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Megatrends and grand societal challenges with a significance for the Czech Republic

Output 2 of the FUTURE-PRO project:
Megatrends and grand societal challenges

VELKÉ SPOLEČENSKÉ VÝZVY
MEGATRENDY

End-user of the results: **Office of the Government of the Czech Republic**

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More information on the project:

This document was created under project TITDUVCR946MT01 "A proposal for a methodology to identify megatrends and grand societal challenges with a significance for the Czech Republic and for research in the Czech Republic and their first identification", the first of a series of projects covered by framework agreement TITDUVCR946 FUTURE-PRO, the aim of which is to create mechanisms to identify priorities in societal challenges and needs of research in the challenges. The project title used was "FUTURE-PRO: Megatrends and Grand societal challenges".

The project was initiated by the Government Council for Research, Development, and Innovation (RDI Council). The project promoter was the Czech Priorities think-tank whose mission is to systematically find the best solutions to societal problems.

The project was implemented from October 2020 to June 2021. It aimed to create and pilot a methodology for identification of megatrends and grand societal challenges significant for Czechia. The project builds on the foresight approach, consisting in structured thinking about future developments. The time horizon of the foresight was 15-30 years, based on the available sources. The jointly defined basic requirements were: evidence-based approach, transparency, inclusiveness, repeatability, implementability and use of value frameworks for the quality of life, resilience and sustainable development.

List of documents created in the project:

- "**Challenges & Megatrends Methodology**" - the text of the CM Methodology, project output V1.
- "**Megatrends and grand societal challenges with a significance for the Czech Republic**" - pilot implementation of the CM Methodology, project output V2 (this document).
- "**Background research for the CM Methodology**" - a separate annex of output V1.
- "**Reflection on the pilot implementation of the CM Methodology**" - a separate annex of output V1.
- "**Cards of the areas of megatrends and grand societal challenges**" - a separate annex of output V2.

All the above documents are publicly available on the websites of:

- the project promoter Czech Priorities: https://ceskepriority.cz/megatrendy and
- TA CR: www.tacr.cz/projekt-future-pro-megatrendy-a-velke-spolecenske-vyzvy

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Glossary and abbreviations:

- ***CM Methodology*** *(Challenges and Megatrends Meth.): Methodology for identifying megatrends and grand societal challenges with a significance for the Czech Republic*
- ***MTs****: megatrends*
- ***GSCs****: grand societal challenges (of global nature, unless otherwise stated)*
- ***MT/GSC****: both MT and GSC in the context of an activity implemented concurrently for MTs and GSCs*
- ***Foresight****: a structured approach to presuming future developments*
- ***MT/GSC areas****: thematic clusters of identified MTs/GSCs*
- ***Card of a MT/GSC area****: a structured document drawn up for a specific MT/GSC area*
- ***MT/GSC studies:*** *foresight studies and other studies generally focused on global megatrends and grand societal challenges*
- ***Sectoral studies****: studies focused on specific issues of MTs and GSCs*
- ***Quality of life****: Czech translation/equivalent of the well-being concept*

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Executive Summary

The aim of the project FUTURE-PRO: Megatrends and Grand societal challenges was to create and pilot a methodology for identifying megatrends (MTs) and grand societal challenges (GSCs) significant for Czechia, which would help to formulate research priorities in social sciences, humanities and arts (SSHA). The methodology has been created and called "Challenges & Megatrends Methodology", shortly: CM Methodology (see Output 1). The Methodology uses the foresight approach that is based on structured thinking about future developments.

To achieve the project objective, background research was conducted as the main source for designing the Methodology. The background research included analysing 38 world studies dealing with MTs and GSCs, and conducting interviews with 41 foreign experts - authors or co-authors of the studies[1]. The background research results were used to draft a working version of the CM Methodology that was piloted in the second part of the project (Output 2).

The CM Methodology makes it possible, in the first step, to identify global MTs and GSCs and group them thematically into MT/GSC areas, and, in the subsequent step, to prioritise the MT/GSC areas from the viewpoint of the Czech Republic (Czechia), and create a list of challenges relevant for Czechia in each of the areas.

