DRAFT

JOINT HORIZON SCANNING: IDENTIFYING COMMON STRATEGIC CHOICES AND QUESTIONS FOR KNOWLEDGE

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NOTE: The views expressed in this article are those of the author (as coordinator of the Pilot joint horizonscan project) and do not necessarily reflect the views of the Netherlands ministry of Education, Culture and Science neither that of the other partners involved in the project.
Summary

Horizon Scanning, together with other future-oriented methods such as foresight and technology assessment, is a powerful tool that can be used to inform the strategic decisions of companies, non-government and government organisations. Horizon scanning not only provides a view of key future issues and actors, along with their potential interactions, it can also help surface the major (scientific and political) questions that require answering in order to make strategies more robust and resilient.

Over the past decade, horizon scanning has been recognised as part of forward-looking government processes in a number of industrialised countries. It helps policy-makers in addressing not only the diversity of societal and environmental challenges of the future, but also the potential of emerging areas of Science and Technology.

Based on the experience of the UK, Canada, Japan and the Netherlands, the ERA-Net network For Society\(^1\) initiated a pilot project “Joint Horizon”, combining the latest data and experience of three national horizon scans – namely the Sigma Scan of the Foresight Horizon Scanning Centre at the UK Government Office of Science; the OECD-DASTI Horizon scan commissioned by the Danish Agency for Science Technology and Innovation; and the Netherlands Horizon scan of the COS, commissioned by the Netherlands Government.

The pilot was executed by a special team made up of representatives of DASTI, the UK Horizon Scanning Centre, COS\(^{ii}\), the Malta Council for Science and Technology and PREST.

The pilot resulted in a mutually beneficial exchange of information between the partners regarding the purposes and approaches of the different national horizon scanning processes, and a database containing the main scan data from the three countries. Analysis of these data and approaches leads us to make some recommendations regarding horizon scanning processes on the national level, and also regarding the way joining up horizon scanning efforts may contribute to the construction of future-oriented common policies and new joint research programmes.

Keywords:

horizon scanning, participative foresight, resilience, sustainable policy, knowledge agenda, research programming, strategic decision making, international cooperation

\(^{i}\) [http://www.eranet-forsociety.net/ForSociety/index.html](http://www.eranet-forsociety.net/ForSociety/index.html)

\(^{ii}\) Commissie van Overleg Sectorraden voor Onderzoek en Ontwikkeling
1 Introduction

In 2004, the ERA Net For Society began its mission to develop sustainable cooperation between national foresight programming bodies in 15 European countries. One of the aims of this network was to initiate joint transnational (foresight) activities which combined the foresight activities of at least 3 to 5 of the foresight programming bodies. To achieve this the pilot project, the “Joint Horizon” project was launched, focused on assessing the feasibility and desirability of joining the individual horizon scanning activities of the participating countries, the United Kingdom, Denmark, and The Netherlands. Since these activities share and are characterised by their broad scope, it was envisaged that it would be less difficult to create a joint approach in contrast with foresight activities with a more specific focus.

Furthermore, it was assumed that the sharing of these broad-scope activities could facilitate the development of cooperative mechanisms, not only between policy domains and scientific disciplines, but also between countries and different parts of government. These cooperative mechanisms could make prioritising specific areas of interest in an international setting possible. This might then make it possible to undertake joint or internationally coordinated foresight activities on a specific theme, based on sets of scanned issues that identify important foresight topics. This might apply not only to the partners involved, but also to the other For Society partners and interested parties outside of the present cooperation (for instance Japan and Canada).

Joint horizon scanning could become the engine for further cooperation between national foresight programmes and European institutions, as was originally envisaged for the For Society Network. This network took a certain time to understand the similarities and differences between national foresight programmes and activities. It had to acknowledge that, for the development of joint activities, it is nearly impossible to try to combine projects and programmes that are up and running, even if they share titles. One of the reasons for this is that it is very difficult to alter activities if they have already been scoped. Further analysis of barriers and catalyzing factors (carried out by the EAR Net) established that cooperation could be achieved more easily during the scoping phase, and in projects that focus on raising awareness of emerging issues. This explains why horizon scanning activities rather than larger foresight projects may in the end provide the common language and currency for exchanging ideas and perspectives about the future between countries.

1.1 What is horizon scanning?

The word scanning usually refers to a repeated and systematic observation of a space or a body, which is meant to distinguish and locate phenomena that for some reason need to be watched more closely. It is frequently used in warfare to develop early warning for attacks (radar, sonar scans) but also in medicine, where it can be used to locate infected tissues or malignant cancer (NMR, ultrasound etc). In business management the term environmental scanning is used to refer to the systematic observation of developments that present either threats or opportunities for the business. These may take place in the immediate business (or ‘transaction’) environment, but may also be broader social or regulatory trends.

