Growing Inequality:
a Novel Integration of
transformations research

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D7.1 Report: Scenario methodology and trends and drivers assessment

WP7 Future scenarios: design, analysis and outcomes

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Contents

Summary

This report (D7.1) describes the activities and results of GI-NI Task 7.1. The main goal of Task 7.1 is to **develop a methodology for assessing future scenarios, trends, and drivers of socioeconomic inequality and skills** based on the main external developments (trends) in GI-NI: technological change, globalisation, and migration.
We will use a recently developed structured foresight approach called PRO-SPECT as the basis for the methodology. PRO-SPECT integrates scientific evidence regarding foresight methods and is described in a Dutch report (Koen et al., 2023). To align with the aims and scope of the GI-NI project, the approach has been further developed and refined in two scoping workshops.

Chapter 1 provides background on Future studies and introduces our overall scenario approach (PRO-SPECT) in which we embed our WP7 activities. In Chapter 2, we describe the structure of the four-step PRO-SPECT approach. Chapter 3 describes the results of the first step (scoping) within the context of the GI-NI project. Chapter 4 describes the results of the second step (scanning), specifically the results of the DESTEP analyses performed within the GI-NI project. These results were used to develop a more refined foresight approach. Finally, Chapter 5 presents preliminary conclusions and outlines the next steps.
The developed methodology and associated results described in this report serve, together with task 7.2, as a starting point for designing and analysing different qualitative scenarios to be built in task 7.3.

1. Introduction

1.1 Background and objective of this report

The **GI-NI project** examines the combined effect of technological change, globalisation, and migration on socio-economic inequality and skill demand in Europe and worldwide. It aims to provide fresh insights into these external trends and uncertainties and their potential impact on socio-economic inequality and skills. By understanding these dynamics, policymakers can develop strategies to influence socioeconomic inequality levels and promote appropriate skill matches within and beyond the EU. The GI-NI project specifically aims to achieve the following:

1. Provide empirical evidence on the current state of external trends and uncertainties (data, trends) through Work Packages (WP) 3 to 5, focusing on technological change, globalisation, and migration, supported by data and operationalisations in WP2.
2. Understand the potential impact of these external developments on socio-economic inequality and skill demand through models and scenarios in WP6 and WP7.
3. Offer diagnostic tools, solutions, and policy options, including international collaboration and governance solutions, in WP7 and WP8.

Work Package 7 (WP7) has the following objectives:

1. Develop a methodology for assessing future scenarios, trends, and drivers (Task 7.1).
2. Design and analyse distinct future scenarios (Task 7.2, Task 7.3) for Europe and the world, focusing on the combined effects of technological change, globalisation, and migration on socio-economic inequality and skill demand.
3. Identify credible governance and policy changes (Task 7.4) to anticipate scenario outcomes and proactively address future challenges, aiming for shared prosperity.

WP7 combines quantitative projections (Task 7.2) with qualitative foresight methodologies (Task 7.3). The outcomes of WP7 serve as input for WP8 (Policy recommendations to reduce socio-economic inequality) and WP9 (Dissemination and impact). Refer to Table 5.1 for an overview of the main steps in WP7.

The **current report** (D7.1) focuses on Task 7.1 and describes the activities and outcomes related to the development of a methodology for assessing future scenarios, trends, and drivers of socioeconomic inequality and skills. The methodology is based on a recently developed structured foresight approach called PRO-SPECT, which integrates scientific evidence on foresight methods. This approach is further refined in two scoping workshops to align with the aims and scope of the GI-NI project.

1.2 Structure of the report

In Chapter 2 of the report, we outline the structure of the four-step PRO-SPECT foresight approach. Chapter 3 presents the results of the first step (scoping) within the context of the GI-NI project. In Chapter 4, we detail the outcomes of the second step (scanning), specifically the results of the DESTEP analyses conducted as part of the GI-NI project. These results were utilised to enhance and refine the foresight approach. Chapter 5 offers preliminary conclusions and outlines the subsequent steps to be taken.
Furthermore, we provide background information on Future studies and introduce our comprehensive scenario approach (PRO-SPECT), which forms the basis of our WP7 activities.

2. Future studies: the PRO-SPECT methodology

2.1 Introduction

This section provides an overview of the PRO-SPECT methodology, which serves as the basis for assessing and creating future scenarios within the GI-NI project. Before delving into the four steps of the PRO-SPECT approach, it is essential to discuss the concept and types of "future studies".

2.2 Types of future studies

According to the Dutch Scientific Council for Government Policy (WRR), a future study is defined as a systematic examination of potential future scenarios using scientific knowledge (Asselt et al., 2010). The purpose of a future study is not to predict the future, as it involves numerous uncertainties. Instead, future studies aim to enhance preparedness for future possibilities. They explore various forms and can be broadly categorised as descriptive and normative future studies. **Descriptive future studies** describe possible outcomes, while **normative future studies** outline a desirable future and often consider differences in norms and values among different groups.

Descriptive future studies commonly employ two methods: forecasting and foresight. **Forecasting** aims to provide a singular and unambiguous picture of the future, often relying on quantitative methods. It primarily focuses on the most probable future and may have limited room for uncertainties. This method is suitable for relatively stable environments with minimal assumed uncertainty. On the other hand, **foresight** emphasises exploring multiple potential futures and embracing the unknown (Asselt et al., 2010). Foresight encompasses a range of future-oriented activities and involves input from experts, policymakers, and stakeholders throughout the process. Compared to forecasting, foresight acknowledges uncertainty and the possibility of change, enabling better preparation for the future.

For the **WP7 scenario approach** of the GI-NI project, the intentional focus is on foresight techniques to explore the future. This choice stems from the belief that the future is predominantly uncertain, and a singular view of the future does not align with this assumption. Governmental institutions, sectors, and organisations can better equip themselves for what lies ahead by centring uncertainty and the potential for change.

2.3 The PRO-SPECT approach

Foresight is widely employed in strategy and policy development across public and private sectors. However, many foresight studies often lack a clear rationale for the gathered information and a justification for the methods employed. Moreover, domain knowledge needs to be more frequently improved. To address these issues, TNO has developed the PRO-SPECT approach (Koen et al., 2023), a novel foresight methodology. The **PRO-SPECT approach** is based on literature review, expert sessions, and action research and is designed to explore futures at the national, sectoral, and regional levels in a scientifically robust manner.

The PRO-SPECT approach consists of **four steps** (Figure 1), each potentially involving specific methods aligned with the respective step of the foresight process. Not all methods have been applied within the context of the GI-NI project (see 2.1.1).

1. **SCOPING:** The first step involves identifying the primary stakeholder's question and establishing a shared understanding of the problem. Scoping encompasses determining the research question(s), target audience, methodology, criteria for selecting data sources (such as reports, news articles, patents, social

media, etc.), and relevant experts. This step results in a clear conceptual model that guides the choice of foresight methods in subsequent steps.

2. **SCANNING:** In the second step, various methods are employed to collect data for estimating future outcomes. This comprehensive process involves gathering quantitative and qualitative data, creating an overview, and selecting the most significant external developments beyond the client's control but impacting the client's question. The pace and uncertainty associated with these external developments are also considered. The outcome is a long list of (early) signals, external developments, and factors. Subsequently, this longlist is narrowed down to a shortlist through interviews with relevant experts, representing key external developments potentially relevant to the client's question.
3. **IMPACT:** The third step examines the potential impact of external developments on the outcome measure, i.e., the primary stakeholder's question. When there is considerable uncertainty regarding the direction, pace, and impact of external developments, different scenarios are designed, analysed, and elaborated to address these uncertainties.
4. **PERSPECTIVE:** The fourth and final step shifts the focus from exploring possible futures to utilising the insights gained to advise on policy and strategy or support decision-making. The results from the impact analysis are transformed into actionable products that assist decision-makers in selecting and managing strategic actions for implementation (Voros, 2003). This process primarily focuses on identifying and informing future pathways for change.

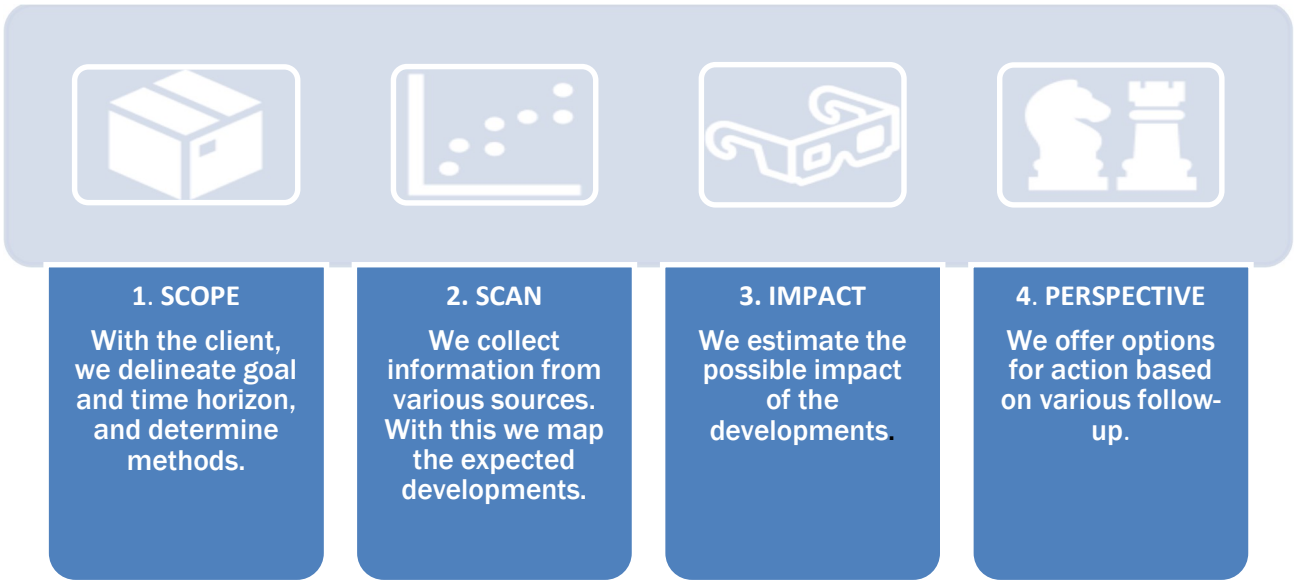

Figure 1. The PRO-SPECT framework (Koen et al., 2023)

2.4 The PRO-SPECT approach in the GI-NI project

Below, we will first describe how we conducted steps 1 (scoping) and 2 (scanning) in the context of the GI-NI project. Note that both steps have already been described to some extent by the EU policymakers in their call for proposals and in the GI-NI WP7 task description by pre-selecting and defining the three scenario variables, technological change, globalisation and migration, as the main impact variables, and socio-economic inequality and skill demand as output variables. Next, we describe how we plan to conduct step 3 and step 4.

2.4.1 Step 1 SCOPING

In the scoping part we:

- identified the question from the EU Horizon Europe call's primary stakeholder (EU) and the GI-NI proposal;
- created a common vision of the problem from the EU call for proposals and the WP7 task description from the GI-NI proposal;
- identified the research questions, target audience (EU policymakers and researchers), methodology, criteria for selection of data sources, and relevant experts based on GI-NI preliminary research deliverables and from internal GI-NI expert meetings;
- designed a conceptual model that can be used to guide (the choice of) methods of foresight in the next steps.

The outcomes of step 1 are discussed in Chapter 3.

2.4.2 Step 2 SCANNING: Trends and drivers assessment

The scanning phase conducted within the GI-NI project consisted of three consecutive steps involving consortium partners and experts to various extents.

- First, we internally identified, discussed, and described relevant trends using the DESTEP domains based on (grey) literature of the last 10-15 years and assessed their future development toward 2030. This resulted in a **longlist** of trends discussed in 4.1 (see also Annexe 1).
- Second, we organised an online and live horizon scanning workshop (November 23rd, 2022; May 24th, 2023) to consult the expertise of the consortium and Scientific Advisory Board (SAB) partners (see Annexe 2), in which we discussed the **potential development, impact and uncertainty** of the longlist of trends identified in step 1 (see 4.2).
- Third, we quantitatively and anonymously assessed the **potential impact** of the longlist of trends on socio-economic inequality and skill/job demands using an online survey tool among 27 labour experts (see 4.3.).

Developing a longlist of trends

We used the DESTEP analysis as a framework to create a structured and comprehensive overview that systematically describes the external (future) environment. DESTEP is an abbreviation for six domains: demographic, economic, sociocultural, technological, ecological and political-legal (Rastogi & Trivedi, 2016; RIVM & TNO, 2022). The list in Box 1 below describes these domains. Note that the factors explored within the six DESTEP domains are external developments that cannot be influenced by the client or decisionmaker for whom the analyses are conducted. However, these developments do influence the problem.

Box 1. Domains DESTEP analysis

- Demographics covers the traits and characteristics of the population. Factors such as size, age structure, geographies, education levels, gender, birth and death rates and family structures are often included in this domain of DESTEP. Demography is one of the least uncertain elements of the DESTEP analysis, as population profiles for most countries can be predicted well in advance.
- Economic considerations include economic and financial stability, interest rate, tax rate, recession, exchange rates, wages, inflation, and any factor that relates to the financial conditions of the key economic agents.

- Sociocultural is the topic for any social or cultural factor. Topics such as beliefs, risk tolerance, values, or consumer behavioural trends are covered in this area.
- Technological considerations are the factors around innovation and its usage, knowledge, and future. Include cybersecurity, analytics, mobile usage, Internet of Things (IoT), Augmented Reality (AR), Virtual Reality (VR), Blockchain, and other technologies that may change the way business is done.
- Ecological covers everything environmental. It has been a larger topic in recent years, including areas around climate change, carbon footprint, recycling, and waste management.
- Political/legal covers all the aspects related to regulation, laws, and policies, often with a profound impact on every company, regardless of how large or small.

