST has the mandate to formulate recommendations. Several recommendations have been used in resolutions that have been endorsed by parliament (e.g. resolutions of non-ionising radiation and on nanotechnology).

5.2.2 **Opinion of parliamentarians on effects of PTA organisations**

Members of parliament in countries with PTA organisations have been interviewed about the effects of PTA organisations on their work. Names of parliamentarians were provided by the PTA organisations. In the case of France, where parliamentarians themselves are in the lead of TA activities, no additional interviews were held. In some countries it was not possible to interview a parliamentarian (Greece, Italy and the UK).

Parliamentary Committee model

Parliamentarians value the 'raising knowledge' dimension. One parliamentarian stressed, however, that the most (indirect) effects were on 'initialising actions', since reports are decision-oriented and must offer proposals for improving S&T decision-making. Because TA reports are supposed to give neutral, factual information, based on inputs from various sources and stakeholders, the direct effects on the 'forming of opinions' dimension was perceived as relatively low (in the sense that TA reports explicitly try to push one specific opinion). It is recognised, however, that TA reports can lead to new insights, new perspectives and new opinions on S&T issues, especially in cases where parliamentarians did not have pre-existing knowledge or clear opinions on specific S&T issues.

Another parliamentarian stressed the importance of interactions and cross-fertilisations between parliamentarians and the S&T community. "By working together there is cross-fertilisation of thinking between members of parliament and researchers." Interactions in hearings, seminars etc. are not perceived as a unidirectional flow of scientific knowledge and opinions of experts to parliamentarians, but rather a bidirectional exchange in which researchers are also fed by insights of parliamentarians in societal and political aspects of technology development. This enhances the knowledge of researchers in societal acceptance, legal admissibility, ethical consequences and political feasibility. Although effects are difficult to assess, it appears that both parliamentarians and researchers benefit from TA activities. The main effects, however, appear to be on the dimension of 'raising knowledge' of parliamentarians.

Parliamentary Office model

Parliamentarians in countries belonging to this model report on effects in all three dimensions. Especially the 'raising knowledge' dimension is highly valued. One parliamentarian mentioned that the PTA office was very important: "As a member of parliament I like to have good knowledge that enhances my political decision-making. In the topics I work, you need to have strong scientific knowledge."

Regarding the 'raising knowledge' dimension, one parliamentarian gave an example of a TA study that gave new insights in the problems with renewable fuels as substitutes for fossil fuels (e.g. energy density and land use). This had an effect on the 'forming opinions' dimension because the knowledge gained in the study changed the general opinion of the involved parliamentary committee with regard to bio-fuels. Moreover, the TA study also received broad attention from the involved stakeholders. Attribution is, however, difficult because the TA study was one building block of a larger debate. The combined effect of the TA study, other studies and the debate was a change in the political programme of the committee and of political parties. Energy savings were given more emphasis. There were also effects in the 'initialising actions' dimension: the TA study led to follow-up studies on options for changes in the legislative and taxation framework on fossil fuels. A concrete policy effect was also a reduction in specific subsidies.

Another parliamentarian gave two examples of recent TA activities that have impacted upon parliamentary legislative work (on genetically modified crops and on a vaccine for the human papillomavirus). 'Raising knowledge' appears to be the primary direct effect of PTA. TA reports are used by political parties to determine or strengthen their position in S&T issues. Because parliamentarians use many different sources of information to determine their political positions, it is difficult to know how much impact PTA has had on the dimension of 'forming opinions and attitudes'. Effects on the dimension 'initialising actions' appear to be the weakest, according to this parliamentarian.

Some parliamentarians also mention the effect of PTA on broadening the horizon of S&T experts, rather than parliamentarians themselves.

The interviews with parliamentarians indicate that it is not self-evident that all parliamentary committees will find their way to the PTA office when they come across an S&T issue. It tends to take several years before the PTA office has become a well-known parliamentary service. This means that PTA organisations have to work on signalling their relevance to all parliamentary committees rather than only the committees that deal with research/technology/innovation policy.

Independent institute model

One general finding of the interviews with parliamentarians in countries of this model is that the effectiveness of PTA organisations is dependent upon the way parliamentarians are involved in the TA activities. Because PTA organisations have an independent position, access to parliament is not self-evident. For instance, parliament is not required to give a formal response to TA reports. One much appreciated way of getting a broad range of parliamentarians to take notice of what a PTA organisation has done, is to organise hearings. Also direct involvement of parliamentarians in TA projects occurs in most countries. This reaches a more limited number of parliamentarians, but the effects on individual parliamentarians (and their committees) appear to be deeper.

Parliamentarians are aware that independent PTA institutes not just work for parliament, but target a much broader audience. Some see the PTA organisation more as a societal think-tank than as a political think-tank. By stimulating public debates, knowledge and opinions of stakeholders on specific S&T issues are influenced. In turn, these S&T issues may end up higher on the political agenda. All the parliamentarians that have been interviewed see the added value of the involvement of citizens and stakeholders. As one parliamentarian put it: "This is important because you get a feeling what common people think about expert issues. You can see how they interact with experts, how they form opinions." Stimulating the public debate is recognised as an important mechanism to attract the attention of parliament and to (indirectly) influence the opinions within parliament.