There are many descriptions and definitions of horizon scanning in use. Here we give one based on definitions used in different horizon scanning programmes in the UK and the Netherlands.
Horizon scanning is the **systematic** examination of potential (future) problems, threats, opportunities and likely future developments, including those at the margins of current thinking and planning. Horizon scanning may explore novel and unexpected issues, as well as persistent problems, trends and weak signals. Overall, horizon scanning is intended to improve the robustness of policies and to identify gaps in the knowledge agenda (derived from UK Foresight Horizon Scanning Centre (HSC) / Horizon Scanning Netherlands”).

Horizon scanning is also: looking **ahead, beyond usual timescales (as far as we can see)** and **across disciplinary and departmental borders** 

1.2 **Characteristics government horizon scanning**

An analysis/reviews of different horizon scanning exercises and descriptions highlights the following characteristics:

- A **systematic process**, which is designed to give a comprehensive picture of relevant future issues for an actor (or a set of actors), to support strategic considerations, decisions and actions. In general, this means that the future horizon is divided up into **a set of categories** that serve as co-ordinates

- A focus on all signals that might have **significant impact** on the strategic missions and **underlying values** of the actor(s).

- **No particular timeframe** (try to look forward as far as we can see or imagine), and the deliberate inclusion and recognition of **weak signals**.

- Deeper analysis of **weak signals** and of the **possible interaction of all scanned issues** and their relevance for strategic decision making.

- A **repetitive character**: since the horizon reveals more details each year, it is necessary to repeat the scan to see what has changed. Not only on the far horizon, to search for new emerging issues, but also to check whether and how phenomena that were observed in an earlier stage are developing over time.

- **Participation** and involvement of societal and government stakeholders, not only during the collection of data, but also to guide the interpretation and synthesis of data and to create support for the **implementation of results**.

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iii Crosscutting different policy domains

iv Parallel with the spatial coordinates used by radar and other scanning techniques
1.3 Who is engages in horizon scanning?

Horizon scans are initiated and used by different private and public organisations, mainly for strategic reasons.

Most of the broader governmental horizon scans were initiated by Ministries of Defence (or their agencies). Other examples were initiated by Ministries or departments, such as DEFRA (Department for Environment, Food and Rural Affairs) in the UK, the Ministry of economic affairs in the Netherlands, the French department of transport and maritime affairs and of Industry. Horizon scanning also appears in Departments of Health (and ageing), e.g. in New Zealand, Australia and Canada, but these scanning activities seem to have a very limited scope (only assessing new health technologies). Departmental horizon scans can be narrower in scope (only looking for new technologies), but tend to have a much wider scope if they focus on security, environment or the economy.

Horizon scanning on the national level, across all policy areas (including S&T opportunities) is a recent development and is still relatively rare, but fits well with the observation that there is an increasing need for more holistic approaches to informing strategic decision-making (e.g. environmental scanning, trendmonitoring, trend research and strategic early warning). The Government Office of Science in the UK started its national horizon scanning in 2004. This activity covers a wide range of Science and Technology forecasts (Delta Scan) and future developments across all policy domains (Sigma Scan). In the same year, the Netherlands started a national horizon scanning activity that covered a wide range of (potential) future problems, threats and opportunities in all policy domains (societal sectors) and in Science and Technology. Denmark started a horizon scan process in 2006, focusing on the societal needs of the future and emerging science and technology. NISTEP in Japan executed a scanning-like activity during 2005, which covers expectations across a wide range of societal areas and provides a broad scan of S&T developments and opportunities. The NISTEP exercise combines this broad-scope foresight with a thorough analysis of strengths and weaknesses of Japanese Research and Development, and connects this to emerging challenges. An increasing number of countries in Europe are considering undertaking horizon scanning activities in the near future (Malta, Norway, Swiss and Belgium), while other countries are building up scan-based policy documents (Finland, Canada) or recently carried out scanlike exercises that were solely used to design foresight programs (Germany, France)

Scans that were initiated by Public bodies and government were usually carried out by special units and/or councils and agencies most of these scan targeted a wide variety of users (as policy makers, researchers, consultancies, enterprises, departments etc).

Non-governmental organisations have carried out both narrow and broad horizon scanning, even on a global level. Well-known examples include the ICSU exercise that focused on societal issues and research agenda setting titled: “Worldwide Identification of Key Emerging Issues in Science and Society,” published in 2002 and the Foresight Analysis (2004). The exercise of the High Level Expert Group “Key technologies for Europe” can also be

\[\text{V} \text{ These scans will be merged before the end of 2008 into one scan, which will keep the Sigma Scan name.}\]
considered a horizon scanning exercise, but with a scope that is more directed towards technology. Also the Euro-scan$^{22}$ is worth mentioning here as an example of a scan with a more focused character (New health technologies).

1.4 Why join (trans national) horizon scanning?

The rationale for joining up horizon scans lies in the expectation that the sum of the scans may reveal issues that have been overlooked in the separate national scans. It was also hoped that the exchange of experience and know-how would be useful in strengthening the national scans. Finally, we are persuaded that horizon scanning gives us a tool to create a common understanding and shared awareness of a wide variety of future problems, threats and opportunities$^{vi}$, often originating in areas of activity or parts of the world that are ignored by mainstream media and generally under-researched which might have a significant impact on our future way of living and which need to be incorporated in our deliberations to develop robust (resilient and adaptive) shared strategies.