After the longlist was compiled, it was reduced to a **shortlist** based on interviews with relevant experts: a selection of relevant external developments.
Finally, we synthesised the outcomes of the three steps described above to arrive at a **shortlist** of trends that may impact skill demand and socioeconomic inequality in the EU within the next decade (see Chapter 4 for an elaborate discussion of these trends). By describing and analysing the impact of these external factors on socioeconomic inequality and skill demand, we provide a first broad picture of the landscape in wherein Europe will operate in the near future and how these factors may affect socioeconomic inequality and skill demands. These results will be used as input for the following scenario analyses (Task 7.2 and 7.3 within WP7).

Horizon scanning workshop with consortium partners

After mapping the external developments using the DESTEP framework, our next step was to discuss the key scenario variables (technological change, globalisation and migration) and other potentially relevant drivers with a team of experts and to provide a first assessment of their potential impact on skill demand and socioeconomic inequality in the EU within the next decade (2025-2030). To this purpose, we organised an online horizon scanning workshop with all consortium partners involved in WP7 of the GI-NI project (for an overview of participants, see Annexe 2). This workshop was repeated with the SAB-members, to include an international perspective to the results (see Annexe 2).
The horizon scanning workshop is a technique to get the vision and knowledge from experts and quickly gather information from a group (European Commission, 2020a). This workshop starts with an introduction with basic information about the problem, involves splitting up into smaller groups to discuss external developments in more detail, and ends with ranking the impact and (un-)certainty of the external developments to understand what developments the group expects to face in the future.

The horizon scanning workshop organised within the GI-NI project consisted of three parts consecutively designed first to indicate the potential impact of relevant trends on skill demand and socioeconomic inequality in the EU and arrive at a shortlist of the most important trends.
In Part 1, the **longlist** of trends (see Annexe 1) was discussed and clarified with all consortium partners in a general session, after which there was a possibility to ask questions, share thoughts and bring forward missing trends. Next, we asked consortium partners to take 10 minutes to reflect individually upon the relevance of the trends for both skill demand and socioeconomic inequality in the EU. Finally, they submitted their top 5 trends for each outcome via Mentimeter. This interactive online presentation tool allowed us to visualise their input in a so-called 'word cloud': a graphical representation of word frequency that gives greater prominence to words that appear more frequently.

In Part 2, consortium partners were divided over three breakout sessions for a guided discussion on one of the three key scenario variables within the GI-NI project (globalisation, technological change and migration). The goal of the breakout sessions (30-40 minutes) was to discuss each trend's development, impact, and uncertainty and identify potentially relevant underlying drivers. Box 2 below presents the questions asked to guide the discussion.

Box 2. Questions to guide discussion on key scenario variables

1. In which direction will this trend develop over time?

The direction in which a trend develops over time can vary depending on various factors. It is important to analyse the trend's underlying drivers and the dynamics of the environment in which it operates. Some helpful questions to consider include:

- Is there a clear increase or decrease in the trend? Is it expected to continue growing or decline?
- Can the trend go both ways, or are there factors that strongly determine its direction?
- What is the time horizon for the development of the trend? Is it expected to manifest within the next 5 years, 10 years, or longer? Alternatively, does the trend's development depend on certain conditions or events?

2. What is your expectation on the impact of this trend on a) skill demand and b) inequality?

Assessing the impact of a trend on skill demand and inequality requires considering various factors and contexts. Some helpful questions to guide this analysis include:

- How important or disruptive is the trend in relation to skill demand and inequality?
- Which countries, people, sectors, or industries are likely to be impacted by this trend?
- When will the impact of the trend take place? Is it already occurring, expected to happen soon, or projected to occur in the distant future?

3. Can you describe the mechanisms behind the impact of this trend?

Understanding the mechanisms behind the impact of a trend involves identifying the cause-and-effect relationships and the processes through which the trend influences skill demand and inequality. Some helpful questions to explore include:

- How does the impact of the trend unfold? What are the primary effects and secondary consequences?
- What are the key factors or conditions that determine the trend's impact on skill demand and inequality?
- What sequence of events or interactions occurs as a result of the trend, and what are the boundary conditions or constraints that shape its impact?

4. How certain is it that this trend will impact a) skill demand and b) inequality?

Assessing the certainty of a trend's impact on skill demand and inequality requires considering the available evidence, expert opinions, and the level of uncertainty surrounding the trend. Some helpful questions to consider include:

- Is there a clear indication of an increase or decrease in skill demand and inequality due to the trend, or can it go both ways?

- What are the factors that may determine the direction and certainty of the trend's impact on skill demand and inequality?
- Are there any potential mitigating factors, counter-trends, or uncertainties that could affect the certainty of the trend's impact?

In Part 3, we presented consortium partners with the five most important trends that resulted from their assessment in Part 1. Using driver assessment techniques, consortium partners were asked to rate each trend according to their expected impact and expected uncertainty for both skill demand and socioeconomic inequality in the EU. Specifically, they had to drag-and-drop each trend in a 2x2 matrix with uncertainty on the x-axis and impact on the y-axis.

Impact assessment with TNO experts

The final step in the scanning phase was to objectively estimate the trends' impact on skill demand and socio-economic inequality as objectively as possible. Using a quantitative survey method, we asked a number of people with expertise in this area to estimate the impact of each trend identified in the longlist.
For each DESTEP domain, 27 experts were anonymously presented with a list of the most important trends and an accompanying brief description (see Annexe 1). They were then asked to indicate the extent to which they expected each trend to have an impact on a) skill demand and b) (social) socio-economic inequality on a 10-point scale.
The results of the three steps in the scanning phase are discussed in Chapter 4.

2.4.3 Step 3 IMPACT

Objectives

Different scenarios can be designed, analysed and worked out based on the scanning work outcomes. This serves as the input, together with task 7.2 (2x2x2 WIOD-based quantitative scenario projections), for Task 7.3 in which the qualitative scenarios are built.
The third phase of the PRO-SPECT foresight methodology defines the relationships between the selected external trends and uncertainties and assesses the impact on skill demand and socio-economic inequality. Impact analysis identifies what effect the external developments selected in PRO-SPECT step 2 (scanning) might have on various dimensions of the problem statement. Typically, the impact is not linear or unambiguous, but rather the result of interactions between developments, events, ecological and social conditions, and societal actors' actions over time. The results of the scanning process from step 2, therefore, form the basis for a thorough impact analysis of external developments, in consultation with the client and experts. The result of these impact assessments is a deeper understanding of reality and a range of alternative futures.
The impact analysis must take into account the cognitive limits of participating experts and/or policymakers. That is, dominant assumptions and frames of thought may affect the ability of experts and/or policymakers to follow up on the identified strategic futures (Geurts et al., 2022). Existing future expectations of clients can be made explicit and the extent to which they are plausible should be analysed (Asselt et al., 2010). In addition, the number of external developments and the variation of possible impacts should also be reduced to manageable numbers.
If there is high uncertainty about the direction and pace of the external development and/or its impact, uncertainties can be worked out in different directions. For example, the external development 'globalisation'

could both increase (based on historical economic trends) and decrease (if demand for more local and seasonal products continues).
Based on this, different scenarios are designed, analysed and worked out.

We will use the input of other WPs' input, collect input from consortium (related) experts, and focus on the interactions between the different external developments and their possible impacts (WP7.3). The uncertainties will be the axes for developing 3 to 4 scenarios. These will be different plausible global, EU and/or EU-country group scenarios.
When the impact analysis is completed, there is an insight into the (possible) future impact of the various external developments on the outcome measures. Also, the external developments are related to each other, and, based on this, there is a number of possible future scenarios.
In Step 3 of the PRO-SPECT approach in the GI-NI project, the focus is on assessing the impact of the selected external trends and uncertainties on skill demand and socio-economic inequality. The objective is to analyse the relationships between these trends and uncertainties and understand their effects on the problem statement.
The impact analysis takes into account the complexity and non-linearity of the relationships between developments, events, ecological and social conditions, and the actions of societal actors over time. It aims to provide a deeper understanding of reality and explore a range of alternative futures. The results from the scanning phase in Step 2 serve as the basis for conducting a comprehensive impact analysis in consultation with the client and experts.
It is important to consider the cognitive limits of participating experts and policymakers during the impact analysis. Dominant assumptions and frames of thought may influence their ability to grasp and follow up on the identified strategic futures. Clients' future expectations should be made explicit and analysed for their plausibility. Additionally, the number of external developments and the range of possible impacts should be managed and reduced to a manageable number.
Different scenarios can be developed to explore alternative futures when there is a high degree of uncertainty regarding the direction and pace of external developments or their impacts. For example, if the external development is "globalisation," scenarios could be designed to explore both increasing and decreasing globalisation trends based on historical economic trends and potential shifts in demand for local and seasonal products.
The input from other work packages and consortium experts will be utilised in developing scenarios and analysing the interactions between different external developments and their potential impacts. The uncertainties identified in the scanning phase will serve as the axes for developing 3 to 4 plausible global, EU, and/or EU-country group scenarios.
Once the impact analysis is completed, there will be insights into the potential future impact of the external developments on the outcome measures (skill demand and socio-economic inequality). The interrelationships between the external developments will also inform the creation of multiple future scenarios.

Approach and impact methods

Based on the results of the earlier steps and input from WP7.2 and other WPs, impact assessment methods can be selected; the approach can be deployed modularly. By definition and common in qualitative foresight, the approach is multi-method and iterative. This means that we (can) use several methods and that the use of methods can also depend on the result of the previous steps. However, we can already form our necessary main guiding research questions and provide a selection of possible methods. The following describes the

initial main questions and basic methods that we selected based on scientific literature and internal working sessions.

1. Main questions

How might external developments affect the outcome measure? What other factors are involved?
The impact analysis analyses the potential impact of external developments on the problem.

2. Consult experts

Experts in skills and labour market research are consulted to estimate the impact of external developments on socio-economic inequality and skills demand. These are possibly GI-NI and TNO researchers (Prof. Dr Steven Dhondt, Prof. Frank Pot, Dr Peter Oeij, Dr Ruud Gerards), the GI-NI Scientific Advisory Board (SAB) members, International research experts (see Annexe 4), but also stakeholders such as policymakers, technologists, or social partners. Several expert workshops and meetings will be planned in Task 7.3 (e.g., with GI-NI SAB members) and WP8. As in the scanning phase, consulting experts and stakeholders can range from one-on-one semi-structured interviews to large (focus) groups. Different forms and techniques can also be used in this step, as described in step 2 (scanning). Which techniques will be chosen will depend on the results and input of earlier steps and the results of the other work packages, but we are thinking about a combination of workshops and interviews. The external developments are presented to the experts and stakeholders as identified in the scanning phase. They are asked about the interrelations between the developments and the expected impact on outcome measures (such as changing skills needs). They are asked about the degree of impact (how far-reaching, the size of the target group that will be affected), but also about uncertainties surrounding the impact and the working mechanisms (through which route the impact takes place).

With regard to the size of the impact and the uncertainties, quantitative estimates will be made by the experts and stakeholders. This will be done with a so-called driver mapping workshop (see below).

3. Driver mapping

In the scanning phase, insight from experts and literature was used to identify which external developments affect the problem, the future expectations regarding these external developments, and how uncertain these expectations are. This is input for the so-called driver mapping (where we can describe a driver as an external development with a major impact). Driver mapping aims to determine the most impactful developments (of technological change, globalisation, migration) and to what extent the impact is certain or uncertain.

Driver mapping occurs in a group discussion based on previously collected input within the project group. The meeting takes 1.5 to 2 hours, works best with groups of 12 or more participants, and consists of three overall steps: 1) introduction of the overview of external developments (including future expectations and uncertainty 2) brainstorming in small groups about the effects of the external developments on the outcome measure and 3) placing the external developments in a so-called driver map (Government Office for Science, 2017). The developments that fall in the upper right quadrant (see Figure 2) and are therefore both high-impact and uncertain are the core uncertainties that can be worked out into future scenarios in different ways. Of course, the more certain high-impact developments are also included in the scenarios, but there is less need to vary them.

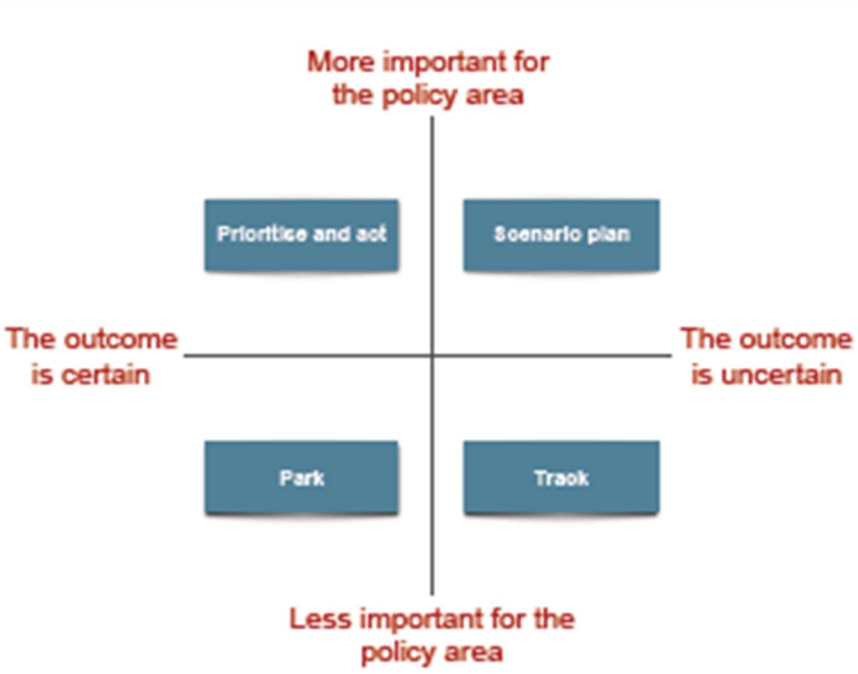

Figure 2. Visual representation of driver mapping (Government Office for Science, 2017).