A recurrent theme in the interviews was that PTA organisations have to make sure to grab the attention of parliamentarians. They have to ensure that their work is relevant and connects with the political agendas. Long-term S&T issues often do not automatically get much response from parliament. Only when a controversy emerges, when the press starts to pick up S&T issues, or when stakeholders raise their voice, parliamentarians are spurred into taking notice. In other words, the challenge for PTA organisations is to make it difficult for parliamentarians to ignore their work and their products. It is illustrative of the difficulty of getting through to parliament that not all parliamentarians that have been interviewed can identify examples of TA projects that have managed to create sufficient upheaval to cause a reaction from parliament.

An example of how the press may be used to raise attention for S&T issues within parliament is the publication of an article (on online gambling) by a PTA organisation in a well-read newspaper. In this article a compromise was proposed for two conflicting opinions. The article had noticeable effects on the debate in parliament, according to one of the parliamentarians that was interviewed.

Several parliamentarians stress the fact that it is important for PTA organisations to be very focused on direct personal relationships with parliamentarians, especially parliamentarians with a high political profile. As one parliamentarian said: "They need to be in continuous good communication with the members of parliament." Another parliamentarian added that PTA organisation should avoid interacting only with parliamentarians that already have affinity with social and ethical aspects of technology. "Preaching to the converted will not lead to changes in opinions and attitudes, nor to initialising actions." Most of the interviewed parliamentarians recognise that PTA organisations have paid more attention to communication in the past years and have become better in finding their way to parliamentarians.

Several examples could be found of active direct involvement of parliamentarians which had effects on 'raising knowledge' and, indirectly, on 'forming opinions' as well. One example of an influential TA project was on the future energy system. It involved all the spokesmen of all parties in parliament and all stakeholders. The insights from this project (on the possibilities of a more sustainable energy system while stimulating economic growth, several scenarios) were relevant for parliamentarians and helped to move the discussion to a higher level. This issue came higher on the political agenda and it became part of a public debate. This TA project not only helped to 'raise knowledge' of parliamentarians, but also gave them factual data to work with and to support their political stances with. The effect on 'initialising actions' is less visible.

Although PTA activities not always receive a lot of attention in parliament or parliamentary committees, TA reports will often be read by staff members of the political parties in parliament as background material, thus contributing to the 'raising knowledge' dimension. It should, however, be noted that "we have many other sources of information as well", as one parliamentarians put it.

One parliamentarian stressed that the impact of PTA on S&T policy-makers within ministries might be larger than the impact on parliamentarians. Especially in the policy-design phase, policy-makers might be more inclined than parliamentarians to take the time to read TA reports carefully. Moreover, in matters related to S&T policies, parliamentarians tend not to be actively involved in the policy-design stage of the policy cycle, but rather to focus on scrutinising policy proposals.

From the interviews it also appeared that it is important to have sufficient critical mass to have an effect. Smaller PTA organisations find it much more difficult to have an impact upon parliamentary decision-making. Especially participatory methods tend to be relatively expensive and resource intensive. If budgets and staff are too small for such activities, it will be very difficult to influence parliament via the public agenda.

In one instance, it was mentioned that the public attitude towards S&T in general is also an important factor. If the ground attitude is negative, parliamentarians will be less inclined to profile themselves in terms of S&T issues, making it more difficult for PTA organisations to have an effect on parliament.

In sum, the interviews with parliamentarians suggest that independent PTA organisations appear to have the most visible effects in the dimensions of 'raising knowledge' and 'forming attitudes/opinions'. Effects on the dimension of 'initialising actions' are much less visible and more indirect. One of the reasons is that PTA is only one of many sources that are used by parliamentarians in their decision-making. Another reason is that in most countries it is the government that undertakes actions with parliament focusing on scrutinizing government's policies.

5.2.3 **Trends in effects**

An overall trend since the introduction of PTA in Europe is a shift from the classic TA function of scientific assessment of technological options towards more stimulating public debate on the social/ethical consequences of technology. This corresponds to a shift in types of effects of PTA. Although raising knowledge is a basic effect of PTA in all countries included in the study, forming attitudes and opinions has gained importance various countries, especially those where PTA is institutionalised as an independent institute.

The findings of the study suggest that it has become more important for PTA organisations to demonstrate their relevance for parliamentary decision-making. Active involvement of parliamentarians in TA projects appears to be on the rise. Communication is increasingly recognised as an integral part of TA work in order to have more effects on parliamentarians and parliamentary committees.

5.3 Conclusions

A general conclusion from the overview of outcomes of PTA is that raising knowledge is a main type of effect for all PTA organisations. This corresponds to the fact that all PTA organisations have the function to inform parliament on S&T issues. PTA organisations with a broader mission that includes stimulation of public debate tend to have effects in the other dimensions as well, but these are often less direct and less visible. Attribution of effects to PTA activities is a general problem, because parliamentary decision-making processes have many varied inputs from various sources.

In an earlier study, Cruz and Sanz (2005) also concluded that the impact on the first dimension of raising knowledge appeared to be larger than the impact on forming attitudes and opinions and on initialising actions. The impact on initialising actions appeared to be the lowest. A possible explanation they offer is that parliaments in Europe are more prone to promoting the function of controlling the government's actions rather than that of the legislation.[25]

A second conclusion of our study is that the institutional embedding and missions of the PTA organisations influence their effects. The institutional setting determines the formal relation of the PTA organisation to parliament. Organisations that have parliament as their 'owner' – i.e. PTA organisations within, or closely linked to parliament – have a direct formal access to parliamentarians, which helps to get their message across to parliamentarians and parliamentary committees and to raise their knowledge on S&T issues.