Therefore a joint scan can be used at many levels of decision-making$^{23, 24}$, but seems to be most rewarding at the level where common strategies have to be developed. Many issues (problems, threats and opportunities) we encounter in national and in departmental horizon scans cross the boundaries of policy areas, scientific disciplines and countries. But our actions generally stop at national borders. The joining-up of horizon scans may contribute to cross-border efforts to address cross-boundary issues through joint (coordinated) research activity and the development of common policies.

$^{vi}$ often originating in areas of activity or parts of the world that are ignored by mainstream media and generally under-researched
2 Methodology

The objectives of the joint horizon scanning pilot were mainly to:

- exchange experiences and know-how on horizon scanning at the national level;
- compare basic data (lists of issues and issue descriptions) from the horizon scans of the UK, Netherlands and Denmark;
- develop a model for continuous data sharing and comparison;
- compare working methods and methodologies used by the different horizon scans and formulate recommendations for improvement;
- formulate recommendations for the development of international cooperation in horizon scanning, including how it can be used.

2.1 Exchange of experiences, know how, comparison methods

During a meeting in the Hague in March 2007 a first exchange of experiences with national horizon scanning took place between the project partners and representatives of other countries and international organisations that either had experience with or were interested in broad-scope horizon scanning (Directorate Research of the EC, IPTS, OECD and the ESF).

After this meeting descriptions of horizon scanning processes in a number of countries were collected. Where necessary, additional information was asked from the representatives of the project partners. In this way information was gathered not only about the rationales for national horizon scanning – its goals, positioning and design – but also about the premises and values that were taken into account for the identification and prioritisation of the issues collected by the scans, and the ways in which the scan data were used.

2.2 Joining up the data

To compare the data of the different scans and create a common corpus for further analysis, it was decided to create a joint database in which the data of all the scans would be entered. The database that was used for this was a copy of the Sigma Scan of the UK Foresight Horizon Scanning Centre (HSC), developed by Outsights-Ipsos MORI. This database was adapted so that data from the Netherlands (COS) horizon scan and from the Danish OECD-DASTI horizon scan could be incorporated.
2.3 Comparison of the scan data

The comparison of data was based on the data of the UK Horizon Scanning Centre Sigma Scan\textsuperscript{25} and Delta Scan\textsuperscript{26} as published on the internet, and the data in the Danish “OECD-DASTI Horizon Scan, August 2007” as published by the OECD\textsuperscript{27} and the Netherlands “Horizon Scan Report 2007, Towards a Future Oriented Policy and Knowledge Agenda” \textsuperscript{28} of the COS.

To facilitate the comparison, some re-labelling of the categories that were used was necessary. Underneath the main categories that were used in the different scans are given.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Netherlands</th>
<th>United Kingdom</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social context</td>
<td>• People</td>
<td>• Culture</td>
<td>• Work life</td>
</tr>
<tr>
<td></td>
<td>• Society (incl. public services)</td>
<td>• Science &amp; Technology</td>
<td>• People</td>
</tr>
<tr>
<td>R&amp;D and education</td>
<td>• Science &amp; Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economical context/Finance</td>
<td>• Economics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical environment</td>
<td>• Environment</td>
<td></td>
<td>• Nature</td>
</tr>
<tr>
<td>Political, administrative and legal</td>
<td>• Politics</td>
<td></td>
<td>• Resources</td>
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<tr>
<td>Public services</td>
<td></td>
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</tbody>
</table>

From these categories\textsuperscript{vii} we derived the following set of main categories:

- Society (incl. Demographical issues) without public services,
- Science and Technology (incl. S&T Policy)
- Economy and Finance (incl. Governance of E and F),
- Environment (Ecological),
- Politics and Public services

Although some issues could be placed in two or even three categories, it was not difficult to label the majority of issues according to these main categories that are nearly identical to the themes as used in the STEEPV\textsuperscript{29} approach.

\textsuperscript{vii} It should be clear these categories are not entirely distinct, so many issues could still be placed under two and sometimes more categories

\textsuperscript{25} Sigma Scan
\textsuperscript{26} Delta Scan
\textsuperscript{27} OECD
\textsuperscript{28} COS
\textsuperscript{29} STEEPV
For further comparison and analytical reasons, these main categories have been given a completely new set of subcategories based on the different sets of subcategories that were used in the UK and Netherlands scans. A number of issues could be placed under several of these new subcategories; during the comparison these issues were noted. These categories were principally used to compare the issues and not to create a new taxonomy, nor to draw any conclusions on how the subcategories should be weighted.