4. Extrapolating external developments from quantitative data and GI-NI results

By supplementing expert estimation with data where possible (e.g., from the other WPs, particularly WP7.2), we provide the most objective assessment of possible futures. This is crucial because foresight inevitably relies on subjective and creative interpretations of the changes that create or shape the future (Popper, 2008). Historical data can help identify a trend and make future projections, but the future's uncertainty must be factored in (Asselt et al., 2010). The trend and impact of external developments can be further substantiated by using the data sources available to GI-NI's researchers and affiliated institutions (e.g., TNO monitoring data, CNAM).

In WP7.2 future projections are made based on the global input-output-based approach as proposed by Duchin (2005). The projections will be based on World Input-Output Database (WIOD) data and a tailored occupations-by-industry dataset connected to WIOD. WIOD provides an internally consistent accounting framework describing the most recent state situation (base year t). Imputing different rates of labour productivity (by type of occupation), trade and migration growth patterns. Based on GI-NI's s consolidated evidence-based appropriate parameters and plausible guesstimates relating to technological change, trade and migration growth, as well as labour productivity and other underlying variables (e.g. demographics) can be done. It also provides for trends, impacts, and state-of-play data on the core endogenous variables: skill demand and socio-economic inequality. WP7.2 is ongoing at the time of writing this report, and no results are available yet. We will closely discuss with the WP leader (RUG) how to best connect this to WP7.3 qualitative scenario building.

We will gather the inputs and evidence base from the other WPs and Policy Briefs as best as possible. More specifically, we will further rely on results about technological change from WP3 (e.g., D3.4), results about globalisation from WP4 (e.g., D4.4), and results about migration pathways from WP5, e.g., D5.4). However, we are dependent on the timely delivery of the related deliverables. Moreover, certain results from the WPs are specific and context-dependent and only sometimes useful for our scenario analyses. Yet, we already used conceptual knowledge for our conceptualisations in the SCOPING step (e.g., from WP1 Setting the scene and

WP2). We will also gather preliminary information through (individual) expert sessions and workshops with the accompanying GI-NI WP researchers.

5. Developing future scenarios

Scenarios are stories that describe alternative ways of what the future could look like for the client. Developing scenarios is used in 42% of foresight studies (Popper, 2008) and is our main goal in Task 7.3. The starting point for the scenarios can be the most impactful and at the same time uncertain external developments identified in driver mapping. From these so-called core uncertainties, an axis can be created that serves as the basis for the scenarios. However, other uncertainties and/or certain high-impact external developments can also be included (Asselt et al., 2010). Therefore, we expect to select two core uncertainties/external developments to base our scenarios on.

Combining the two (most uncertain and impactful) uncertainties creates a cube that serves as a basis for further scenario development (for a graphic display example, see Figure 3). We will not make a scenario for all possible scenario (8) considering the three axes for reasons of manageability. However, based on an analysis of the interactions between the drivers (most important external developments) we expect that 3 or 4 scenarios might be sufficient to explore the most relevant futures. The selection of the two main scenarios is part of the previous steps above.

In addition, each scenario describes how different external developments relate to each other and their possible effects on the outcome measure. Thus, it is important to analyse how different external developments interact (e.g., technological developments and economic growth) and their effect on the outcome measure. For this purpose, the conceptual framework developed in step 1 (scoping) can serve as a basis.

All sub-results from the previous steps are input for scenario development. This can be done by the project team itself or in collaboration with the client or other stakeholders.

This method results in future scenarios in the form of a story and a common understanding of the dynamics of change and the options and choices stakeholders face under different market conditions (Smith & Saritas, 2011). The scenario can be developed in working sessions in four steps; see Box 3 below.

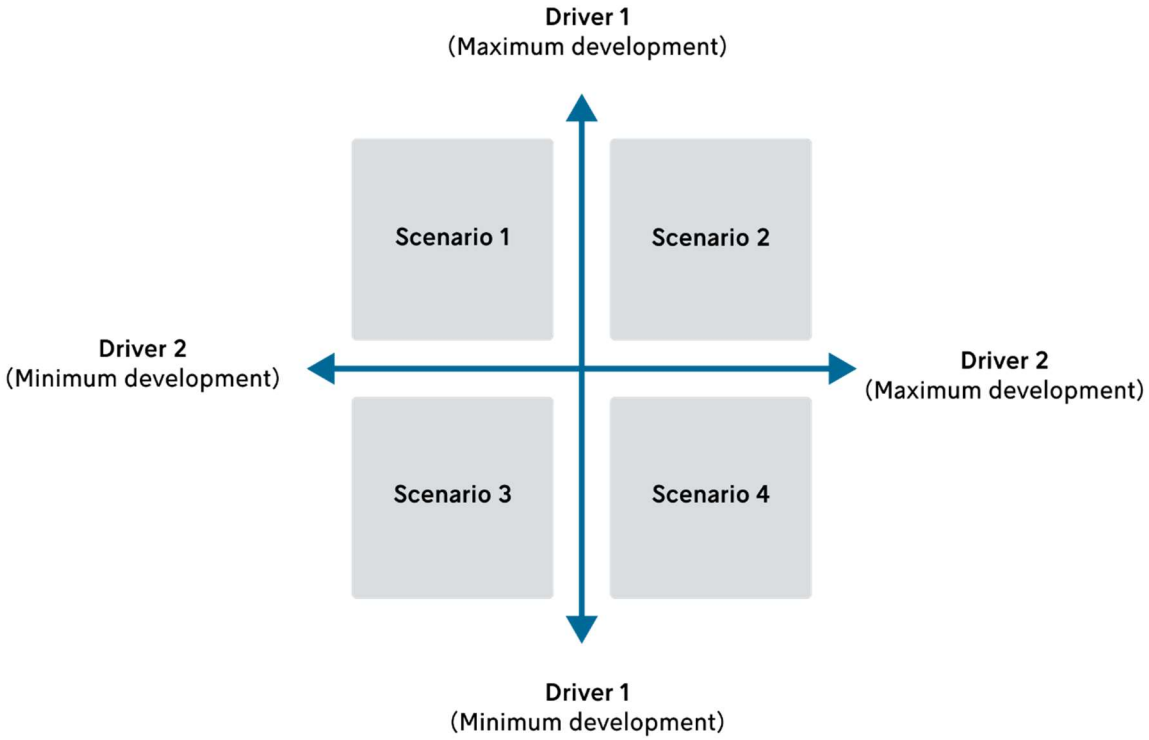

Figure 3. Example of a graphic display and conceptual description of a 2x2 scenario

Box 3. Steps for developing future scenarios

The scenario can be developed through working sessions using four steps:

Step 1: Describe the world as it appears after the specified period of foresight. What are the impacts of the external developments? Provide a description of the policymaker's context, considering developments in Europe or on a global scale.

Step 2: Create a timeline of events.

Step 3: Give the scenario a name and construct a narrative using storytelling techniques to paint a vivid picture of the still uncertain future.

Step 4: Identify key recommendations and issues for policy or strategy development.

This approach is based on an example from The Futures Toolkit (Government Office for Science, 2017).

2.4.4. Step 4 PERSPECTIVE

In the fourth and final PRO-SPECT step, an outline is created for policy options that the policymaker could consider. After all, the ultimate goal of the PRO-SPECT approach (and of foresight in general) is for the user to prepare for the future. This is input for and will be aligned with WP7.4 Scenario-specific barriers, needs and opportunities assessment, WP8 Policy recommendations and WP9 (dissemination and impact). We use PERSPECTIVE, the fourth and final step of the PRO-SPECT approach.

The focus shifts from exploring possible futures to how these insights can be used to advise certain policies and strategies or prepare decision-making. The results from impact analysis are thus transformed into

products that can support decision-makers in choosing and controlling strategic actions for implementation (Voros, 2003). In particular, this process focuses on identifying and informing future pathways for change. Examples include: exploring impacts and choices regarding current policies, providing early warnings about possible (unexpected) difficulties/new opportunities, enabling future-oriented planning, exploring possible disruptive developments or proposing focus (Geurts et al., 2022).
Involving policymakers, other stakeholders and experts again in this step creates a common understanding around the dynamics of change, future decisions and compromises are already explored and more insight can be gained into opportunities and threats in different futures, especially when a SWOT analysis is also performed: a strength-weakness analysis that shows at a glance where opportunities lie and what needs extra attention (Government Office for Science, 2017). We need to cooperate closely with WP8 activities, sessions and tools.
In the scientific literature, strategy development and implementation often follow after the overview of actionable policy options has been made. We have expertise in the GI-NI researchers consortium (WP7, WP8) and can help to shape and discuss action options. In fact, it is the last step in the PRO-SPECT approach. However, implementing the actual strategy and policy options is a step that the policymaker could take.

Approach and methods

What does it yield?

When the impact analysis is completed, we and policymakers have insights into the action options (such as strategic or policy options) with which the client can get started. But a more elaborate roadmap or a knowledge and innovation agenda can also result.

Approach WP7 Task 4 Scenario-specific barriers, needs and opportunities assessment

Task 7.4 will be integrated into our perspective approach. It translates the scenario outcomes into concrete future barriers, needs and opportunities at global and EU-country groupings level for each of the scenarios. It maps the type, breadth and depth of the challenges required in different action domains (i.e. labour markets, skills development, education, mobility/migration) to avoid, resolve and/or steer away from less desirable outcomes and potentially turn negative outcomes into positive ones, focusing on shared prosperity and redressing socio-economic inequality. It also defines appropriate levels of possible action in geo-political and actor-type terms: government action (policies), private action (e.g. formulation of technical and implementation standards) and public-private initiatives. A consistent inventory of themes/domains and possible actions will be drawn up by analysing imbalances, mismatches and gaps and using back-casting techniques. The assessment will serve as a stepping stone for WP8.

1. Option planning

For developing and testing more specific (strategic) options, 'option planning' is a widely used tool (Asselt et al., 2010). Option planning is a process in which different policy or strategic options are developed and assessed in the context of different future scenarios. After the scenarios are developed in step 3, each scenario can be thought through to look for possible options for action. This is done in working sessions with the policymakers, possibly together with other stakeholders. The effectiveness of an option can then be estimated for each scenario.
For option planning, a Boston matrix is often used. In the Boston matrix (see Figure 4 for an example), certain options are planned, i.e., it is thought through how positive an option will be in a scenario, expressed from -

(bad idea) to ++ (very good idea). After planning the options, it becomes clear which options are profitable in all future scenarios (the robust options) and which are profitable only in some scenarios (the dynamic options). Choices must then be made, with robust options providing more certainty to reach a desirable policy outcome. The result of option planning is thus insight into the smartest action options[1].
Option planning is best done in two steps, with first a large group and later focus groups in a half-day workshop. Box 4 below shows an example of what an option planning workshop might look like in the PRO-SPECT approach.

Box 4. Example of an option planning workshop.

Workshop Outline:

Step 1: Begin by introducing the future scenarios and clearly define the criteria that the options should fulfil.

Step 2: Engage the group in a collaborative discussion to collect and gather action options. Through deliberation, aim to reach a consensus and create a unified list of options.

Step 3: Test the identified options within the different scenarios. It may be helpful to establish a risk strategy beforehand and utilize it to assess the viability of each option. Four commonly employed approaches include:

- Portfolio Strategy: Develop a portfolio of options that covers all scenarios. This approach is conservative and prioritizes safety.
- Scenario-specific Strategies: Formulate separate strategies for each scenario. While this approach is thorough, it can be time-consuming and expensive to implement.
- Flexible Strategy: Adopt a flexible strategy where decision-making is deferred as much as possible. Only implement quick wins to maintain adaptability.
- Single-scenario Focus: Concentrate on one likely or desirable scenario. This approach is narrowly focused and carries inherent risks.

For further information, refer to the workshop outline provided by Jisc[2].

In the example in Figure 4, a matrix is filled in with the four different risk strategies for planning energy-saving options. In the scenario where energy and money saving is high on the agenda (cautious world), more will be invested in all saving options. 'Energy audits' seems to be the most robust option. Thus, assuming that the future is uncertain, each scenario must weigh the best option. In each scenario, different variables affect the options.