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[25] In the European parliamentary (rather than presidential) form of government there is no strict separation between executive and legislative powers. The executive branch is elected and supported by parliament. The legislative branch has the right to remove the government from office. In the political reality, government and parliamentary majority work closely together. The real division of power is along the lines of government with the majority party/coalition versus the opposition party or parties. (See Petermann (2000) for an elaborate account of TA units in the European parliamentary systems).

In turn, this creates conditions for changing attitudes and opinions, which might lead to changes in policy-making or legislation. The quality, credibility and impartiality of the information provided are crucial, and this depends on the capabilities and budgets that are available for performing TA activities. Also the status and recognition of the PTA committee/office within parliament is a determining factor. In France, for instance, OPECST can have an effect on legislation or regulation because it benefits from a special recognition inside parliament as the dedicated place for technology assessment. In Greece, however, the Greek Permanent Committee of Technology Assessment appears to suffer from a lack of budget and status within parliament. The status of a PTA committee also depends on its membership. A PTA committee can have more impact when it has experienced influential politicians as its members.

On the other hand, a close link to parliament also limits PTA organisations in the type of TA work they can do and the questions that they can address. They cannot afford too much activism and proactive activities. These constraints may also limit the impact of PTA, especially on the dimension of forming attitudes/opinions and initialising actions. Independent institutes have the advantage that they can play a more active role in the public sphere as compared to parliamentary committees/offices that are integrated in parliament.

PTA organisation that operate at a distance from parliament – the independent PTA institutes – have less of a direct access to parliamentarians which makes it more challenging to get parliamentarians to pay attention. These PTA organisations have to develop more capabilities in involving parliamentarians in their work and communicating their results to parliament and parliamentary committees (and other actors). It is increasingly recognised by this type of PTA organisations that communication should be an integral part of TA. The Rathenau Institute, for example, has made much efforts to professionalise its communication function, and recognises the importance of networking and lobbying with parliament as well as other actors like ministries and societal organisations. The German TAB, as an example of a parliamentary office, does not see communication as part of their work. The TAB reports are distributed via the official channel of the German parliament via their website.

The flipside of the coin of less direct access to parliamentarians is that these type of PTA organisations have more freedom in defining their work programmes and choosing their methods and in formulating conclusions and policy recommendations. Typically, they have a broader mission that includes stimulating public debate and involving various stakeholders. Although they have less direct access to parliamentarians, they have more freedom to access other actors than politicians, which helps to have impact on the dimension of changing attitudes and opinions. By mobilising stakeholders they can create a position to influence the political agenda and to spur parliament into action. To have effect on the agenda, decision-makers have to accept that the information must be considered politically.

Moreover, these PTA organisation usually also target policy-makers within the ministries, which may also contribute to effects in the dimension of changing attitudes (e.g. agenda setting) and initialising action (e.g. changes in policy or legislation).

Because independent institutes are less exclusively focused on improving parliamentary decision-making and more on stimulating sustainable co-evolution of technology and society, their toolboxes are broader and include more interactive methods. Whether or not the participative methods are effective in terms of influencing political decision-making also depends on the political culture, in particular the extent to which parliamentarians are used to listen to stakeholders and their constituencies before they make a decision. In other words, the absorptive capacity of parliaments to integrate participative TA results into their decision-making processes determines whether or not participatory TA methods are likely to be influential.

One recurrent theme for most PTA organisation is the challenge of getting parliament's attention. This is often not easy, if only because political work is largely governed by short-term issues that require immediate attention, rather than long-term issues such as the consequences of S&T for society. Moreover, parliamentarians often do not have an affinity with S&T developments. S&T is generally not high on personal agendas of politicians. It appears to be pivotal to create a sense of urgency or necessity to have effect on parliament, even in cases where the PTA organisation works at the direct request of parliament. To capture the attention of politicians it is never sufficient to have a formal channel that allows direct access. It also depends on how TA results can be used by parliamentarians to underpin and strengthen their arguments and to enhance the legitimacy of their decisions. It appears to be important for PTA organisations to have knowledge of political decision-making and policy-making processes in order to be able to have an effect on parliament. As one interviewee put it: "In order to grasp parliamentarians' attention, you have to offer something very, very interesting. But even more important, it has to be urgent. Nobody has time. If you say: 'it is important and you should learn', they say: 'OK, I'll look into it tomorrow', and tomorrow never comes."

While parliamentary committees and parliamentary offices appear to have their main (direct) effects on the dimension of 'raising knowledge', the independent institutes appear to address all types of outcomes, varying per project, but with a relatively stronger focus on the second and third dimension of outcomes. They do this by involving stakeholders and citizens and stimulating debates. By stimulating societal agenda setting, they influence the political agenda as well. However, as one of the interviewees summarised their position rather illustrative for this group of PTA organisations: "We advise parliament, but we do not decide, so we have to be careful and not to give too strong recommendations, but provide different options. In order to get our message through to parliament, our work has to be easy to read, clear, and concrete as possible".

This is very crucial for catching the interest of parliamentarians, each with their own political and personal agenda; they have to become aware of the work of the PTA organisation, otherwise there will be no impact. For that reason these institutes are putting relatively large emphasis on communication activities.

One clear trend of the last decade is that most PTA organisations appear to have become more effective in getting the attention of parliament and playing a role in parliamentary decision-making processes; this is a result of learning processes in and professionalisation of the PTA organisation.