<table>
<thead>
<tr>
<th>Subcategorie</th>
<th>Economy &amp; Finance</th>
<th>Environment (Ecological)</th>
<th>Politics, government, Public services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Society &amp; Technology</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Social values</td>
<td>ST reflection</td>
<td>Market</td>
<td>Legitimacy-democracy</td>
</tr>
<tr>
<td>Demographical</td>
<td>ST policy - governance</td>
<td>Geosphere &amp; Land space</td>
<td>Law and legislation</td>
</tr>
<tr>
<td>Communities</td>
<td>Sociology</td>
<td>Governance</td>
<td>Geo politics, diplomacy</td>
</tr>
<tr>
<td>Life styles - families</td>
<td>Psychology</td>
<td>Finance - Tax</td>
<td>Security</td>
</tr>
<tr>
<td>Labour - leisure</td>
<td>Physics</td>
<td>Outer space</td>
<td>Health system</td>
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<td></td>
<td>NBIC</td>
<td></td>
<td>Educational system</td>
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<tr>
<td></td>
<td>Nano-tech &amp;science</td>
<td></td>
<td>Agri–Food supply</td>
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<td></td>
<td>ICT Mathematics</td>
<td></td>
<td>Infrastructures</td>
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<td></td>
<td>Mathematics</td>
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<td>Armed Forces</td>
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<td>ICT</td>
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<td>Geology</td>
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<td>Engineering</td>
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<td></td>
<td>Economics</td>
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<td>Chemistry</td>
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<td></td>
<td>Biology</td>
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<td></td>
<td>Medicine</td>
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</tbody>
</table>

2.4 Analysing Data

Data were compared on the subcategory level. An attempt was also made to select some “issue clusters” with estimated high impact to investigate the usefulness of joint horizon scanning as preparation for more in-depth foresight to design common policies and research programming on strategic challenges and questions within these “issue clusters”.

THEME: Impacts and implications for policy and decision-making
2.5 Preparing further cooperation and joint activity

To prepare further cooperation, a network of For society partners was established including some external organisations that had shown interest in the concept of government-initiated horizon scanning. A first discussion with this network was held in March 2007 and a second in October 2007.

The possible use of the horizon scan data at the EC level was discussed in interviews with representatives of different DGs within the Commission.

3 Results policy impacts and implications

3.1 Comparison of national horizon scans

3.1.1 Rationales for governmental horizon scanning

All three scans can be considered as very broad-scope foresight processes that look well beyond the present-day horizon for new emerging challenges for society, but also for promising opportunities, some of which may originate in new or emerging scientific and technology findings and insights. All the scans are designed to generate themes and questions that cross policy domains and research disciplines, meaning they may play a useful role in informing research agenda setting. In the case of the Netherlands and the UK, the aim is also to influence the framing of policies into a more future-oriented mode, and to encourage more resilient policy-making. UK horizon scanning and foresight are explicitly aimed at developing resilient policies that are adaptive to changing and uncertain futures. In addition to the scanning and foresight, there is a large effort to spread good practice to other parts of government and society. In the Netherlands the aim is to contribute to the future orientation of policies towards sustainability, not only in the economic and environmental sense, but also in different other societal value dimensions (health, longevity, human rights, social cohesion, law-based democratic society, international relations, etc.).

Horizon scanning and foresight can therefore be seen as adaptive foresight instruments that deliberately challenge policy makers to look at the uncertainties and the unexpected and develop resilient policies towards sustainability.

Governments use horizon scanning to:

- widen the scope for policy- and decision-makers (by supplying systematically gathered and analysed data on opportunities, challenges and options) to provide the basis for resilient and (where appropriate) cross-departmental policies. Policy-makers are encouraged to expose their analysis to possible future trends to prepare themselves better;
- alert policy-makers to forgotten and emerging (new) risks and opportunities, to provoke reflection and further investigation of the uncertainties, to challenge dominant, implicit assumptions about the future;
- stimulate decision-makers and their staff to use horizon scanning in decision-making on different levels, to broaden their thinking, and to envision the future in a more systematic way;
- identify new challenging issues for policy, research, development and innovation;
- identify knowledge gaps (relevant for resolving future problems or for exploiting potential opportunities);
- identify possible inter linkages (enhancers, inhibitors, multipliers) between future issues (from different parts of the horizon) with a potentially major impact;
- identify new trans-disciplinary and policy domain crossing sets of issues for further focused foresight (improving the scoping of these foresight activities) and research;
- deliver input to research and innovation, policy, public debate, and departmental policies, particularly on the strategic level;
- deliver information to a diversity of societal actors which for instance could be used for priority-setting for future investments but also for initiating public debate.

3.1.2 Development of the national horizon scans

3.1.2.1 Data collection

**Phases**

All three scans were developed in phases. In the first phase, issues were collected from a variety of (future) literature and the internet and through consultation with experts (workshops, interviews, etc.). In the UK scan, experts were asked to write brief papers on the selected issues to deepen the contents; these essays were then published in the Sigma and Delta Scan databases. In the Netherlands, papers were drafted after "issue clusters" had been developed using creative group thinking exercises. The issues in the OECD scan were first drafted by OECD staff, then amended by DASTI, and further used as input for prioritisation discussions in expert and user panels.

**Gathering of data**

The gathering of data for the UK Sigma Scan was facilitated by Outsights-Ipsos MORI, while the Delta scan (S&T developments) was carried out by the Institute for the Future (IFTF). (The Sigma and Delta Scans are soon to be merged.) After the issues had been selected, experts were asked to write synthesis papers, based on a number of cited evidence sources, to explore each issue, including its implications.