[1] Ruijter, P. de & Janssen N. (1996). (Real) Option planning and Scenarios. De Ruijter. Retrieved from http://www.deruijter.net/?p=927.
[2] Jisc (2014, October). Test Options. Retrieved from https://www.jisc.ac.uk/guides/scenario-planning/test-options

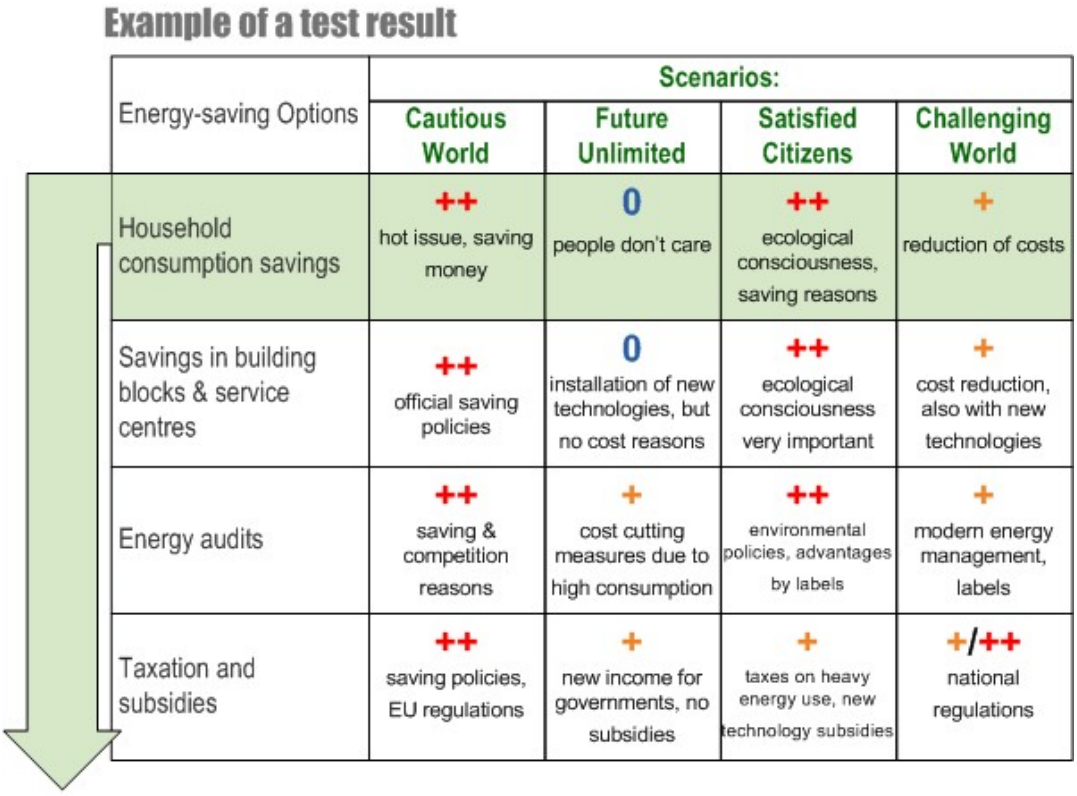

Figure 4. Example of option planning with household energy-saving options[3].

2. Roadmapping

Roadmaps show how the input gathered from scanning and impact can influence the future of the policy or strategy area (Government Office for Science, 2017; Smith & Saritas, 2011). Road mapping can be done by the project team as desk research or as a workshop with the policymaker, other stakeholders and/or experts in groups of 4-6 participants. This method creates a holistic picture of (strategic) action options and puts developments on a timeline. This allows the complex connections and relationships between different elements to be identified. It also helps to prepare for the impact of related - and sometimes unrelated - policy or strategy areas that may be of interest. We use the roadmapping steps within the PRO-SPECT approach as indicated in text box 5 below.

Text box 5 – Steps in Roadmapping

Within roadmapping, there are six steps to follow:

Step 1: Agree on the scope of the roadmap, including the specific area, time span, and other relevant parameters. This scoping process helps define the boundaries of the roadmap.

Step 2: Develop an initial version of the roadmap based on the current ideas and inputs from the working group. This version serves as a starting point for further refinement.

[3] Jisc (2014, October). Test Options. Retrieved from https://www.jisc.ac.uk/guides/scenario-planning/test-options

Step 3: Collect research and insights gathered from earlier steps of PRO-SPECT (presumably a reference to a specific methodology or project) that are relevant to the roadmap. This information provides valuable input for shaping the roadmap.

Step 4: Refine and expand the timeline(s) within the roadmap using the collected research and insights. This step involves adjusting the roadmap to align with the identified factors and developments.

Step 5: Validate the roadmap by engaging in discussions in a plenary setting or with subject matter experts. This validation process helps ensure the roadmap is well-informed, robust, and aligned with the perspectives of relevant stakeholders.

Step 6: Create an action plan that outlines the highest priority objectives derived from the roadmap. This plan specifies the actions needed to achieve these objectives, serving as a guide for implementation.

For further detailed explanations, refer to The Futures Toolkit by Waverly Consultants (Government Office for Science, 2017).

3. Results: Step 1 - SCOPING

The scoping phase typically begins with identifying the question from the primary stakeholder, establishing a shared understanding of the problem, and determining the research question. Since the EU has already carried out these steps in their call for proposals and, in more detail, in the GI-NI proposal and WP7 task description (refer to Chapter 1 for further information), we will only restate the research question below and provide descriptions of the main constructs, selected data sources, and relevant experts.

3.1 Research Question

What is currently occurring in the EU regarding external trends and uncertainties (including technological change, globalisation, and migration), and what potential impact might these external developments have on socio-economic inequality and skill demand within and outside the EU?

3.2 Main Constructs and Definitions

The definitions of the main constructs are provided below. These definitions are based on the deliverables within the GI-NI project (D1.1, D1.2, and D2.1) and ensure consistent alignment with other work packages and coherence in results and outcomes throughout the project.

- *Technological Change*: Technological change refers to "introducing and disseminating new products or production processes that enable the economy to increase output at a given cost, or to maintain or increase output while reducing costs" (Dekker et al., 2021, p. 7).
- *Globalisation*: Globalisation is defined as "the inflow and outflow of goods, services, and investment across national borders, along with the functions— including innovation-related functions— that enterprises and organisations employ to establish, support, and manage these flows" (Seghir et al., 2022, p. 10).
- *Migration:* Migration is defined as "the movement of people from one state to another, with the intention of staying in the host state for a minimum duration, either for reasons related to work, family and study, or due to political instability, conflict, persecution, and disasters" (Seghir et al., 2022, p. 14).
- *Skill Demand*: Before defining "skill demand," it is necessary to clarify the concept of "skills" in the context of the GI-NI project. According to Green (2013) and the integrated approach proposed, skills are understood as any "personal quality" that contributes value, is expandable (capable of improvement through training and development), and has a social dimension (socially determined). Therefore, the project focuses specifically on how skills are utilised within jobs and how they can be enhanced through training and development when there is a mismatch between job requirements and the skills possessed by individuals (Seghir et al., 2022, p. 27).

  The earlier deliverables of the GI-NI project did not provide a specific definition of "skill demand." This study refers to "the skills that organisations require from their employees to enable effective and efficient work, both currently and in the future."

- *(Socio-economic) Socio-economic Inequality*: Like skills, socio-economic inequality is a multidimensional and dynamic construct. In the GI-NI project, a broad perspective is adopted, defining it as "the unequal distribution of opportunities across different segments of society, encompassing economic disparities (such as income and wealth) and imbalances in an individual's capabilities and access to resources (e.g., education, health) for adapting to these changes" (Seghir et al., 2022, p. 6).

3.3 Data Sources and Relevant Experts

We identified relevant data sources and experts through an iterative process involving online scientific databases (Scopus, Google Scholar) and consultation with consortium partners. Annexe 3 provides a list of selected data sources for the literature quickscan conducted during the scanning phase (refer to Chapter 4). Annexe 4 presents a list of potential recommended high-level global experts who will be approached during the impact phase of the foresight process (Task 7.3). These experts specialise in one of the three primary external developments or possess a comprehensive overview of the overall landscape.

3.4 Conceptual Model

The conceptual model that guides the subsequent steps of the foresight process is derived from the research framework of the GI-NI project, as described in D1.1 (Dekker et al., 2021, p. 16). This framework visually depicts how the three external developments (technological progress, globalisation, and migration) influence the distribution of income and wealth through various mechanisms, such as value creation, the production system, and the labour market (including work, skills, and market power). To develop a conceptual model capable of identifying and comprehending the impact of external developments on skill demand and socio-economic inequality, we expanded the research framework by distinguishing the outcomes of interest (skill demand and socio-economic inequality) and incorporating policy options and additional external developments.

The conceptual model is presented in Figure 5 below.

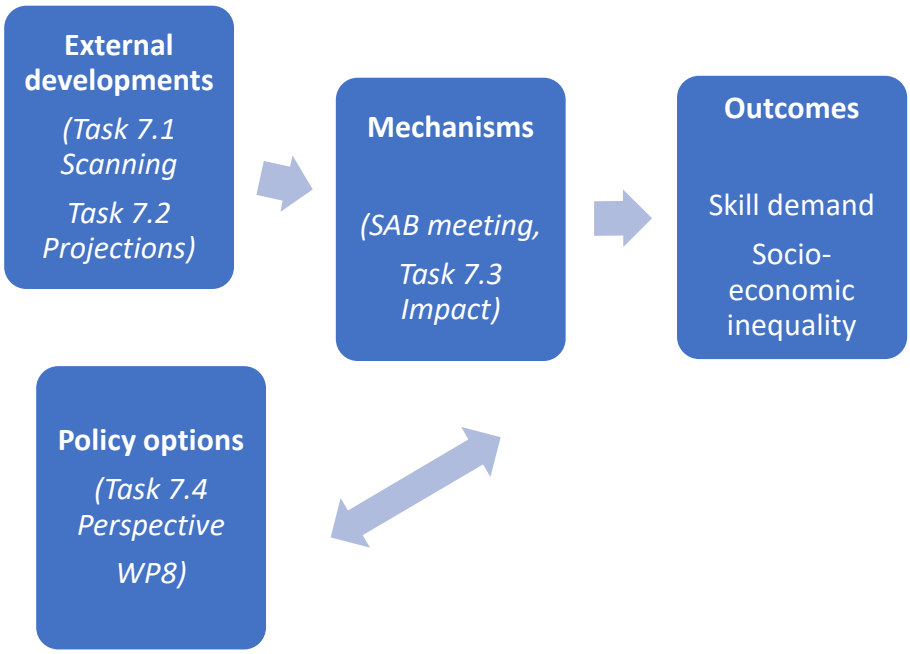

Figure 5. Conceptual model to guide the foresight process and associated WP activities

4. Results: Step 2 - SCANNING

To identify and select the most relevant external developments, we employed the DESTEP framework, which involved conducting a literature overview, a qualitative foresight session with consortium partners (Horizon scanning workshop), and a quantitative impact assessment. The combined results served as the foundation for the initial list of 24 sub-variables representing the six main DESTEP external developments that could impact the EU's skill demand and socio-economic inequality from 2025 to 2030. DESTEP encompasses six domains: demographic, economic, sociocultural, technological, ecological, and political-legal (Rastogi & Trivedi, 2016; RIVM & TNO, 2022). This chapter presents the findings of the scanning phase and examines the potential impact of the nine shortlisted external developments.

4.1 Mapping of relevant external developments: literature quick scan (DESTEP)

The literature quick scan encompassed scientific literature, grey literature (reports, presentations, webpages), and documents and reports from OECD Strategic Foresight and EU Strategic Foresight. It resulted in an initial list of 36 potentially relevant external developments that could affect the EU's skill demand and/or socio-economic inequality. These developments underwent detailed internal discussions among our team of foresight and labour market experts. Over three separate sessions, we eliminated duplicates, combined certain developments, separated others, and identified the most relevant external developments through a guided brainstorming exercise in which each participant individually ranked the trends by relevance. The final longlist consisted of 24 external developments distributed across the six DESTEP domains (refer to Annexe 1 for the full longlist and descriptions of trends).

4.2 Horizon scanning workshop with consortium partners

The longlist of external developments and their potential impact on skill demand and socioeconomic inequality in the EU from 2025 to 2030 was deliberated in an online horizon scanning workshop with all consortium partners involved in WP7 of the GI-NI project (see Annexe 2 for participant overview).

Part 1 of the horizon scanning workshop assessed the relevance of each external development for skill demand and socio-economic inequality through a ranking procedure. The results are depicted in word clouds generated for skill demand and socio-economic inequality (Figure 6). Regarding skill demand, the frequently chosen trends were the ageing workforce, globalisation, technological change, the increasingly higher educated workforce, and new ways of working. Concerning socio-economic inequality, the frequently chosen trends were the same as for skill demand, except that consortium partners selected labour migration as one of the most significant trends that may impact socio-economic inequality in the EU instead of new ways of working.

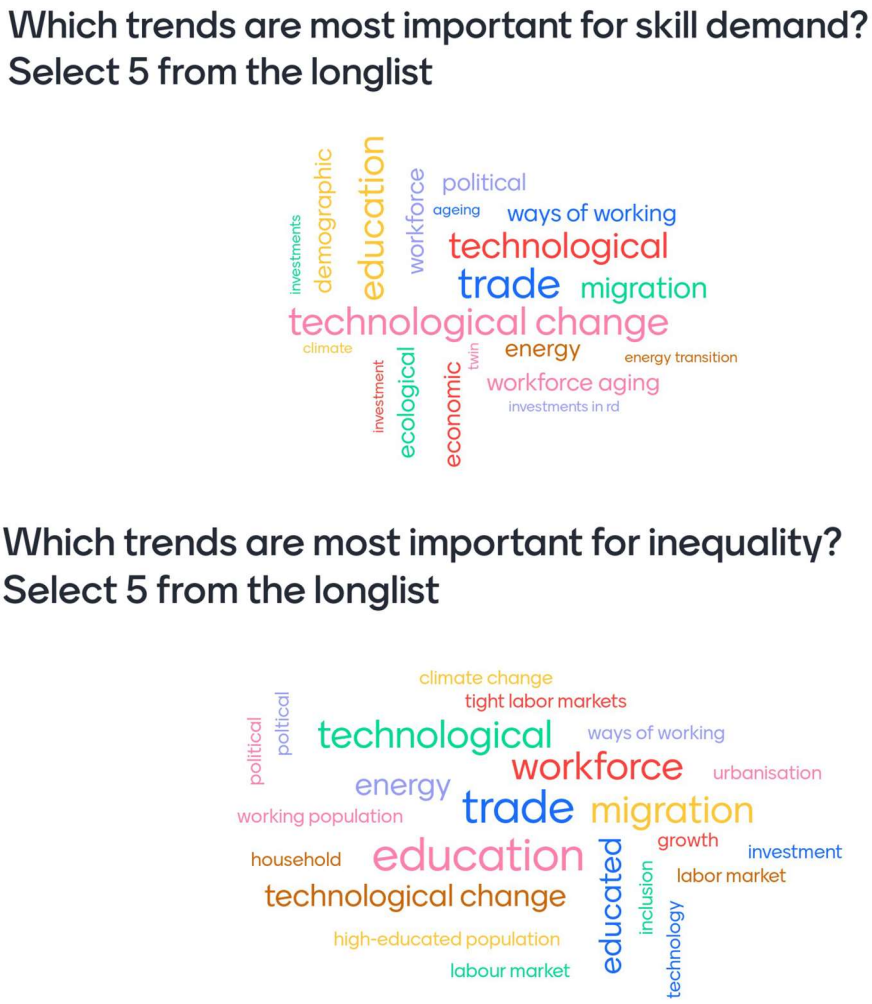

Figure 6. Most relevant trends for skill demand (left) and socio-economic inequality (right) in the EU, selected from the longlist by consortium partners during Foresight session.