Appendix A   List of Interviewees

Figure 12 List of Interviewees

Country	PTA Organisation	Member of Parliament
France	Marie-Christian Flosse-Bloch Eric Szij	-
Finland	Paula Tiihonen	Jyrki Kasvi
Italy	Elisabetta Mirra	-
Greece	Costas Papadimitriou	-
European Parliament	Theodoros Karapiperis	-
United Kingdom	David Cope	-
Germany	Armin Grunwald	[after many tries not succeeded in contacting and arranging interview with PM]
Sweden	Helene Limén	Karin Svensson Smith
Catalonia (Spain)	Ferran Domínguez Garcia	Ernest Benach I Pascual
Denmark	Lars Klüver	Anne-Grethe Holmsgaard
The Netherlands	Jan Staman Frans Brom	Godelieve van Heteren
Switzerland	Sergio Bellucci	Jacques Neirynck
Norway	Tore Tennøe	Alf Holmelid
Flanders (Belgium)	Robby Berloznik	[after many tries not succeeded in contacting and arranging interview with PM]

Appendix B   Questionnaires

Questionnaire for PTA-directors:

1. What is the current position of the PTA organisation in relation to parliament & government (e.g. by using following classification: internal organisation to Parliament, part of other organisation, independent institute)?   Has it changed over time?

2. What is the PTA organisation's mission? Has it changed over time?

3. What is the degree of autonomy/dependence (vis-à-vis main client) in formulating strategy and/or setting the strategic agenda such as (multi-) annual programme, distribution of resources across important activities (studies, interactive work forms, communication, etc? Has it changed over time?

4. Are there other clients and funders? Has it changed over time?

5. Are there other governance actors? What is the role of these other governance actors (such as: member of board or council, financers, ….)? Has it changed over time (types and roles of other governance actors)?

6. What is the annual budget? Has it changed over time?

7. What is the part of budget (%) from other financers than parliament? Has it changed over time?

8. What is the number of employees (FTE)? Change over time in # employees?

9. What is the composition of staff (%): 'experts', communication, supportive staff? Change over time in composition of staff?

10. What are main methods used in PTA used in 2010? What are the main changes in the use of types of methods in PTA since the start of the PTA office (timing & trends) and why have these changes taken place?

11. What type of stakeholder (NGOs, companies, scientists, broad public, etc.) are involved in PTA activities? What is there role and how has this evolved over time?

12. On which domains do the current PTA activities focus; what are the main topics (technology, issues)?

13. What are main effects of the PTA activities on parliament at the moment? (use of classification Raising knowledge , Forming of attitudes and opinions and Actions have been initialised; and their sub-specifications. Illustrate your answer with specific projects where needed). How has this changed over time?

Questionnaire for MPs:

1. What are the type of effects of the reports, meetings and other PTA-products on the work of Parliament (in general, and in order to illustrate: for specific projects, issues as examples)?

2. What did you gain most (Raising knowledge, Forming attitudes and opinions, Initialising actions)?

3. Did the study have effects on actors other than those of the Parliament? In what way?

4. In what way would the opinion of a left / right wing Member of Parliament differ from yours?

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Appendix D   Overview of institutionalisation characteristics of PTA organisations

Figure 13 Summarising table of PTA institutional settings

Country	Name	Year of establish-ment	Mission / mandate	Main audience	Organisation / Governance	Staff (secretariat)	Annual budget
France	OPECST	1983	To improve (or 'enlighten') S&T decision making in parliament by providing information on the consequences of S&T options	Parliament	Joint non-legislative committee with 36 members from both Houses of Parliament; established (and extended) by law; with own rules of working; assisted by Scientific Council with 24 leading scientists	?? 'Rapporteurs' are assisted by civil servants of the parliament	?? [no fixed budget?]
Finland	Committee for the Future	1993	To improve policy making in Parliament on the future by assessing the societal impact of technological development	Parliament	Standing parliamentary committee, regulated by the parliamentary regulations. TA activities mainly funded by parliamentary budget	4 civil servants (3 FTE): 2 experts, 2 assistants	Ca. 90,000 (for commissioning studies and producing reports, excluding salaries and overhead cost) Plus: contribution of SITRA (expert assistance)
Italy	VAST	1997	To improve S&T policy making in Parliament by coordinating parliamentary activities related to S&T	Parliament	Committee of the Bureau of the Chamber of Deputies; the Bureau decides on the funding of TA activities	No permanent secretariat. VAST is assisted by 2 secretarial staff members from the Standing Committee for Economic Affairs, Trade and Tourism	?? No fixed budget
Greece	GPCTA	1997	To support and improve S&T decision making in parliament by providing background studies, organising discussions and giving strategic advice	Parliament	A special permanent parliamentary committee provided by the Standing Orders of Parliament. Scientific support by the Directorate of Studies in parliament	2 FTE	?? No fixed budget; expenses paid by parliamentary budget