The primary data for the Danish scan were delivered by the OECD International Futures Programme Unit with support from DASTI, which adapted the issue descriptions to the Danish situation after discussions with representatives from different ministries.

The primary data for the Netherlands scan were collected by the COS Horizon Scanning team and discussed with expert panels.

Within the Dutch scan and the Netherlands scan, attempts have been made to rank the issues according to estimated overall impact (on implicit or explicit values, see 3.1.3) and likelihood by inter-subjective judgement.

In the Dutch scan as well as in the UK scan, networks of Future analysts were used to support the scan as permanent sounding board.

**Dissemination of results and take up**

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viii For the comparison of the data of the national scans all data of the Delta scan were added to the data collection
The UK horizon scans were published on an public internet site once complete. The Netherlands horizon scan was published on an open internet site at an early stage of the project, giving all visitors the opportunity to contribute a new issue and/or to comment and assess the published issues with regard to their plausibility and impact (taking into account the sustainability dimension). At the end of the 2007 round, the issues were published in a final report.

After completion the data in the OECD-DASTI scan were published on the OECD website.

### 3.1.2.2 Principal use of the scan data

The UK horizon scan has tended to be used as part of a client-oriented project approach, where the starting point is a client (for example, a government department) reflecting on its strategic direction or policy. Part of HSC engagement with the client will be an analysis of scan data (and data from other specialist sources) relevant to the client’s policy domain. Depending on the issues encountered in this analysis, workshops may be organised with different stakeholders, providing a broad range of inputs to the policy and creating relevant new networks that cross not only policy domains but also scientific disciplines. The involvement of client departments and their own future analysis is considered to be mutually advantageous: such contacts have been encouraged by the formation of a network of Future Analysts (FAN club). In this way, the future-oriented approach is disseminated through the whole of the government system, as well as the scientific community and society.

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**Fig 1 Schematic design of the UK horizon scan**
In the Netherlands the approach used can be described as the cluster approach. This started with the assembling of clusters of issues with potentially impact-rich interactions. Clusters were developed in creative sessions with a wide variety of stakeholders. After completion, clusters that cover a variety of policy domains and scientific disciplines were forwarded to some essay-writers. Essays and cluster descriptions are seen as a potential input to further, more focused foresight and the formulation of recommendations for research and policy. Next to this, a more client-oriented “scan proof” approach was developed and implemented for some clients on the regional level. Furthermore it was expected that publication of the issue lists on the horizon scan website would have an public awareness-raising effect.

In Denmark, the scan issues were used as input for the selection of prioritised research themes in a 4-year cycle of research funding. The scan data were used alongside the outcome of a public internet ‘hearing’ process that delivered an additional input of 366 proposals from the general public, companies, researchers, universities and organisations. Pre-selection of prioritised themes took place within an expert group that delivered input for a workshop with a user panel, consisting of representatives from trade and industry, the public sector and civil society. The final selection of themes was made by a stakeholder workshop.

Fig 2. Design of the Netherlands horizonscan
3.1.3 Premises and values for identifying and filtering issues

All horizon scans are based on broad and intensive studies of literature (including foresight, future studies and even science fiction) and panel groups.

Horizon scanning seeks to identify what in the Netherlands scan is described as potential Problems, Threats and Opportunities (PTO) and in the UK horizon scan are called “Issues”. Horizon scanning is different from trend scanning in that it does not solely focus on trends, but also on potential breakthroughs, analysis of risks, uncertainties and unexpected events that are considered as potentially disruptive in the future.

Issue (or PTO) selection is therefore based on likelihood and estimated impact on the future of our society. Every effort is made to avoid the influence of personal values and preferences and ‘group think’. In all scans the issues were categorised to achieve a degree of comprehensiveness and to cover all policy domains and science disciplines. In all horizon scans, organisations and individuals were allowed to make contributions.

The UK Scans focus is on “public policy” (not explicitly government policy, although government is the main intended client). The UK effort has focused on drafting the issue papers in such a way that they present a balanced synthesis of the sources scanned (and referenced), so that any values (and biases) contained within the issue papers reflect those of the sources. The number of sources cited per issue paper (generally more than ten), and their diversity, are intended to reduce the risk of one strong viewpoint dominating.
The goal is to provide a reasonably objective basis for the necessary political process (consideration of options, consultation, debate) that will lead to implementable policies (policies that achieve government’s goals while meeting society’s expectations). In this way, the Scans are positioned as part of the policy evidence base.

Danish scan focused on the policy domains of all Ministries and therefore implicitly took in all the values incorporated in the policies and services for which they are responsible.

In the Netherlands scan, explicit attention was given to the sustainability of society in the light of different sets of values for which the government will be held responsible, whatever its political constitution. Issues were selected on base of indications in literature on either positive and/or negative impact on the these values, this was also done for issues where authors had (very) different opinions.