After a guided discussion (Part 2) on the development, impact, and uncertainty of the three key scenario variables within the GI-NI project (globalisation, technological change, and migration), consortium partners rated each trend based on their expected impact and expected uncertainty for both skill demand and socioeconomic inequality in the EU (Part 3). The results indicated that consortium partners anticipated a relatively high impact of technological change and globalisation on skill demand (Figure 7) and a relatively high impact of technological change, globalisation, and labour migration on socio-economic inequality (Figure 8). In addition, for both skill demand and socio-economic inequality, the expected uncertainty of these trends was assessed as average compared to most of the other trends, which were considered low (i.e., relatively certain), except for ways of working, which was also deemed relatively uncertain.

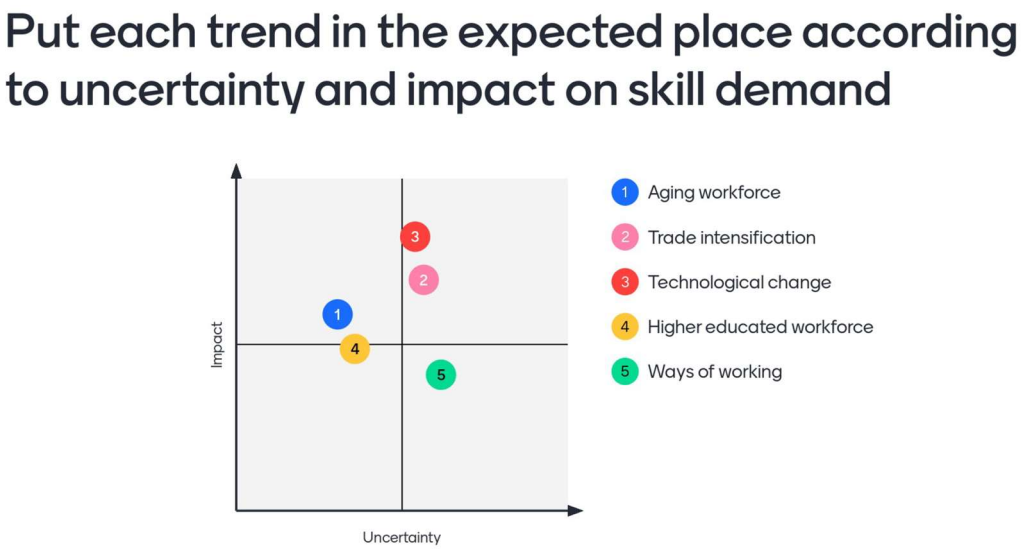

Figure 7. Consortium partners' assessment of impact and uncertainty of the most relevant trends for skill demand in the EU during Foresight session.

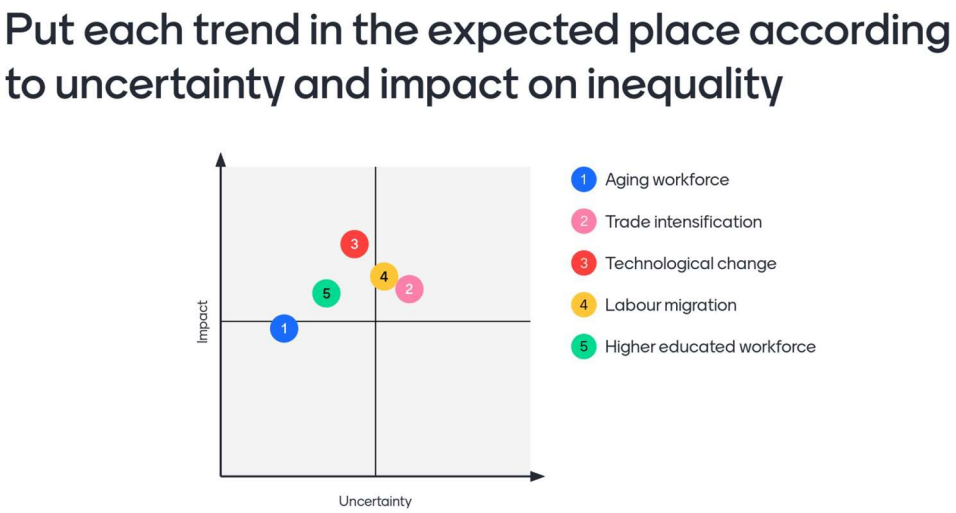

Figure 8. Consortium partners' assessment of impact and uncertainty of the most relevant trends for socio-economic inequality in the EU during Foresight session.

4.3 Impact assessment with TNO experts

To arrive at a shortlist of the most relevant external developments, we used a quantitative survey method in which 27 TNO labour and work experts anonymously estimated each trend's impact. The results of this quantitative impact assessment are described below.

Skill demand: In terms of skill demand (see Figure 9), the external developments assessed as most impactful were the ageing workforce, an increasingly tight labour market, the EU becoming a market leader in technological developments, technological change, the energy transition, and an increased focus on the twin (green & digital) transition. However, it's important to note that the standard deviation of two of these trends, namely the ageing workforce and the EU becoming a market leader in technological developments, was equal to or higher than 2.0. This indicates that experts differed considerably in their assessment of the expected impact of these external developments.

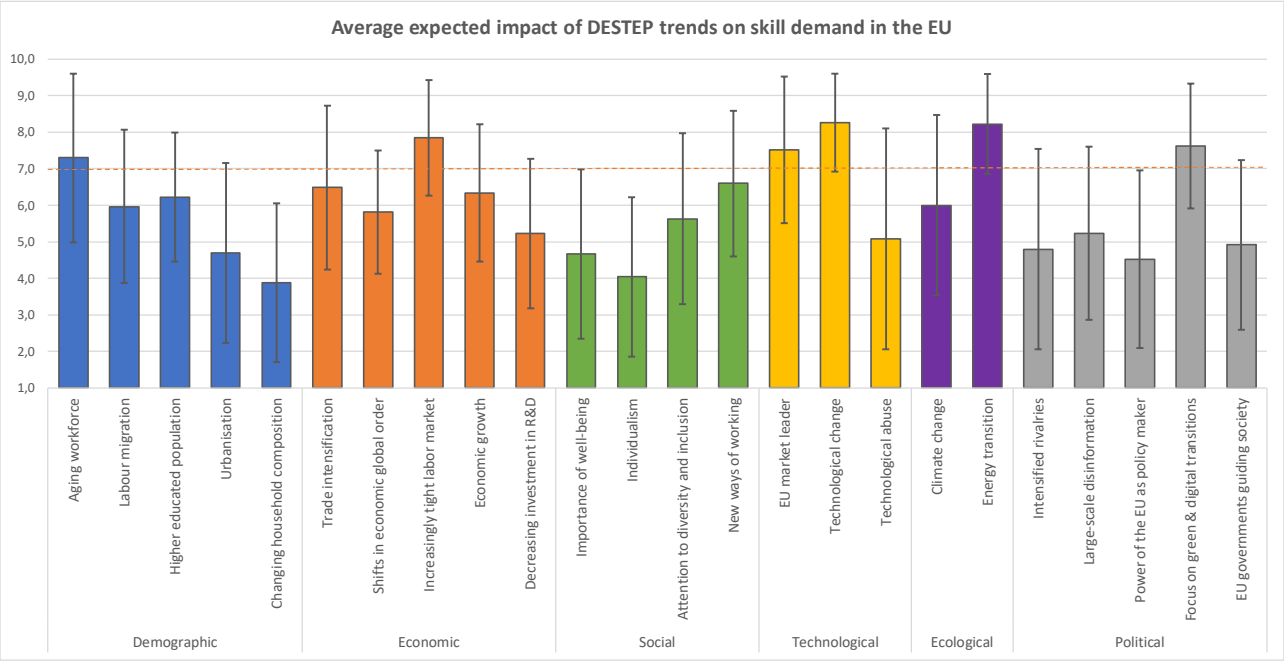

Figure 9. Average expected impact of external developments on skill demand within the EU, based on the results from a quantitative survey among TNO experts.

Socio-economic inequality: For socio-economic inequality, the external developments assessed as most impactful were labour migration, technological change, climate change, and the energy transition (see Figure 10). Similar to skill demand, the standard deviation of the ageing workforce and the EU becoming a market leader in technological developments was equal to 2.0, indicating significant differences in experts' assessment of their expected impact.

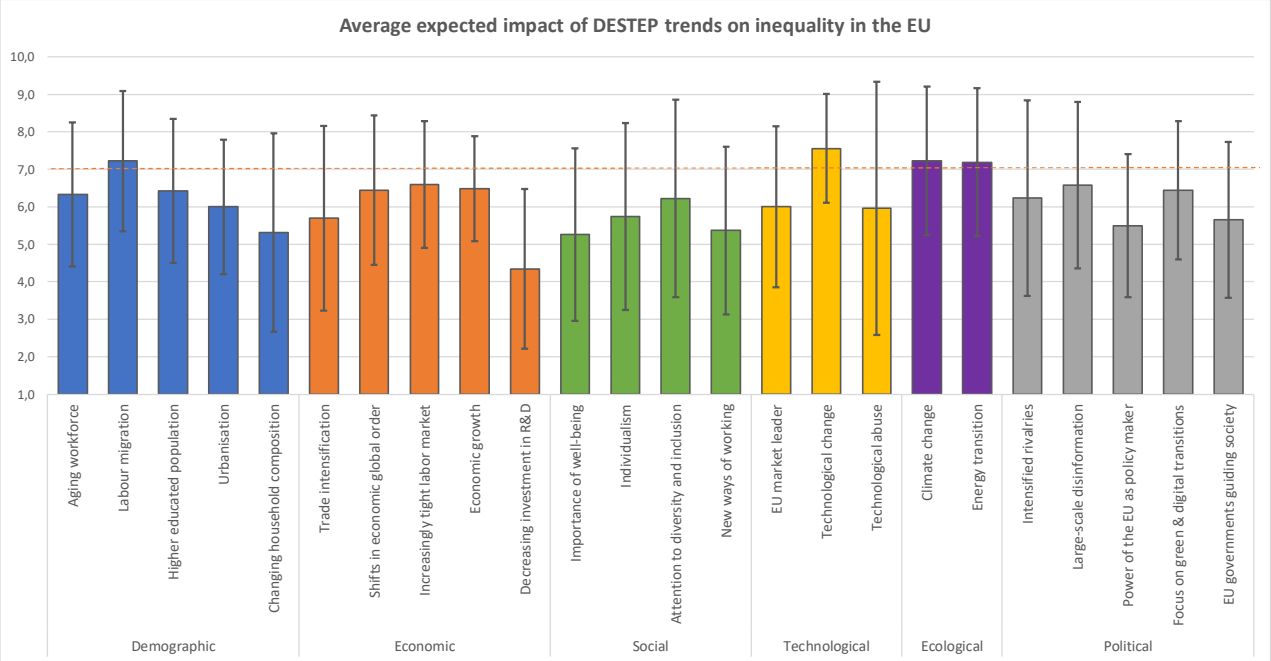

Figure 10. Average expected impact of external developments on socio-economic inequality within the EU, based on the results from a quantitative survey among TNO experts.

4.4 Overview and discussion of the most important trends

To arrive at the shortlist of the most relevant external developments, we included those developments that consortium partners indicated as most relevant for skill demand and/or socio-economic inequality. We also considered the highest impact category in the quantitative impact assessment, which included trends with an expected impact of Mean ≥ 7, Mode ≥ 8, and Median ≥ 8. Additionally, the three key scenario variables in the GI-NI project (globalisation, technological change, and migration) were included regardless of the assessments during the scanning process. This resulted in a shortlist of nine external developments relevant to the GI-NI project. These developments and a broad description of their expected impact on skill demand and/or socio-economic inequality are discussed below.

1. Labour Migration (Demographic)

Labour migration refers to the movement of people from one place to another for the purpose of seeking employment or work opportunities. Labour migration is expected to continue to be a crucial factor for both skill demand and socioeconomic inequality in the EU over the next decade. Demographic changes and skills gaps in specific sectors and regions are driving the demand for migrant workers.