The CM Methodology has four phases: 1 - Preparation, 2 - Identification of MTs/GSCs through searches, 3 - Verifying and supplementing the MT/GSC areas through a world café workshop and individual consultations, and 4 - Prioritising the MT/GSC areas by means of deliberation of experts in Delphi, using inputs from civic participation gained through a forecasting tournament. The preparation was conducted from October 2020 until January 2021, the next phase from February to June 2021. The pilot implementation of the CM Methodology involved, to a various degree and in various roles, 111 experts across fields of expertise and 238 participants in the forecasting tournament from among a broader professional public[2].

The pilot implementation identified 18 MT/GSC areas: Climate, Environment, Resources, Energy, Demography, Health, Education and Employment, Migration, Urbanisation, Values, Economics, Consumption, Poverty and Inequalities, Geopolitics, Democracy and Governance, Conflicts, Science and Innovation, Digitisation and Artificial Intelligence and Automation.

The significance of each MT/GSC area for Czechia was assessed on the basis of the expected MT/GSC impacts on the quality of life in Czechia. The criteria for prioritising the MT/GSC areas were the values frameworks of the quality of life (well-being), resilience and sustainable development. The areas were further prioritised with regard to the need for allocating funding to understanding and addressing the given MT/GSC area, and specifically with regard to the need to implement SSHA research.

The main outputs include 18 identified MT/GSC areas and their cards (see a separate annex "Cards of the areas of megatrends and grand societal challenges", only in Czech), a list of priority MT/GSC areas for Czechia (see Chapter 3) and a list of challenges for Czechia, identified in each area (see Annex 13). The cards of MT/GSC areas have the form of roughly 10-page structured documents describing the key MTs/GSCs in each area. The result of the prioritisation is a list of eight most significant MT/GSC areas: Education and Employment, Values, Digitisation and Artificial Intelligence and Automation, Democracy

[1] See annexes 3 and 4 in the Output 1

[2] Beyond the scope of the CM Methodology, 51 applicants or beneficiaries in the Zeta programme of TA CR were also involved.

and Governance, Science and Innovation, Environment, Poverty and Inequalities, Health. The list of challenges with a significance for Czechia contains 15-33 challenges for each of the 18 MT/GSC areas.

To conclude the pilot implementation, the priority MT/GSC areas for Czechia were compared with priority thematic clusters in the EU Horizon Europe 2021-2027 programme and with National Priorities of Oriented Research, Experimental Development and Innovation.

The final version of the CM Methodology was adjusted on the basis of a reflection on the pilot implementation.

The results should be viewed in a broader context of contemplations on the future. Although the identification and prioritisation of MTs and GSCs is important, it is apparent that the future will bring expected as well as unexpected situations and that we must enhance and develop such structures in the society and public institutions, that are flexible, operational and resilient vis-à-vis the unexpected challenges of the future.

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1 - Introduction

The CM Methodology is intended to identify megatrends (MTs) and grand societal challenges (GSCs) significant for Czechia. It is part of the series of FUTURE-PRO projects that prepare mechanisms for identifying priorities in the area of societal challenges and needs of research in the challenges.

The main objective of FUTURE-PRO is to formulate ambitious research missions linked to the societal challenges, the solution of which would have the potential to significantly influence the quality of life in Czechia in the future. The implementation of these research missions would involve, apart from SSHA, also interdisciplinary research and would be mainly supported from public funds intended for SSHA and from other funding for innovation support. To determine the research missions, it is necessary to name future societal challenges that can be perceived already today.

The CM Methodology as an output of the first project out of the FUTURE-PRO series opens this topic. It makes it possible, in the first step, to identify global MTs and GSCs and group them thematically into MT/GSC areas, and, in the subsequent step, to prioritise the MT/GSC areas from the viewpoint of Czechia, and produce a list of challenges relevant for Czechia in each of the areas. The key prioritisation criterion is the quality of life in Czechia.