These sets of values\textsuperscript{ix} are:

1. Biological dimension: Quality of life, Ecological Quality (Survival, health, longevity of (future) citizens – health of ecosystems)
2. Social dimension: Social Quality (Social cohesion in the present and in the future, eliminating poverty, mental health of (future) citizens)
3. Economic financial dimension: Economic Quality (base for other dimensions but also welfare creation, luxury, leisure, distribution of wealth)
4. Governmental dimension: Juridical and Democratic Quality (rule and policy base to realize other dimension, sustain justice for all, sustain democracy, human rights etc.)
5. Cultural, ethical and intellectual dimension: Cultural, ethical and intellectual Quality (stimulate cultural development and cultural expression (and religion) as long as it does not interfere with other dimensions, increasing the intellectual level in service of
6. Self realization of (future) citizens, freedom of individuals and of religious and cultural expression
7. Good neighbourhood dimension: International relationship Quality (what you do not want that another country does to you do not do this to them, create win–win in the other dimensions)

\subsection{3.1.4 Positioning of the scans}

The Horizon Scanning Centre in the UK was established in 2005 with a central function to use horizon scanning and future thinking to inform the policies of (all) departments. It operates under the government’s Chief Scientific Adviser. Its goals are to:

- inform departmental and cross-departmental decision-making
- support horizon scanning carried out by others inside government
- identify the implications of emerging science and technology and enable others to act on them

\textsuperscript{ix} It should be clear that the pursuit of all these values may create tensions because issues may cause very high positive impact on one or more of these values but at the same time very negative impact on one or more of the others.
COS was the umbrella organisation of the so called Sector Councils for Research and Development that were established by Dutch law during the eighties to provide strategic knowledge questions for departmental policies in a number of policy domains (environment, agriculture, health, developmental policy and technology) and to establish the interface between policy, research and society. An important tool of these sector councils was participative foresight that developed over time and was used to influence decision makers in government, research and society in a future-oriented setting. COS had the task of facilitating cross-departmental foresight and identifying cross-cutting departmental themes; the horizon scan started in 2004 to guide this search in systematic way. In 2007 the Netherlands government decided to abandon the system of sector councils and to create new provisions within all Ministries (so called Knowledge chambers). The horizon scanning task will be maintained and has been reallocated to the newly formed Knowledge Directorate of the Ministry of Education, Culture and Science\(^x\).

The Danish Agency for Science, Technology and Innovation (DASTI) is an agency of the Ministry of Science, Technology and Innovation that aims to promote research and innovation of a high international standard for the benefit of Danish society, facilitating development in economic, cultural and social respects. The Horizon scan was mandated by the Danish Parliament in 2006 to feed directly into the Research agenda setting. Since this research agenda setting has a long cyclic character it has not yet been announced when a next round will be organised.

### 3.1.5 Impact

Although there are many unresolved methodological difficulties in assessing the impact of foresight\(^32\) also due to more general problems around the interaction of scientific advice, government and society\(^33\) it is clear that horizon scanning is seen as a valued but also vulnerable learning process\(^34\) which seems to be embedded in important decision-making processes in at least three European countries.

For the OECD-DASTI horizon scan it was clear from the beginning that the results of the scan will be used as an important input for the process of prioritising new research themes for the Danish 4-year cycle of the research funding councils, which is acknowledged in the research 2015 document\(^35\) that sets the stage for research prioritisation in Denmark for the coming 4 years in a clear relationship to the future challenges of the Danish Society. In addition to this we may assume that the process which contained many experts and stakeholders will also have indirect impacts among this group.

Within the Netherlands the preliminary results of the horizon scan (COS) were also used as input for the strategic planning and prioritising of research by the National Funding Agency to which reference is given in the “NWO strategy 2007-2020”\(^36\). Also here the process involved many stakeholders who have been influenced by the discussions and issues that were selected. After the report was published the horizon scan team was approached by a number of organisations and regional and local communities that asked for help and or cooperation on the area of horizon scanning and development of future strategies. Also there was some attention in

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\(^x\) This location is provisional, a more central permanent positioning is under investigation
the press, especially on the topic of robotics which was pushed forward as a typical cluster where no main stakeholder could be found. The report contained recommendations for specific foresight activities which still have to be executed. The disappearance of the COS and reallocation of the horizon scanning task creates a new situation that should lead to a more effective positioning of the horizon scanning task.

The UK horizon scan has a more continuous character due to its recognised central task and its strong networking capacity in the UK government and futures community, which is strongly supported by the so called Future Analysts network (FAN club) that the Horizon Scanning Centre established to support horizon scanning activities in government and elsewhere. Also here the processes involve many people and institutions that are certainly influenced by the future-oriented project work and the material provided by the scans. The launch of the scan data was well covered by the UK and some international press. Several departments are now initiating their own horizon scanning projects.

### 3.2 Joint database

A joint database has been established containing 430 issues of which 159 are from the Netherlands horizon scan, 125 the Danish scan and 146 of the UK scan.

The distribution of the issues over the different categories is showed in the table below.