European Parliament	STOA	1987	To support S&T policy making by EP Committees by providing expert, independent assessments of the various S&T options in the policy sectors concerned	Parliament	Official organ of the EP. The STOA Panel – with MEPs nominated by six parliamentary Committees – is politically responsible for STOA's work. The STOA Bureau runs STOA's activities and prepares the Panel meetings. Operational responsibility is with the STOA Team in Policy Department A (Economic and Scientific Policy) of the DG for Internal Policies of the Union.	The STOA team consists of a Director, Head of Unit and a permanent staff of eight persons (3 administrators, 2 assistants and 3 secretaries)	650,000 euro (20118)
United Kingdom	POST	1989	To support parliamentarians to examine S&T issues effectively by providing information resources, in-depth analysis and impartial advice)	Parliament	Permanent bicameral parliamentary office that works exclusively for the two Houses of Parliament. The POST Board includes MPs en non-MPs and is responsible for strategic management. POST staff consists of science advisers that conduct analyses, drawing on a wide range of external expertise. TA activities are done in-house.	POST employs 9 people: a director, a deputy director, 5 parliamentary scientific advisors and 2 office administrators. Plus: 4 Fellows via collaborative fellowship schemes	Ca. 1.2 million GBP (1.4 million euro)
Germany	TAB	1990	To advise parliament and its committees on S&T issues by supplying information and providing a scientific basis for the policy making process	Parliament	TAB is a non-parliamentary bureau contracted out by parliament to the Karlsruhe Institute of Technology (KIT) TAB is an independent scientific unit of the Institute for Technology Assessment and System Analysis (ITAS) at the KIT. The TAB director is responsible for the scientific results. TAB reports to the parliamentary committee on Education, Research and TA, which acts as the governing body (§56a of the Procedural Rules of the parliament) and decides on the work programme. The secretariat of the committee organises communication between TAB, the committee and the TA rapporteur group which is formed for each TA projects and draws members from relevant parliamentary committees.	TAB employs 11 people: 2 directors, 6 research staff and 3 secretaries.	Ca. 2 million euro

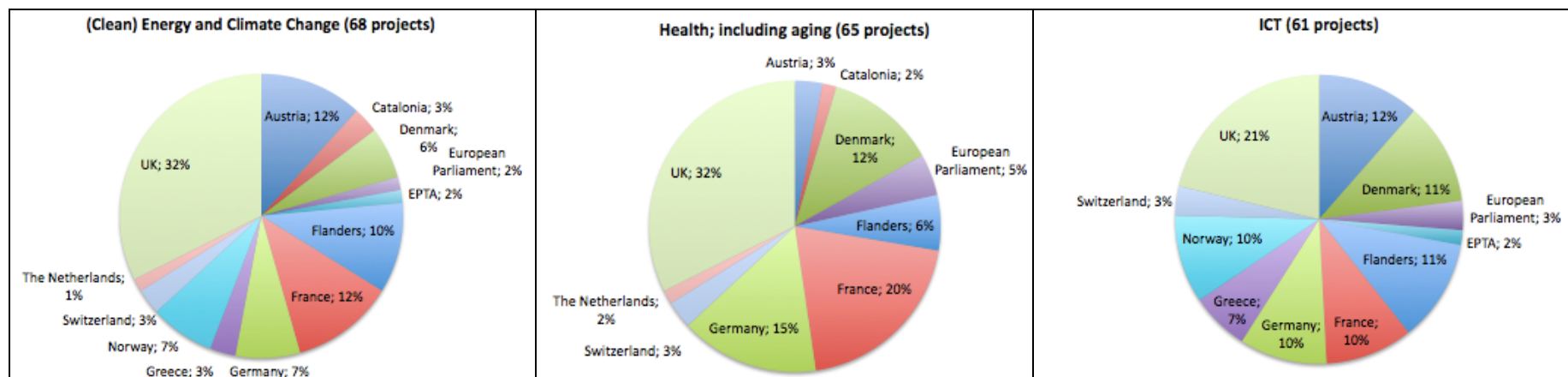| Sweden	PER	2007	To help parliament to make evidence-based decision on S&T by providing parliament with high-quality background material	Parliament	PER is part of the Research Service of the Swedish Parliament. Parliamentary committees can submit proposals and requests to the unit. All-party steering groups guide TA projects.	The unit has 3 people, two for TA projects, one for organising workshops, seminars, etc.	Ca. 400,000 euro
Catalonia (Spain)	CAPCIR	2008	• To improve S&T knowledge of parliament and disseminating it among Catalan society. • To channel participation from the main S&T institutions in parliamentary S&T decision making • To cooperate and coordinate with the various actors that operate in the fields of S&T • To promote shared responsibility with regard to S&T policies.	Parliament S&T community	CAPCIR is the Parliament's Advisory Board on S&T. It is a joint body with the participation MPs and representatives of S&T institutions in Catalonia. CAPCIR is chaired by the president of parliament. It is responsible for coordinating S&T advice to be received by Parliament using input from the S&T community. It acts as an intermediary between parliament and the S&T community.	The Advisory Board has a secretary	??
Denmark	DBT	1986	• To monitor the technological development • To carry out independent studies and comprehensive assessments of the possibilities and consequences of technology for society and the individual citizen • To encourage and support public debates on technology by communicating the results of the work to the Danish Parliament and to other political decision-makers as well	Parliament Government Danish population	The DBT was established by law and is since 1995 a permanent independent institute that is formally under the Ministry of Science, Technology and Innovation. The DNT consists of a Board of Governors and a Board of Representatives. A secretariat is attached to the Board. The Board of Governors determines independently the tasks of the DBT and consists of a chairman and ten trustees appointed by the Minister of Science, Technology and Innovation (after broad consultation). Board members are non-MPs. The Board of Representatives with 50 members with various backgrounds serves as a room for open debate on current issues in relation to TA. It may propose new initiatives.	The secretariat employs has a steady staff of 18 FTE (1 director, 10 project managers, 15 project assistants, 10 support staff)	DKK 12,5 million (ca. 1.7 million euro) via government grant. Additional sources of revenue amount to 1/3