The fundamental approach of the CM Methodology is foresight. The essence of foresight is a structured approach to presuming future developments based on historical development and signals in the present, and to using the obtained knowledge for actions that help to co-create the future actively. It is a discipline that has been used for roughly seventy years in its modern form. Foresight was originally focused on the development of technologies but in the last 30 years it has expanded to cover more general societal topics such as sustainable development and quality of life[3].

In recent years, foresight has been on the rise in the EU - mainly thanks to the European Strategy and Policy Analysis System (ESPAS) that associates all EU institutions as well as in Joint Research Centres of the EU Commission.MT/GSC studies, identifying future challenges for EU public policies, are regularly published there. From that it has been deduced that foresight is an adequate approach to identifying and prioritising MTs/GSCs. Foresight also uses participative methods where actors can jointly seek solutions contributing to the collectively defined objectives. The search for challenges significant for

[3] The development, methods and use of foresight are detailed in the document "Background Research for the CM Methodology" (only in Czech) that is part of the project outputs.

Czechia and the future definition of ambitious research missions for Czechia is certainly a goal that requires such broad involvement of actors.

The essence and benefits of structured thinking about the future

To understand the essence of structured thinking about the future by means of foresight, it is useful to mention a broader framework of reflections on the future. An aspect that is associated with the future and that cannot be omitted is the limited predictability. That relates to the configurations of future situations, unknown in principle, with the freedom of human action that continues to bring something new into the world, with the factor of human inventiveness, creativity and ingenuity, with exponential developments of the world, disruptions and black swan events. From that perspective, the relationship to the future can be understood as part of preparations for the new and unpredictable. In preparing for the future, it appears important to create suitable conditions fostering the above inventiveness, creativity and ingenuity, mainly by building structures that are flexible and operational.

Nevertheless, some signals about the future state of the world can be perceived already today, with greater or smaller uncertainty. That exactly is the domain of foresight. Foresight as such is based on the thesis that the future is structured by challenges that appeal to us in a given situation and to which we are to respond. The key point in our relationship to the future is whether we are able to understand such challenges and respond to them with our action, that is to formulate and implement solutions addressing them. Therefore, in the strategic considerations and preparation for the future developments, we need to foster openness and sensitivity to the challenges.

Exploring and analysing the future is important in particular for governments and public institutions. The substance of foresight is assuming the responsibility for co-creating the future as opposed to standing idly by and watching the future being formed by other forces. The structured reflections on the future also enable us to better understand the reasons behind the changes that are or will be required and that may be radical and even paralysing in a democratic society without sufficient preparation. Foresight is an incentive and a preparation for actively shaping the future. Apart from the outputs of foresight, a key aspect is the actual process that presupposes, supports and enables discussion among various groups in the society about what future we consider desirable and what challenges of the future we perceive already today. For foresight it is undoubtedly true that the journey is the destination.

Foresight also makes it possible to form specific measures of public policies and investments so that their effectiveness is maximised in the long term. Long-term planning taking into account challenges of the future that are reaching out to us today is highly worthwhile and at the price of short-term costs since it brings long-term benefits. Preparation for future developments of the society is an integral part of good governance in public policies because strategies and measures adopted in the light of future developments are significantly more effective, robust and resilient in the long term.

2 - The procedure of implementing the CM Methodology

The background research for the CM Methodology was carried out from October 2020 to January 2021. During that period, the working version of the CM Methodology was drawn up, providing a basis for the pilot implementation of the Methodology. The pilot implementation was used to verify and reflect upon the proposed procedure and subsequently compile the final version of the CM Methodology. The general framework of the Methodology is shown in Diagram 1. Due to the iterative manner of developing the methodology, there are several minor aspects in which the CM Methodology differs from the pilot implementation procedure. These small differences are highlighted in the relevant parts of the text.