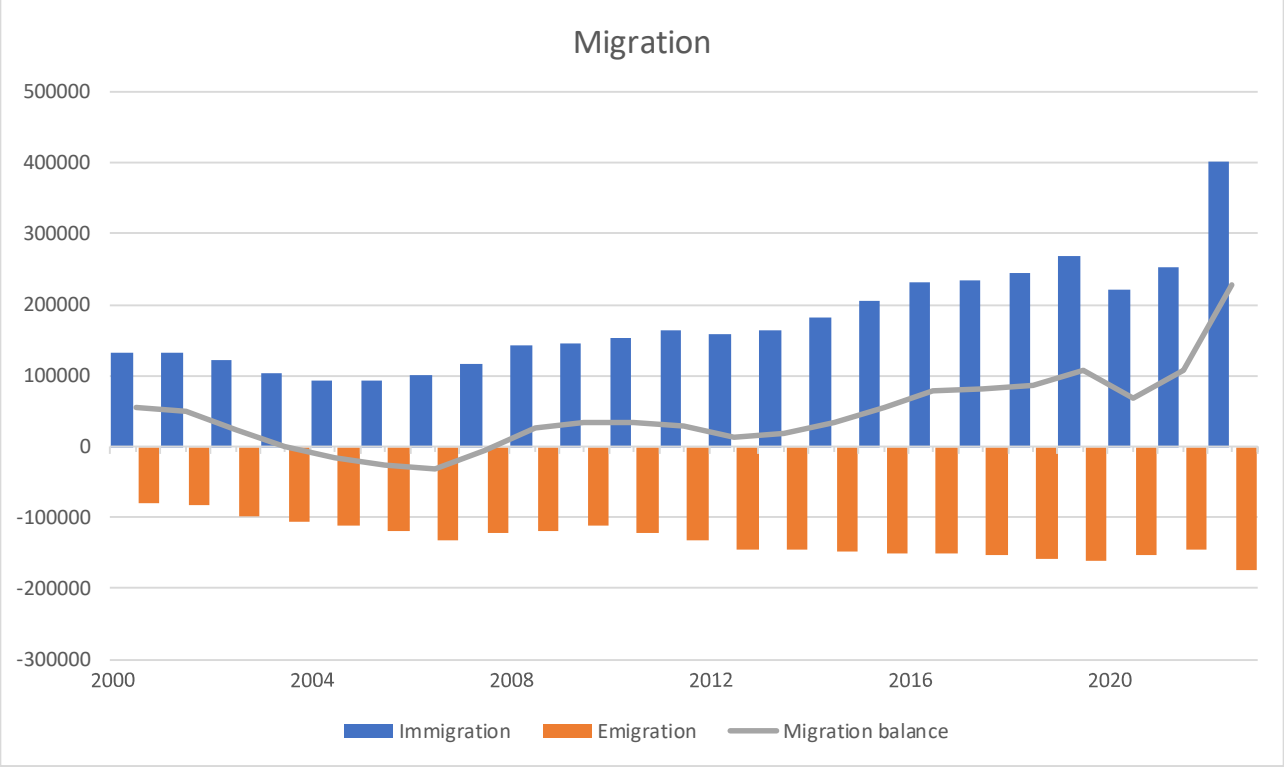

Figure 11. Development of migration within the Netherlands since 2001 (source: CBS[4]).

Although the COVID-19 pandemic may have impacted the volume and patterns of labour migration in recent years, it is unlikely to change the long-term trend of labour mobility in the EU (CEDEFOP, n.d.). The EU is likely

[4] https://opendata.cbs.nl/#/CBS/nl/dataset/83474NED/table?ts=1685220810815

to continue promoting legal and regulated migration, with a focus on attracting highly skilled workers. However, changing political landscapes and growing anti-immigrant sentiments in some member states may lead to greater restrictions on labour migration (Patuzzi, 2020).

The consortium partners and participants in the quantitative impact assessment expected that labour migration could affect the demand for skills as well as socio-economic inequality.

2. Ageing workforce (Demographic)

The workforce in the EU is expected to undergo significant changes due to various factors, including demographic shifts, technological advancements, and changing economic and social conditions (European Commission, 2017). In addition, the ageing population is especially expected to impact the workforce, with a shrinking pool of available workers and a greater demand for healthcare and social services. The ageing workforce refers to a situation where a significant proportion of the working population comprises older individuals, typically 50 years and above. This presents both opportunities and challenges for businesses. For example, while experienced workers bring valuable skill sets, knowledge, and expertise, businesses may also face higher healthcare costs.

To illustrate, Figure 12 displays the past and expected development of the ageing population for the next decades within the Netherlands.

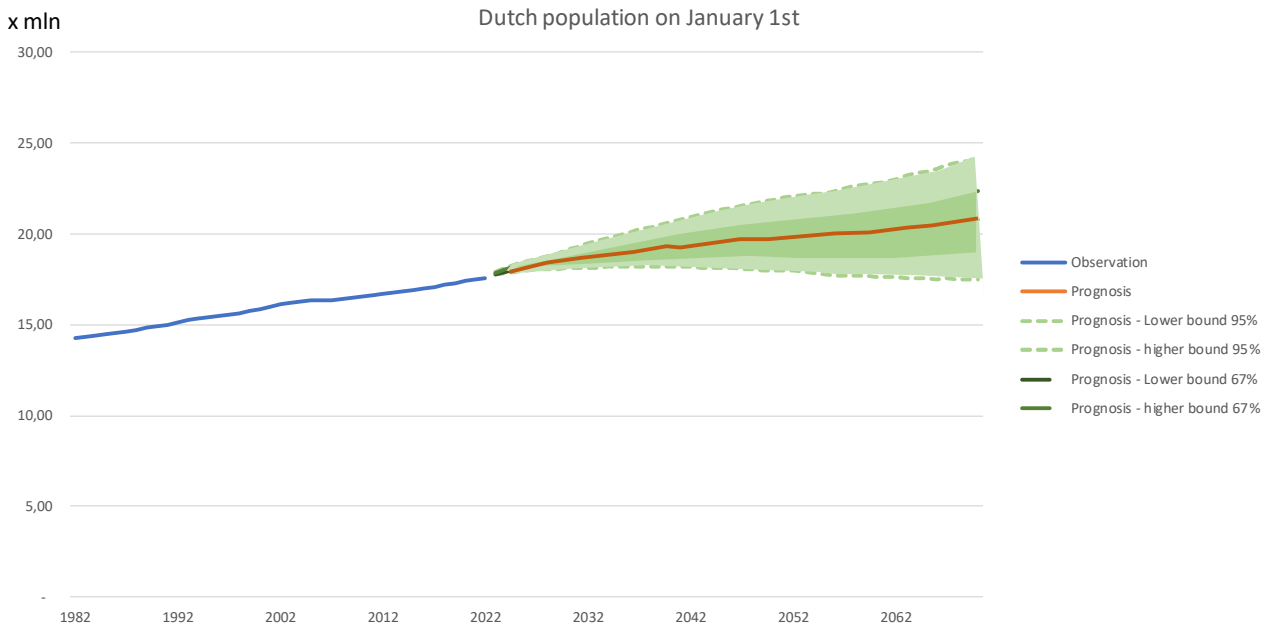

Figure 12. Development and prognosis of the ageing population within the Netherlands (source: CBS[5]).

The consortium partners and participants in the quantitative impact assessment expected that the ageing workforce would only affect the demand for skills.

3. Globalisation (Economic)

Globalisation refers to the increasing interconnectedness and interdependence of countries and economies around the world, driven by advancements in communication, transportation, and technology. It is mostly

[5] https://www.cbs.nl/nl-nl/visualisaties/dashboard-bevolking/bevolkingsgroei/toekomst

characterised by the intensification of international trade and investment and is likely to continue to increase within the EU for multiple reasons[6]. First, technological advancements and digital transformation are expected to foster global interconnectedness (European Commission, 2020b). Second, globalisation may further increase because the COVID-19 pandemic has highlighted the importance of global cooperation and solidarity and the vulnerabilities of global supply chains (European Commission, 2020a). Third, the EU will likely continue to promote free and fair trade, sustainable development, and human rights in its global interactions, which may further stimulate globalisation. Fourth and finally, the EU's changing geopolitical landscape and relations with major global actors, including the United States, China, and Russia, can also impact the future of globalisation – although it remains unclear in which direction[7].

However, it is important to note that some experts foresee deglobalisation rather than globalisation, with an increased focus on local production and self-sufficient countries. In fact, according to a survey by McKinsey & Company, 73% of executives from global supply chain companies are planning to increase resilience in their supply chains by localising production and diversifying supplier bases. Similarly, a survey conducted by Boston Consulting Group[8] found that 73% of executives in Europe and North America were planning to increase their investments in local production. In addition, governments are also taking steps to encourage local production and self-sufficiency: the EU increasingly addresses the challenges and risks of globalisation and has launched an industrial strategy aimed at building more resilient and strategic supply chains (European Commission, 2020a). The Biden administration has proposed a $2.3 trillion infrastructure plan in the United States, including domestic manufacturing, research, and development investments.

While most literature leans towards an increase in globalisation, it is difficult to predict the future with certainty as the evidence also tentatively suggests a growing focus on local production and self-sufficiency. The consortium partners and participants in the quantitative impact assessment expected that globalisation could affect the demand for skills as well as socio-economic inequality.

4. Tight labour market (Economic)

A tight labour market is a labour market in which there are more job openings than available workers. The tightness of the labour market in the EU is expected to vary by sector and region over the next decade: some sectors and regions may face labour shortages due to demographic shifts and skills mismatches, while others may experience higher unemployment rates and relatively high job insecurity (European Commission, 2020a). Yet, the overall trend is that the labour demand in the EU will increase, resulting in a high number of job vacancies relative to a low unemployment rate (also see the Beveridge curve in Figure 13 below). In addition, the recent COVID-19 pandemic has significantly impacted the labour market, with some sectors experiencing job losses and others facing increased demand for workers in essential industries such as healthcare and food retail (Eurofound, 2021).

[6] European Commission (2023). EU position in world trade. Retrieved at March 13, from https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/eu-position-world-trade_en

[7] European Parliament. (2021). EU-China relations: Prospects and challenges. Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/696209/EPRS_BRI(2021)696209_EN.pdf

[8] https://www.bcg.com/publications/2020/covid-investor-pulse-survey/overview

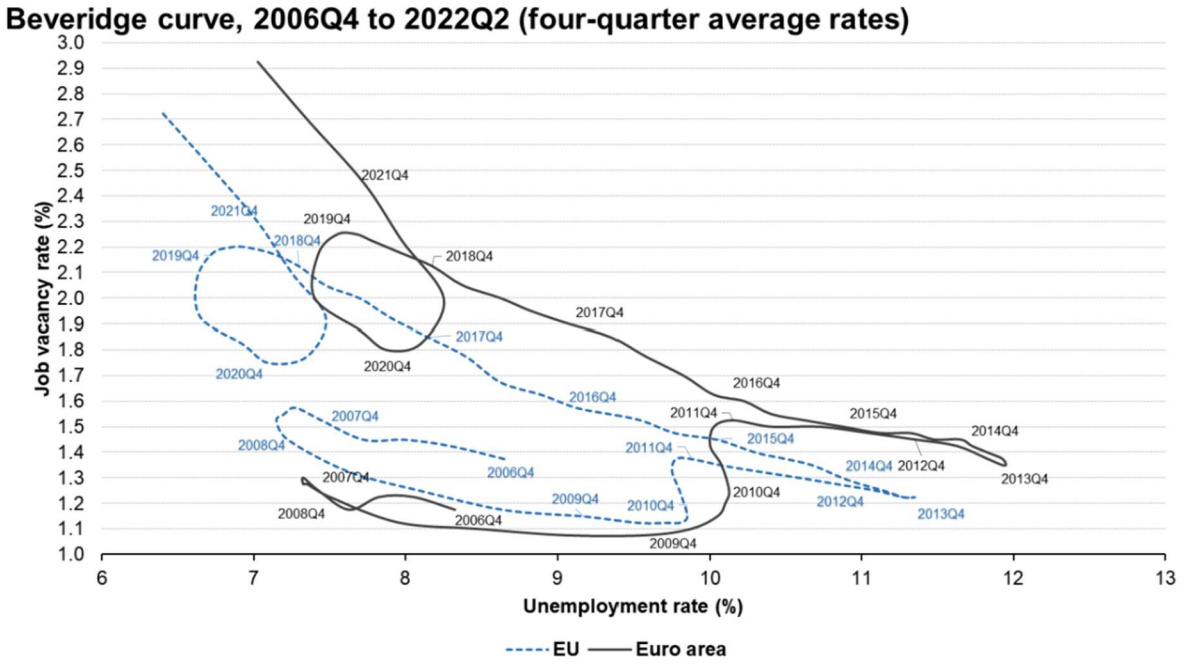

Figure 13. Developments in the relationship between the job vacancy rate (JVR) and the unemployment rate (UR) in the European Union (EU) (source: Eurostat[9]).

5. Technological Change (Technological)

Technological change is expected to continue rapidly in the EU over the next decade, driven by artificial intelligence, robotics, and the Internet of Things (IoT) developments. One reason for the expected increase is that the EU has set ambitious targets for digital transformation, including increasing investment in digital infrastructure and skills, promoting the use of open data and emerging technologies, and supporting innovation and entrepreneurship (European Commission, 2021). Another reason is that the COVID-19 pandemic has accelerated digitalisation and remote working trends. With the EU's focus on promoting a sustainable and inclusive digital transition (European Commission, 2021, 2020b), technological change will likely continue shaping the EU's economy and society over the next decade, with opportunities and challenges for different sectors and communities.

The consortium partners and participants in the quantitative impact assessment expected that technological change could affect the demand for skills as well as socio-economic inequality.

6. EU market leader in tech developments (Technological)

Despite the shifts in the balance of power on the world stage (e.g., the rise of China), the EU still remains the largest economy in the world and is committed to remaining a market leader[10]. This certainly applies to technological developments since (digital) technology is playing an increasingly prominent role in industry (European Commission, 2020b), but also in the ecological domain (twin transitions) (Muench et al., 2022). The EU has set itself the goal of becoming a market leader in (1) artificial intelligence and quantum technology and (2) advanced manufacturing and materials (European Commission, 2022a).