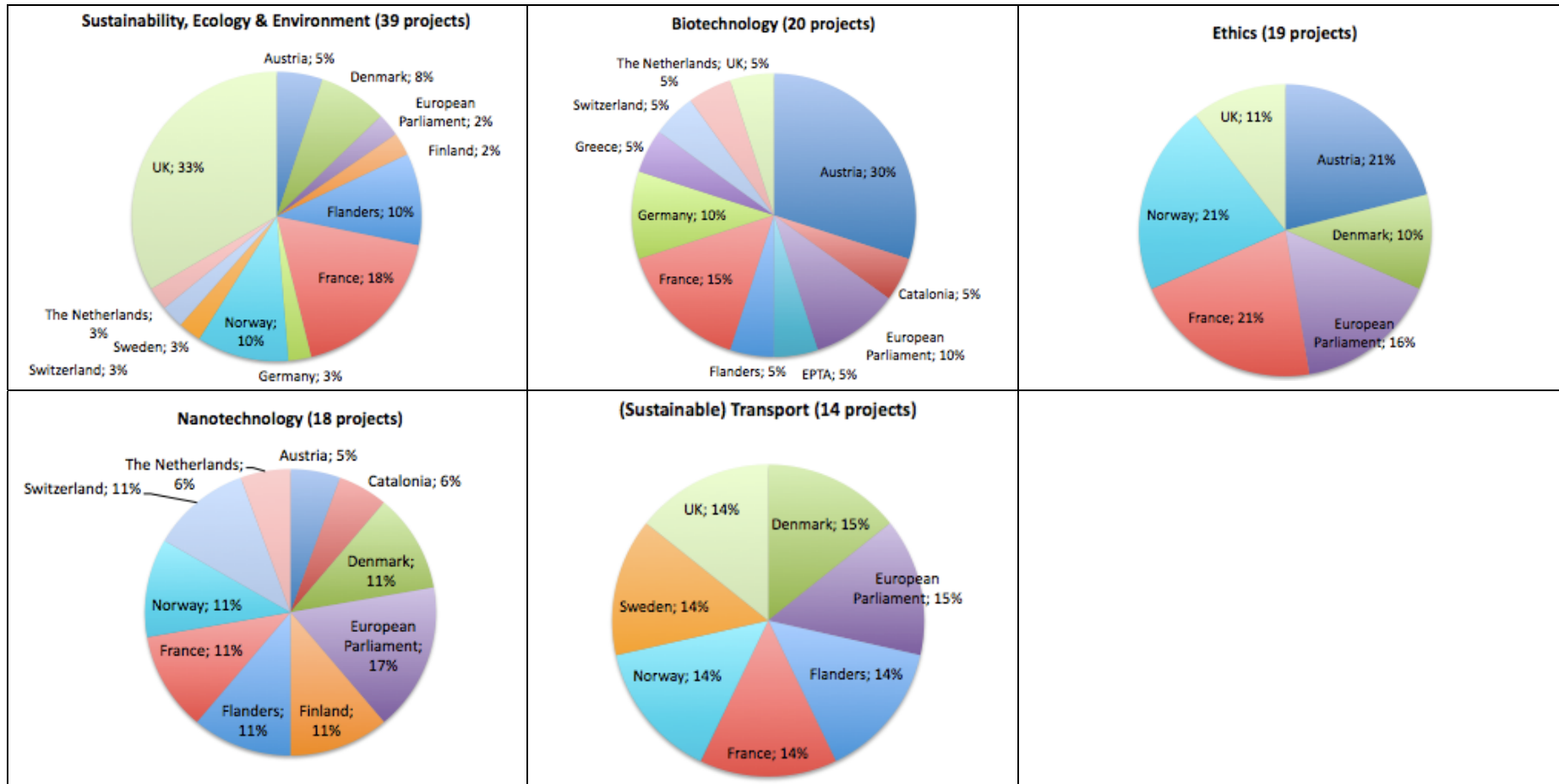|							
			as to the Danish population		The DBT receives an annual government grant (Finance Act). The trustees are responsible for the prioritisation of the tasks of the DBT and the administration of the grant.		
The Netherlands	Rathenau Institute	1986	• To encourage public debate and with regard to the social, ethical and political impact of modern S&T • To assist political decision-making with regard to the social, ethical and political impact of modern S&T • To study the organisation of the science system and how that system responds to scientific, social and economic developments.	Parliament Government (ministries) Stakeholders (e.g. organisations within the science system, societal organisations, the private sector, etc.) Dutch population, European Parliament	Independent institute, founded by ministerial decree, administratively under the Royal Academy of Arts and Science (KNAW). The Board is responsible for the strategic management. Its members are appointed by the minister of Education, Culture and Science after consultation of the KNAW and the Scientific Council for Government Policy. The Board may establish an advisory Programme Council. The Board decides on the bi-annual work programme, which is sent to the minister, and via him to Parliament. The director of the institute is responsible for the operational management. Director and other personnel are employed by the KNAW. Rathenau receives a government grant.	Rathenau employs 52 people: 1 director, 16 for Technology Assessment, 17 for Science System Assessment, 7 for communication, 10 for management & support (the latter also serve two other KNAW institutes).	5.4 million euro (4.9 million government grant); half for Technology Assessment, half for Science System Assessment
Switzerland	TA-SWISS	1992	To support the political decision making process in relevant S&T issues by gathering the views of citizens and compiling scientific and interdisciplinary studies	Parliament Federal Council (government) Stakeholders (e.g. organisations within the science system, societal organisations, the private sector, etc.) Swiss population	Independent institute, administratively under the Swiss Academies of Arts and Sciences (as a Centre of Competence), founded by law. The TA-SWISS Steering Committee is responsible for the strategic management. Its 30 members are nominated by the Executive Board of the Swiss Academies of Sciences after consultation with government and the Head of TA-SWISS. Half from S&T community, industry and NGOs, half from public bodies. The latter group are 'guest members' without voting right. TA-SWISS is funded by the federal government. The TA-SWISS office is responsible for operational activities. Expert studies are contracted out to external experts.	The TA-SWISS office employs 6 people: 1 director, 2 administration & finance, 2 scientific staff. There are also 2 external co-workers.	CHF 1.4 million (1 million euro)