<table>
<thead>
<tr>
<th>Category</th>
<th>% of issues in Sigma</th>
<th>% of issues in OECD-DASTI</th>
<th>% of issues in COS</th>
<th>% of issues in all (UK horizon)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Society</td>
<td>18.5</td>
<td>22.4</td>
<td>7.5</td>
<td>15.6</td>
</tr>
<tr>
<td>Science &amp; technology</td>
<td>16.4</td>
<td>8.8</td>
<td>15.1</td>
<td>13.7</td>
</tr>
<tr>
<td>Economy/Finance</td>
<td>21.2</td>
<td>21.6</td>
<td>18.9</td>
<td>20.5</td>
</tr>
<tr>
<td>Environment/Ecology</td>
<td>13.7</td>
<td>15.2</td>
<td>23.3</td>
<td>17.7</td>
</tr>
<tr>
<td>Politics/Public services</td>
<td>30.1</td>
<td>32.0</td>
<td>35.2</td>
<td>32.6</td>
</tr>
<tr>
<td>total number of issues</td>
<td>146</td>
<td>125</td>
<td>159</td>
<td>430</td>
</tr>
</tbody>
</table>

* in addition to the Sigma scan the UK Horizon scanning Centre also executed the Delta scan which contains about 100 Science and Technology issues
3.3 Analysis of the joint data

Although all scans covered all STEEP domains, the Netherlands scan contained significantly fewer issues in the societal domain and the Danish in the Science and Technology domain than the others. In all scans we can observe that the level of abstraction (or granularity) that was used to describe the issues differed slightly between the scans. Despite this the data can be compared quite easily on the revised sub-category level. This comparison led to the conclusion that the scans contained many similar issues that were closely related that were taken up in all three scans (or at least in two). Some issues only figured in one scan sometimes because they were specific to the country of the scan.

The main conclusion is that the joint scan offers additional material that could be used by each national scan. It is expected that widening the cooperation may reveal more issues of high impact that are overlooked in the scans that are now combined, especially if data can be incorporated from scans developed by countries on the other side of the world, at different stages of economic development or with contrasting political (and geopolitical) systems. Such different perspectives may contribute enormously to understanding our own place in the future.

3.4 Further development of the joint horizon scan

On the basis of the experience of the pilot joint horizon scan and discussions within the established network of interested organisations and interviews with representatives of different DGs, a proposal for further development of the joint horizon scan has been developed within the For society network. This proposal suggests to developing a network of countries and EC level organisations that have performed horizon scanning (or similar activities) in the past or are planning to carry out horizon scanning (or similar activities) in the future. The function of this network will be the exchange of experience and know-how, but also to combine all scan data in one central database that will be used to develop proposals for joint foresight on common themes (through EC and other projects), provide feedback on the national scans, and lead to the joint development of methodologies for using and carrying out the scans.

4 Conclusions and Discussion

Overall we conclude that horizon scanning as performed in the three cooperating countries is a powerful tool which can be used for different purposes such as R&D agenda setting and the development of more resilient policies. To be effective, however, it is important to involve High Level Decisionmakers who support the philosophy of the scan. Next to this it is important to involve all departments and to connect the horizon scan to more focused participative (foresight) activities that are directed to the use and implementation of the scan data in departmental and regional strategic policy discussions and agenda setting for research.
The more ambitious approach of the UK, where central horizon scanning serves as a dynamo for further dissemination of the horizon scanning approach through all departments of government, and through which it creates more participative future-oriented approaches for policy-making in government and society is a model of good practice.

The approach of the Netherlands scan is in this aspect less ambitious. It does, however, attempt to identify emerging sets of future issues which, through their interaction, may have significant impact, but where there are no obvious policy actors ready to take charge of the response to these challenges. A strong government-supported follow-up is therefore needed to align many different stakeholders around these clusters.

The Danish approach was deliberately organised with the aim of delivering input to the decision process that the Danish Parliament initiated for the development of the strategic long-term research agenda for the research councils. This scan has led to the selection of research themes that were taken up in the strategic agenda.

The fact that all three scans delivered issue lists which overlapped considerably but which are also complementary supports the idea of further cooperation in data gathering. Since the three scans cover countries at a comparable stage of economic development and with many similar geographical conditions, it is expected that the complementarity could be considerably increased if the results of horizon scans of countries with different economic and geographical conditions could be added. It would be particularly interesting to be able to compare and use such data on the European level.

Also the exchange of experiences of the scanning teams was in itself very fruitful. Overall we may conclude that the national horizon scanning activities would generate significant additional benefits by being joined together; they may also provide a suitable basis for scoping joint foresight for coordinated research programming, innovation and policies.

Although principal purpose of the national scans differed, the scanning teams confronted similar questions regarding the methodology of data gathering, analysis, synthesis and use.