[9] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Job_vacancy_and_unemployment_rates_-_Beveridge_curve

[10] European Commission (2023). EU position in world trade. Retrieved at March 13, from https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/eu-position-world-trade_en

At this moment, the EU's capabilities in artificial intelligence are similar to Japan's, but it needs to catch up with leaders: the USA and China. The USA, Japan, and China are currently in the lead in key quantum technologies. However, by 2025, the EU will have its first computer with quantum acceleration, and if matched with investment, it could be at the cutting edge of quantum capabilities by 2030 (European Commission, 2022b).

In addition, the EU is expected to become a technological champion in advanced manufacturing and materials, with its firms delivering many critical enablers to global production lines. Furthermore, it is a leader in future smart and sustainable mobility and low-carbon technologies (OECD, 2021).

The consortium partners and participants in the quantitative impact assessment expect that if the EU becomes/remains a market leader in these technologies, this will affect the demand for skills but will not have an impact on socio-economic inequality.

7. Energy transition (Ecological)

The energy transition is the transition from the use of fossil fuels to more renewable energy sources such as wind energy, solar energy, and biomass. This energy transition is important to achieve climate objectives but also because fossil fuels will eventually be exhausted (RIVM & TNO, 2022). Nuclear energy can also contribute to achieving CO_2 targets (NEA, 2018). However, nuclear energy is still under discussion in EU politics and society. Opinions are divided when it comes to nuclear energy as a suitable energy source in the energy transition (Ciucci, 2022; RIVM & TNO, 2022).

The energy transition in the EU will certainly continue in the coming years. Partly influenced by the war in Ukraine and the EU's attempts to rapidly reduce its dependence on Russian fossil fuels, the EU's renewable energy target for 2030 is currently 45%[11]. Solar energy, wind energy, and heat pumps are important sources to achieve this increase (European Commission, 2022a).

Although it is expected that the energy transition will continue, there are also uncertainties related to supply and demand on the EU market, fuel prices, knowledge development and innovation in the field of renewable energy, government policy (e.g., subsidies for home insulation, solar panels, hybrid heat pumps, and electric cars), the capacity of the electricity network, and the availability of materials and workers (RIVM & TNO, 2022).

The consortium partners and participants in the quantitative impact assessment expect that if the energy transition continues, this will have an impact on both skill demand and socio-economic inequality.

8. Climate change (Ecological)

A relatively rapid increase in temperature characterises climate change. This increase is expected to continue in the upcoming decades (RIVM & TNO, 2022). At a global level, the average temperature is expected to be about 1.5 to 2.5 degrees Celsius higher in 2050 compared to pre-industrial levels in 1850-1900. If the policy remains unchanged, the average temperature will rise further in 2100 to about 4 degrees Celsius compared to 1850-1900 (Masson-Delmotte et al., 2021; OECD (Organization for Economic Cooperation and Development), 2012; Royal Dutch Metereological Institute, 2021). This is likely to have disastrous effects. The Intergovernmental Panel on Climate Change (IPCC) estimates, for instance, that 1 to 2 degrees Celsius of global warming risks reaching unstoppable tipping points, such as sea-level rise, collapsing ice sheets, loss of

[11] European Commission (2023). Renewable energy targets. Retrieved at March 13, from https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en

natural carbon sinks such as the Amazon rainforest, one million species becoming extinct, and the transfer of pandemic-causing pathogens (Masson-Delmotte et al., 2021).
The main cause of climate change is human behaviour. The use of fossil raw materials (and the resulting greenhouse gas emissions) is particularly harmful (Masson-Delmotte et al., 2021).
Greenhouse gas emissions have been decreasing in Europe for a number of years. This development is expected to continue in the upcoming decades. However, it should be noted that this picture is distorted because the production of goods destined for the European market often takes place outside Europe. In addition, there is an increase in greenhouse gases worldwide (Masson-Delmotte et al., 2021). Therefore, it is very likely that the temperature rise will continue.
The consortium partners and participants in the quantitative impact assessment expect that climate change, reflected in global warming, will not affect the demand for skills but will have an impact on socio-economic inequality.

9. Policy focus on green & digital transitions (Political)

The EU faces two important challenges: the green and digital transitions. These transitions are also known as the "twin transitions", as neither can succeed without the other. On the one hand, digitalisation can help us reduce our carbon footprint (e.g., by joining video conferences rather than travelling to meetings). But on the other hand, we need to ensure that digital technologies do not consume more energy than they save. Digital technologies account for between 8-10% of our energy consumption and 2-4% of our greenhouse gas emissions[12].
The green and digital transitions are at the top of the EU's political agenda, and their interplay is expected to have massive consequences for the future. They are, for instance, expected to be key for achieving the United Nations Sustainable Development Goals (European Commission, 2022b).
Although it is high on the EU's policy agenda, the envisaged 'twinning 'has yet to be a foregone conclusion. It depends on the ability to deploy existing and new technologies at scale and various geopolitical, social, environmental, and economic factors (Muench et al., 2022). For this reason, the European Commission has identified ten key areas where action will be needed (European Commission, 2022b). These areas of action must increase the chance of successful twinning.
The consortium partners and participants in the quantitative impact assessment expect that if the twin transitions continue, this will have an impact on skill demand but will not affect socio-economic inequality.

[12] European Commission (2023). Green digital sector: Europe's digital transition goes hand in hand with the European Green Deal. Retrieved at March 13, from https://digital-strategy.ec.europa.eu/en/policies/green-digital

5. Preliminary conclusion and main next steps

5.1 Main conclusions

In section 4, we identified and selected the nine most relevant external developments out of 24 (longlist) and created an overview of the literature using the DESTEP framework. The nine most relevant external developments are:

- Labour Migration (Demographic)
- Ageing workforce (Demographic)
- Globalisation (Economic)
- Tight labour market (Economic)
- Technological Change (Technological)
- EU market leader in tech developments (Technological)
- Energy transition (Ecological)
- Climate change (Ecological)
- Policy focus on green & digital transitions (Political)

Additionally, we conducted a qualitative foresight session with consortium partners (Horizon scanning workshop) and a quantitative impact assessment of the nine external developments. The combined results formed the basis for the **shortlist** of nine external effects that may impact the EU's skill demand and socio-economic inequality within the next decade (2025-2030). The specific results for the major impacts on the two primary outcomes (skill demand and inequality) were as follows:

- For skill demand, the external developments assessed as most impactful were: the **ageing workforce**, an increasingly **tight labour market**, the EU becoming a **market leader in technological** developments, **technological change**, the **energy transition**, and an increased focus on the **twin (green & digital) transition**.
- For socio-economic inequality, the external developments assessed as most impactful were: **labour migration, technological change, climate change,** and the **energy transition**.

Our following impact assessment will focus on the three main developments: technological change, globalisation, and labour migration.

5.2 Main next steps: Final impact assessments and scenario building

In our next steps, under the foresight: selecting, deepening, and validating 3-4 core scenarios (Task 7.3), we will first assess the impact of the three main developments: technological change, globalisation, and labour migration. We will do this in guided expert sessions with internal GI-NI and TNO experts, GI-NI SAB members, and international experts (see Annexe 4). This will serve as input for Task 7.3 and WP8 Policy recommendations (refer to the scheme below for the interconnections).

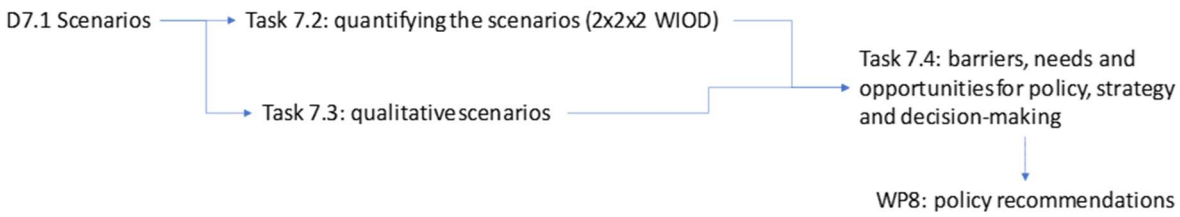

Figure 14. ***Overview of steps that will be executed***

The overall and final steps of WP7 are described below.

Table 1. The overall and final main steps of WP7

WP7 Scenario Steps	With whom?
Scoping assessment (see section 3)	From call for proposals, GI-NI proposal, TNO and GI-NI experts
Scanning assessment (see section 4)	From call for proposals, GI-NI proposal, TNO and GI-NI experts
Impact assessment (to be finally determined Task 7.3, for the first concept, see 2.3.3)	TNO and GI-NI consortium experts, SAB, international experts (see Annexe 4) From GI-NI deliverables which are still work in progress
Perspective assessment (to be finally determined in Task 7.3 and WP8, for the first concept, see 2.3.4)	Experts, Researchers, Policy makers, Social partners, Other relevant stakeholders in close collaboration with WP8
Input to WP6 and WP8	WP6 and WP8 researchers and other relevant experts and stakeholders

References

Asselt, M. B. A. Van, Faas, A., & Molen, F. Van Der. (2010). *Uit zicht. Toekomstverkennen met beleid.* Amsterdam: Amsterdam University Press.

CEDEFOP. (n.d.). *https://www.cedefop.europa.eu/en/news/post-pandemic-recovery-sight-europes-labour-market*. https://www.cedefop.europa.eu/en/news/post-pandemic-recovery-sight-europes-labour-market

Ciucci, M. (2022). *Fact sheets on the European Union: Nuclear energy.* https://www.europarl.europa.eu/factsheets/en/sheet/62/nuclear-energy

Dekker, R., Alcidi, C., Rademakers, E., Zierahn, U., Garmann Johnsen, H.-C., & Peijen, R. (2021). *D1.1 Internal guidance paper for the institutional and economic analysis WP1. Setting the scene : framework , approaches , methodology* (Issue GI-NI Report).

Duchin, F. (2005). A world trade model based on comparative advantage with m regions, n goods, and k factors. *Economic Systems Research*, *17*(2), 141–162. https://doi.org/10.1080/09535310500114903

Eurofound. (2021). *Business not as usual: How EU companies adapted to the COVID-19 pandemic*. http://eurofound.link/ef21033

European Commission. (2017). *Germany: Industrie 4.0. Digital Transformation Monitor. (DG GROW)*. https://ati.ec.europa.eu/sites/default/files/2020-06/DTM_Industrie 4.0_DE.pdf

European Commission. (2020a). Shaping Europe´s Digital Future. *Digital Services Act Roadmap*, 2–6. https://doi.org/10.2759/48191

European Commission. (2021). *Strategic Foresight Report The EU's capacity and freedom to act (COM/2021/750 final).*

European Commission. (2022a). *REPowerEU Plan - COM(2022) 230 final*. https://ec.europa.eu/commission/presscorner/detail/es/ip_22_3131

European Commission. (2022b). *Twinning the green and digital transitions in the new geopolitical context*.

European Commission, E.-D. G. (2020b). *Advanced Technologies for Industry – Methodological report*. https://doi.org/10.2826/16708

Geurts, A., Gutknecht, R., Warnke, P., Goetheer, A., Schirrmeister, E., Bakker, B., & Meissner, S. (2022). New perspectives for data-supported foresight: The hybrid AI-expert approach. *FUTURES & FORESIGHT SCIENCE*, *4*(1). https://doi.org/10.1002/ffo2.99

Government Office for Science. (2017). *The Futures Toolkit. Tools for futures thinking and foresight across UK government* (Issue November). http://www.urenio.org/futurreg/files/The_FUTURREG_Futures_Toolkit_v3.pdf

Green, F. (2013). *Skills and skilled work: an economic and social analysis*. Oxford University Press.

Koen, J., Bruel, D., Preenen, P. T. Y., & Torre, W. van der. (2023). *PRO-SPECT: Professional Sectoral Perspective on the Future.*

Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S. L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M. I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J. B. R., Maycock, T. K., Waterfield, T., Yelekçi, O., & Yu, R. Z. B. (eds. . (2021). *IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change []. In Press.*

Muench, S., Stoermer, E., Jensen, K., Asikainen, T., Salvi, M., & Scapolo, F. (2022). *Towards a Green & Digital Future: Key Requirements for Successful Twin Transitions in the European Union.* Sevilla: JRC. https://doi.org/10.2760/54

NEA. (2018). The Full Costs of Electricity Provision. In *The Full Costs of Electricity Provision*. Paris: OECD Publishing. https://doi.org/10.1787/9789264303119-en

OECD. (2021). *Global Scenarios 2035: Exploring implications for the future of global collaboration and the OECD*. https://doi.org/10.1787/df7ebe33-en%0Ahttps://www.oecd-ilibrary.org/docserver/df7ebc33-en.pdf?expires=1663898392&id=id&accname=guest&checksum=286739639CFA62A9B2FA226019032F14

OECD (Organization for Economic Cooperation and Development). (2012). *OECD Environmental Outlook to*

2050. Paris: OECD Publishing. https://doi.org/10.1787/9789264122246-en

Patuzzi, L. (2020). *European cities on the front line: New and emerging governance models for migrant inclusion*. https://www.migrationpolicy.org/sites/default/files/publications/MPIE-LocalGovernance-FINAL.pdf

Popper, R. (2008). How are foresight methods selected? *Foresight*, *10*(6), 62–89. https://doi.org/10.1108/14636680810918586

Rastogi, N., & Trivedi, M. K. (2016). Pestle Technique - A tool to identify external risks in construction projects. *International Research Journal of Engineering and Technology (IRJET)*, *3*(1), 384–388. https://lawaspect.com/pestle-analysis-construction-industry-2/

RIVM, & TNO. (2022). *De Toekomst van Gezond en Veilig Werken, Een brede horizonscan.* https://doi.org/10.21945/RIVM-2022-0197

Royal Dutch Metereological Institute. (2021). *KNMI Klimaatsignaal'21*. https://www.rijksoverheid.nl/documenten/rapporten/2021/10/25/bijlage-1-knmi-klimaatsignaal-21-hoe-het-klimaat-in-nederland-snel-verandert

Seghir, M., Alcidi, C., Aldaz, L., Los, B., Garmann, H., Paschen Knudsen, J., Trondal, J., & Pinheiro, R. (2022). *Report on definition and measurement of GI-NI key concepts within EU data sources (Report D2.1 - H2020 GI-NI)* (Issue 101004494).