| Norway | NBT | 1999 | • To assess impacts and options of technology in all areas of society
• To stimulate public debate on technology
• To support the political decision-making process and shaping of technological change.
• To monitor international technological trends and methods for TA | Parliament
Governmental
Norwegian population | Independent institute, established by the government, at the initiative of parliament. The NBT has 14 non-parliamentary members, appointed by government. It has a secretariat that is formally organised under the Research Council of Norway.
The NBT makes a yearly report to the Ministry of Trade and Industry, which is widely distributed. The regulations of the NBT are laid down once a year by Order in Council. | The secretariat employs 9 people: 1 director, 1 senior executive officer, 6 project managers, 1 information manager | NOK 8 million (ca 1 million euro) |
| Flanders (Belgium) | IST | 2000 | • To enhance the quality of the societal debate
• To contribute to a better-founded decision-making process
• By investigating the societal aspects of S&T developments, by structuring and stimulating the societal debate, by observing S&T developments, by conducting prospective research into these developments, by informing its target groups, and by advising the Flemish Parliament based upon these activities. | Parliament
Interest groups
General public | Independent para-parliamentary institute, established by decree, associated with parliament. IST consists of a Board of Directors and a Scientific Secretariat. The Board has 16 member, half from parliament, half from the S&T community) and is responsible for the strategic management. Members are appointed by parliament. The IST has its own internal regulations, endorsed by parliament. The Secretariat is responsible for the operational management. IST's budget comes from parliament and the Bureau of the Parliament decides on the budget. | The secretariat employs 8 people: 1 director, 5 project managers, 1 communication and coordination, 1 secretary. | 1.5 million euro |

Appendix E   Relative shares per country of the projects in the major project themes in the EPTA database

Figure 14 Contributions of countries to the major themes of projects taken up in the EPTA database. The database gives an indication of important themes in PTA, but might not include all activities of PTA organisations.

Note that the number of projects are displayed; the relative size of projects is not taken into account.

Sustainability, Ecology & Environment (39 projects)

Austria; 5%
Denmark; 8%
European Parliament; 2%
Finland; 2%
UK; 33%
Flanders; 10%
France; 18%
The Netherlands; 3%
Switzerland; 3%
Sweden; 3%
Norway; 10%
Germany; 3%

Biotechnology (20 projects)

The Netherlands; 5%
UK; 5%
Switzerland; 5%
Greece; 5%
Germany; 10%
Austria; 30%
France; 15%
Catalonia; 5%
European Parliament; 10%
Flanders; 5%
EPTA; 5%

Ethics (19 projects)

UK; 11%
Austria; 21%
Norway; 21%
Denmark; 10%
France; 21%
European Parliament; 16%

Nanotechnology (18 projects)

The Netherlands; 6%
Austria; 5%
Catalonia; 6%
Switzerland; 11%
Denmark; 11%
Norway; 11%
European Parliament; 17%
France; 11%
Flanders; 11%
Finland; 11%

(Sustainable) Transport (14 projects)

UK; 14%
Denmark; 15%
European Parliament; 15%
Sweden; 14%
Norway; 14%
Flanders; 14%
France; 14%

Appendix F   Topics addressed by PTA organisations by year (2005-2010)

Figure 15 Topics addressed by PTA organisations in 2005-10
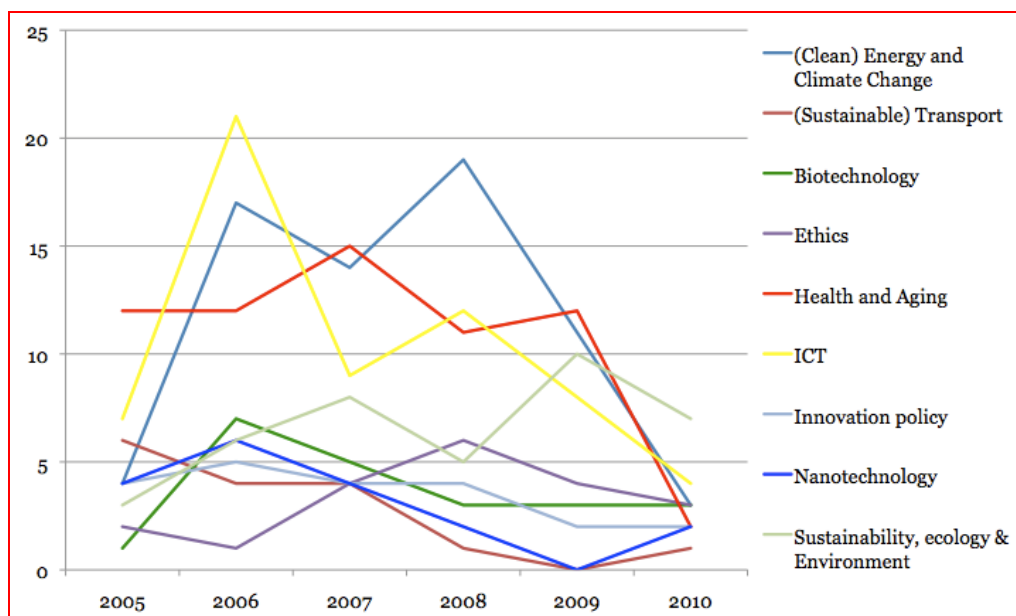
Appendix G   Potential topics for collaboration