**Data gathering**

In all cases data gathering took initially place through desk work (literature studies and internet surveys); this was then complemented by expert consultations. In the Netherlands, in addition to stakeholder group workshops an attempt has been made to create a complementary open process by internet consultation of the public, while in Denmark an open consultation took place among the main stakeholders within departments. In all scans, questions arose regarding the ways in which stakeholder (or public) involvement in the initial phase could be improved. In the UK scan and the Netherlands, thought was also given to the way in which the number of entirely new issues and weak signals could be increased. New approaches are therefore being considered to boost stakeholder and public involvement, for example the use of blogs and wikipedia-like structures, and web-bots for information gathering.
It was felt that the overall aggregation levels of issues of the different scans make them highly comparable even if not every issue has been described at same level of granularity. In many discussions about the scans, it was suggested that the high level of aggregation might give the impression that the choice of issues was too superficial. One way of improving this would be by providing more in-depth descriptions (expert essays) on the issues, as has happened in the UK scan. Another way would be to carry out more in-depth scanning on particular themes: this might be a way forward where the broad national scan is complemented by more in-depth departmental scans from other Ministries or agencies. By connecting these more specific scans with more global scans a complete picture could be established where users may be provided with a broad strategic context at the top level, but are then also able to ‘drill down’ into more depth where needed.

Finally, the handling of science issues in the scans requires a careful approach. This should balance the need for scientific scrutiny, making sure that existing scientific evidence is not overlooked or contradicted, with the need to point to potential future scientific developments for which by definition little (or no) authoritative evidence is yet available. The successful approach to this taken by the UK’s Delta Scan was to seek the views of 250 leading scientists and members of the S&T community through an online Delphi-like survey facilitated by a wiki. It is important that, for the scans in general, and perhaps particularly for S&T issues, differences of opinion – controversies even – are presented in the scans, along with the evidence each side draws on to make its case, rather than seeking to choose one view over another or simply include views on which a consensus can be reached.

Data analysis, synthesis and use

We have found that consideration of (and reaction to) the scan issues by a diverse group of people, with regard to a specific question or set of questions, delivers the most promising results, whether this is done by creative groups (Netherlands) or by policy stakeholder groups (UK). Whether this also leads to new cross-departmental policies or trans-disciplinary research remains to be seen and should be the subject of evaluation. In all countries the first results are promising, as demonstrated by the demand to expand the horizon scanning activities to other departments and levels of government (UK and the Netherlands), and by use of the scans in strategic research agenda setting (Denmark and to a lesser extent in the Netherlands).

It is however clear that the issues identified are very different in nature: they may describe events or trends that are desirable or undesirable, likely to happen or unlikely to happen, possible to influence or inevitable. Furthermore, almost all issues may interact in a very complex way. This makes it very difficult to determine simply on the basis of the scans what are the most appropriate answers, whether further study, foresight or research focused on the development of resilient strategies, (immediate) policy reactions, or no reaction at all.

The fact that some of the scan issues published in 2005 (e.g. risk of a financial crisis caused by poor lending practices and worldwide lack of governmental financial control) become reality highlights the value of referring to individual scan issues, even before they have been considered in combination with other papers in a group context.


These issues were also published on the Dutch horizonscanwebsite at the end of 2005

THEME: Impacts and implications for policy and decision-making
Use of joint scans – further development

The fact that the horizon scans considered here were developed for different purposes illustrates their versatility as a policy- and research-informing tool. To complement their increasingly acknowledged role in persuading policy and research teams to think more broadly, openly, and strategically, it would now be helpful to establish clearer guidelines for their application, including a robust methodology so that their effectiveness could be properly evaluated. The purpose of such guidelines would not be to limit their use to one particular context, but to clearly distinguish the different ways in which horizon scanning might be used in different contexts, and what it can (and cannot) deliver in each case.

The use of joint scan data at the European level could offer a useful way of addressing the complex challenges the world and Europe are facing, and merits further attention. Better guidance on the use of scanning, and a robust methodology (such as proposed by ERA-net for society) would make this more likely to happen.

Example of analysis of the joint scan: The growing energy demand and uncertainty of energy supply is not only related to the scarcity of some of these resources, but also to the widely assumed connection to climate change, the future technological possibilities and scientific breakthroughs (which all may lead to better ways for saving, transporting and producing energy using all thinkable resources), to our potential to change our way of living (behaviour) and to the geopolitical developments (energy demand of developing giant economies – tensions on distribution). This issue does not only require a trans-disciplinary approach, but also a policy that transcends several policy areas and the borders of countries. Joint horizon scanning could be used as a tool: - to clarify the picture of the most relevant relationships in a shared process (with involvement of decision makers) on a much earlier moment than usual when problems have accumulated this picture can be used to scope further (foresight) activities to align key stakeholders and to prepare the joint research and development programmes and common policies that are required.

At the same time, the content of the joint scan could be progressively enhanced by a network of European (and non-European) countries that regularly perform horizon scanning, and countries and organisations that contribute relevant data and expertise. This network would then be available to policy groups within the EC (and other international groups), who might wish to use it to inform their strategic decision-making processes.

The network should not only deliver a joint scan base to serve national and EC policy and research, but could also serve as a platform for exchanging experience and addressing methodological questions relevant to horizon scanning such as explicitation of values (prevention of biases), the identification and significance of weak signals, how to deal with...
complexity, the learning function of horizon scanning, stakeholder participation and how to increase impact.
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THEME: Impacts and implications for policy and decision-making