Smith, J. E., & Saritas, O. (2011). Science and technology foresight baker's dozen: a pocket primer of comparative and combined foresight methods. *Foresight*, *13*(2), 79–96. https://doi.org/10.1108/14636681111126265

Voros, J. (2003). A generic foresight process framework. *Foresight*, *5*(3), 10–21. https://doi.org/10.1108/14636680310698379

Annexe 1 - Longlist of DESTEP trends

	Trend	*Description*
Demographic	Aging workforce / decreasing working population	By 2050, the working age population will diminish by about 16% in Europe. If this trend continues, by 2050 there may be 135 dependent non-workers for every 100 workers in the EU.
	Labour migration	Migration refers to the movement of people from one state to the other to stay in the host state for a minimum length of time, for reasons related to work, family and study, or because of political instability, conflict, persecution and disaster (climate change). In GI-NI, there is a strong focus on labour migration.
	Higher educated population	Increasing average level of education; more higher-educated women
	Urbanisation	Population growth is higher in cities and lower in rural areas
	Changing household composition	Smaller households, more single households
Economic	Trade intensification	There is an increasing inward and outward flow of goods, services, and investment across national borders, along with the functions related to innovation that enterprises and organisations use to set up, support, and manage these flows.
	Shifts in economic global order	The world is becoming increasingly multipolar. China is set to become the biggest economy before the end of this decade, with India possibly surpassing the EU in the next 20 years.
	Increasingly tight labour market	The labour market in the EU will become tighter (job openings are plentiful, and available workers are scarce)
	Economic growth	Although there may be signs of a pending recession, all countries are expected to experience long-term economic growth.
	Decreasing investment in R&D	The EU is a strong player in terms of knowledge and innovation: it accounts for almost 20% of the world's total research and development, publications and patenting activity. However, it lags behind global competitors in private investment into R&D. Since 2014, its position improved to Australia, Canada, Brazil, India, Russia and South Africa but has worsened to Japan, South Korea, the USA and China.
Social-cultural	Importance of well-being	For decades, the progress of societies has been defined in terms of the material standard of living and measured by proxy through GDP. However, new national budgets based on a broader understanding of well-being are being developed, and organisations as the OECD are finding more holistic ways of measuring human well-being, and leaders are embracing new economic standards.
	Individualism	Stronger focus on the individual. Note that in the public debate, more and more attention is being paid to the

		excessive individualisation and there is a call for more collectivity.
	Attention to diversity and inclusion	Increasing attention to achieve more diversity and offer equal opportunities for all: inclusion policies for women & minorities
	New ways of working	New ways of working and maintaining relationships with colleagues and business partners in all EU-countries: Working is less 'local' and can be done online from any country or city. This has consequences for work and relationships.
Technological	EU market leader in various technologies	Manufacturing: The EU will become a technological champion in advanced manufacturing and materials, with its firms delivering many critical enablers to global production lines. It is a leader in future smart and sustainable mobility and low-carbon technologies. AI & quantum: The EU's capabilities in artificial intelligence are similar to Japan's, but it needs to catch up with leaders: the USA and China. In key quantum technologies, the USA, Japan and China are currently in the lead. By 2025, the EU will have its first computer with quantum acceleration and if matched with investment, it could be at the cutting edge of quantum capabilities by 2030.
	Technological change	Increase in automation and digitalisation in all EU countries: - Robots/cobots: Technology that can support workers in their tasks or take over (repetitive) tasks - Hyperconnectivity: The number of connected devices globally might increase from 30.4 billion in 2020 to 200 billion in 2030. Hybrid working: Working is less 'local' and can be done from any country or city
	Technology abuse	Technology has led to an increase in the ability of humans to destroy all that our species has built, with one expert estimating there is a one in six chance of self-inflicted extinction this century.
Ecological	Climate change	The Intergovernmental Panel on Climate Change (IPCC) estimates that 1 to 2 degrees Celsius of warming risks reaching unstoppable tipping points, for example: - sea-level raising - ice sheet collapse - loss of natural carbon sinks such as the Amazon rainforest - one million species to become extinct - transferring pandemic-causing pathogens
	Realisation of the energy transition	There will be less fossil fuels, more sustainable and circular energy
Political	Intensified (EU and global) rivalries in a range of areas	- Zones of instability and conflict: Both state and non-state actors are likely to strengthen their hybrid tools, including the use of disruptive technologies, spread of disinformation

		and misinformation, information operations and both military and non-military influence. - Pressure on democracy and values: As of 2020, 34% of the world's population was living in countries where democratic governance was declining and only 4% in countries that were becoming more democratic.
	Large-scale disinformation	New tools and online platforms will pose increasing challenges to democratic systems and drive a new type of information warfare. Countries, organised crime groups, businesses or individuals use these solutions to spread disinformation globally or gain competitive advantages. This could threaten our democracies, polarise debates, and put health, security and the environment at risk.
	Power of the EU as policy maker	he decision latitude of the EU is predicted to increase.
	Stronger focus in EU-policies on twin (green & digital) transitions in Europe	The EU has been placing a stronger focus on twin transitions in its policies, specifically the transition to a green and digital economy. This includes efforts to reduce carbon emissions and increase the use of renewable energy sources, as well as the development of digital technologies such as AI. The goal of these twin transitions is to create a more sustainable and efficient economy, while also increasing the competitiveness of European businesses in the global market.
	- EU governments guiding society	EU-governments will take a larger role in guiding the economy and society. COVID-19 has renewed questions about the role of states vs. markets in guiding the economy and society. Note that it is uncertain what balance of state- and market-led approaches will prove most effective.

Annexe 2 - List of experts online Horizon Scanning Workshops

23 November 2022

NAME	ORGANISATION	COUNTRY
Bart Los	RuG	The Netherlands
Cinzia Alcidi	CEPS	Belgium, Italy
Farzaneh Shamsfakhr	CEPS	Belgium
Majda Seghir	CNAM	France
Egoitz Pomares	UPV/EHU	Spain - The Basque Country
Asier Lakidain	UPV/EHU	Spain - The Basque Country
Leire Aldaz	UPV/EHU	Spain - The Basque Country
Begoña Eguía Peña	UPV/EHU	Spain - The Basque Country
Balazs Reizer	MTA	Hungary
Suhendan Adiguzel-van Zoelen	TNO	The Netherlands, Turkey
Ulrich Zierahn	UU	The Netherlands, Germany

24 May 2023

NAME	ORGANISATION	COUNTRY
Research team		
Bart Los	RuG	The Netherlands
Cinzia Alcidi	CEPS	Belgium, Italy
Egoitz Pomares	UPV/EHU	Spain - The Basque Country
Asier Lakidain	UPV/EHU	Spain - The Basque Country
Leire Aldaz	UPV/EHU	Spain - The Basque Country
Marcel Smolka	EUF	Germany
Emilie Rademaker	UU	The Netherlands, Germany
SAB-members		
Michael Handel	Northeastern University	USA
Baris Alpaslan	Social Sciences University of Ankara Department of Economics	Turkey
Giselle Martins Venancio	Department of History at the Universidade Federal Fluminense	Brazil
Pinghan Liang	School of Government, Sun Yat-sen Universit	China

Annexe 3 - Overview of references included in the quick scan

Scientific literature & Reports

- Behrend, C.R., Götting, A., Kohlgrüber, M., Pomares, E., & S. Wright (August 2022). Understanding future skills and enriching the skills debate (BEYOND4.0 deliverable D6.1). Dortmund: BEYOND4.0. Retrieved from: https://beyond4-0.eu/publications
- Council of the European Union, General Secretariat of the Council, Conference on the Future of Europe – Report on the final outcome : May 2022, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2860/637445
- Dekker, R., Alcidi, C., Rademakers, E., Zierahn, U., Garmann Johnsen, H., van Zoelen, S., & Peijen, R. (2022). D1.1 Internal guidance paper for the institutional and economic analysis. GI-NI project.
- Dhondt, S. (2022). D1.2 Positioning paper on relevant EU policy areas and Governance models/instruments. GI-NI project.
- European Commission (2020). Strategic Foresight Report Charting the course towards a more resilient Europe (COM/2020/493 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1601279942481&uri=CELEX%3A52020DC0493
- European Commission (2021). Strategic Foresight Report The EU's capacity and freedom to act (COM/2021/750 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:750:FIN
- European Commission (2022). Strategic Foresight Report Twinning the green and digital transitions in the new geopolitical context (COM/2022/289 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022DC0289
- European Commission (2022). REPowerEU Plan (SWD/2022/ 230 final). https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131
- Kantar Public (2019). European Elections 2019. Report on the developments in the political landscape.
- Leis, M. (2010). Challenges for the future of learning until 2030: Foresight on learning, innovation and creativity. TNO, the Netherlands.
- Muench, S., Stoermer, E., Jensen, K., Asikainen, T., Salvi, M. and Scapolo, F., Towards a green and digital future, EUR 31075 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-52451-9, doi:10.2760/977331, JRC129319.
- Priess, J. A., Hauck, J., Haines-Young, R., Alkemade, R., Mandryk, M., Veerkamp, C., & Zulian, G. (2018). New EU-scale environmental scenarios until 2050–Scenario process and initial scenario applications. Ecosystem services, 29, 542-551. [New EU-scale environmental scenarios until 2050 – Scenario process and initial scenario applications - ScienceDirect]
- Seghir, M., Alcidi, c., Aldaz, L., Los, B., & Garmann Johnsen, H. (2022). D2.1 Report on definition and measurement of GI-NI key concepts within EU data sources. GI-NI project.
- Van der Voort, M. P. J., Schoorlemmer, H. B., & de Visser, C. L. M. (2013). Country Report - The Netherlands, Stakeholder and Driver Analysis on Energy Efficiency in Agriculture. agrEE. https://edepot.wur.nl/278552
- Von der Leyen, U. (2022). State of the Union address, European Commission.
- OECD (2021). Global Scenarios 2035: Exploring Implications for the Future of Global Collaboration and the OECD, OECD Publishing, Paris. https://doi.org/10.1787/df7ebc33-en

Webpages

- Eurobarometer – Public opinion in the European Union (europa.eu)
- Home - Eurostat (europa.eu)
- Priorities, actions, achievements | European Union (europa.eu)
- NextGenerationEU (europa.eu)
- Strategic foresight (europa.eu)
- European Environment Agency's home page (europa.eu)
- The 'Scenarios for a sustainable Europe in 2050' project — European Environment Agency (europa.eu)
- Strategic Foresight - Organisation for Economic Co-operation and Development (oecd.org)
- Global Future Councils | World Economic Forum (weforum.org)

Annexe 4 - List of possible experts to be approached in the impact phase of the foresight process

NAME	ORGANISATION	COUNTRY
Globalisation		
Richard Baldwin	Geneva Graduate Institute	Switzerland
Simon Evenett	University of St. Gallen	Switzerland
Marcel Timmer	University of Groningen / CPB	The Netherlands
Sebastien Miroudot	OECD	France
Technology and R&D		
Marco Vivarelli	Università Cattolica del Sacro CuoreMilano	Italy
Paul Hünermund	Copenhagen Business School	Denmark
Dominique Guellec	OECD	France
Migration and urbanisation		
Michael Storper	London School of Economics	UK
Andres Rodriguez-Pose	London School of Economics	UK/Spain
Tom Kemeny	University of Toronto	Canada
Richard Florida	University of Toronto	Canada
Overall experts		
Bart van Ark	University of Manchester	UK
John van Reenen	London School of Economics	UK
Cecilia Jona-Lasinio	University of Rome	Italy
Jonathan Haskell	Imperial College London	UK
Alexandra Spitz-Öner	Humboldt University	Germany
SAB-members		
Michael Handel	Northeastern University	USA
Irmgard Nübler	International Labour Organisation	Switzerland
Mehtap Akgüç	Economic, Employment and Social Policies Unit of the Research Department at the ETUI	Belgium
Baris Alpaslan	Social Sciences University of Ankara Department of Economics	Turkey
Swati Banerjee	Centre for Livelihoods and Social Innovation (CLSI), School of Social Work, Tata Institute of Social Sciences (TISS), Mumbai, India and Co-ordinator, Right Livelihood College, RLC – TISS)	India
Johnny Sung Chi Keung	Institute for Adult Learning (IAL)	Singapore
Giselle Martins Venancio	Department of History at the Universidade Federal Fluminense	Brazil
Hong Ma	Tsinghua University	China
Pinghan Liang	School of Government, Sun Yat-sen Universit	China
Seri No	Korea Labor Institute. Industrial Relations Division, Research Fellow	South Korea

Project name

Growing Inequality: a novel integration of transformations research — GI-NI

Co-ordinator

Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek TNO, Netherlands

Consortium

CNAM – CEET, Centre d`études de l´emploi et du travail (France)
University of Groningen (Netherlands)
Centre for European Policy Studies (Belgium)
University of Adger (Norway)
Centre for Economic and Regional Studies (Hungary)
Utrecht University (Netherlands)
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