Nanotechnology

Nanotechnology is a technological topic that is addressed by most of the PTA-organisations (see Figure 16).

Figure 16 Nanotechnology projects of the EPTA members

Country	2003	2004	2005	2006	2007	2008	2009	2010
Austria								
Catalonia								
Denmark								
European Parliament								
Flanders								
Finland								
France								
Germany								
Italy								
Greece								
Norway								
Switzerland								
Sweden								
The Netherlands[26]								
United Kingdom								

= project duration max 1 year   = project duration longer than 1 year

Source: Technopolis Group 2010.

Source: EPTA database

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[26] The Dutch Rathenau Institute has published several other studies and organised conferences; these are not in this overview because they were not included in the EPTA database.

PTA-projects on nanotechnology are carried out since 2003, according to the EPTA database and additional information from a PTA-office[27]. The countries/regions that started nanotechnology projects are Denmark, Flanders, Germany, The Netherlands and Swiss; primarily Independent Organisations. This could be an indication that the Independent Organisations are well capable of signalling new trends. Because they have more in-house expertise in technological fields than Parliamentary Committees and Offices and thus are better equipped to identify new trends[28], they are also able to influence the parliamentary agenda setting process.

Although accents may differ from country to country, nanotechnology seems to be a rather coherent field of study by the PTA-organisations. Within the projects that address nanotechnology, common issues are (potential) consequences for health and the environment. Another issue often addressed in the projects are regulatory issues related to the new characteristics of nanomaterials. Another frequently studied issue is the convergence of nanotechnology with other fields (NBIC: nanotechnology, Biotechnology, Information and Communication technologies). Furthermore, a number of the projects have a communication function (Flanders, Denmark)[29]. However, most of the projects are studies assessing the impacts of the (both negative and positive) promises of the technology.

All in all, nanotechnology is a topic that is more and more addressed by PTA-organisations. As part of the projects concerns rather technical issues of nanotechnology – as science and technology development are globalised activities there will be entrance points for synergies at European level.

Global warming

Global Warming is a societal issue that is high on the PTA agenda, according to the interviewees and the EPTA database search. Moreover, it is a pivotal issue to one of the Grand Challenges that EU research policies aim to contribute to.

The EPTA database has been scanned for projects that have a key word related to global warming in the title or project description[30]. Figure 17 shows the projects of EPTA members related to this issue.

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[27] TA-SWISS published a first Study on "Nanotechnology in Medicine" in 2003. We are aware of studies on nanotechnology in The Netherlands and Germany, conducted before 2004, such as TAB study 92. These studies are not listed in the EPTA database.

[28] The last argument also counts for Germany, because the studies are conducted by the TA institute ITAS.

[29] This topic is addressed in other countries as well, but not necessarily by the PTA organisation. In Germany and The Netherlands for instance, science communication activities such as the Nanotruck have no affiliation with TAB, nor does the Dutch Nanopodium.

[30] i.e. global change, global warming, green house, CO_2 (and all variants), carbon dioxide, CCS.

Figure 17 Global Warming projects of the EPTA members

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Austria												
Catalonia												
Denmark		■		■	■	■	■	■	■		■	■
European Parliament						■	■	■				
Flanders					■				■			
Finland							■	■	■	■		
France	■	■				3	■	■	■	■		
Germany				■		■						
Italy												
Greece												
Norway					■				■			
Switzerland												
Sweden												
Netherlands[31]												
United Kingdom						2	3	3	4	■		

■	= Project duration max 1 year; Number indicates the number of studies	■	= Project duration longer than 1 year

Technopolis Group 2010.

Source: EPTA database

Global warming is an area that is quite intensely addressed by a number of PTA-organisations: Denmark, the European Parliament, Flanders, Finland, France, Germany, Norway and the UK dedicate projects to this topic. Several of them have done in-depth studies that last for a number of years (Finland and France with very lengthy projects – and Denmark the EP and the UK with 2 and 3-year projects. In the UK, France and Denmark global warming is high on the agenda of the PTA organisations; quite a number projects is aimed at global warming.

Issues addressed by the projects are nearly all related to energy efficiency or renewable energy sources. The projects address technological solutions for emission of greenhouse gases (e.g. in transport), behavioural and legislative issues and public opinions on the problem of global warming.

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[31] The Dutch Rathenau Institute has published several other studies on this subject. They are not included in the EPTA database.

Global warming is relevant at the European level; it is a grand challenge to EU the research policy, it is a cross-border issue and the problem is comparable from country to country. The technological solutions and regulatory issues that are dealt with in the studies are however not always congruent. Overall, global warming is a field that can benefit from co-operation and coordination of PTA activities at a pan-European level.