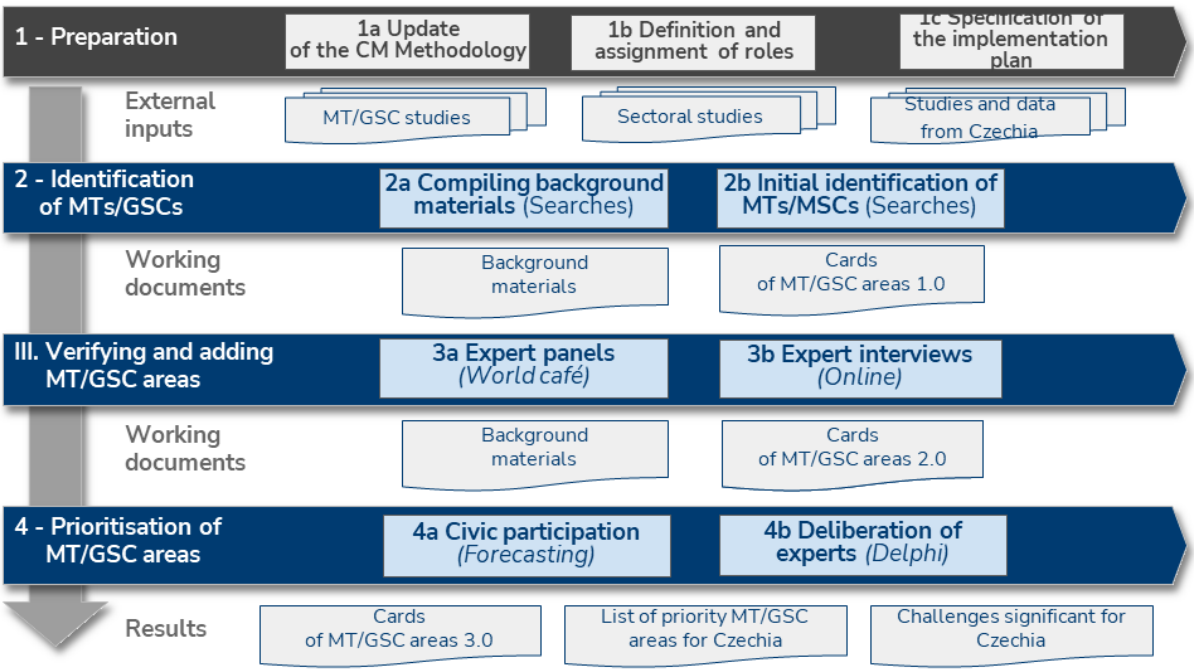


Diagram 1 - General framework of the CM Methodology

The implementation of the CM Methodology involved, apart from the 9-member project team of Czech Priorities and other collaborators, also 111 experts across fields of expertise, 238 members of the general public participating in the forecasting tournament and, beyond the scope of the Methodology, 51 applicants or promoters from the Zeta programme of TA CR, to a various degree and in various roles.

2.1 Phase 1 - Preparation

In piloting the CM Methodology, the first step of Phase 1 - Preparation was the actual draft[4] of the Methodology based on the background research for preparing the Methodology (see the document Background Research for the CM Methodology). This phase lasted from October 2020 till January 2021. As part of the preparation and to coordinate the project, the roles needed to achieve the project objective were defined and assigned, and a detailed implementation plan was drawn up. The general schedule in Table 1 below presents an outline of the implementation plan. The main difference of the implementation procedure from the CM Methodology in Phase 1 - Preparation is the shorter implementation period in Phases 2-4 due to limitations imposed by the contracting authority on the project. In the pilot implementation of the CM Methodology, these phases lasted 5 months. In the CM Methodology, after reflecting on the pilot implementation, the total period of these phases is proposed to last at least 8 months.

Phase		**Duration**
1 - Preparation		October 2020-January 2021
2 - Identification of MTs/GSCs	2a - Compiling support materials	March 2021
	2b - Initial identification of MTs/GSCs	February–March 2021
3 - Verifying and supplementing the MT/GSC areas	3a - Expert panels (world café)	March 2021
	3b - Expert interviews	March-April 2021
4 - Prioritising the MT/GSC areas	3a - Civic participation	April 2021
	3b - Deliberation of experts	May 2021
	3c - Consolidation of the output	June 2021

Table 1 - General schedule of the CM Methodology implementation

[4] As required by the contracting authority, the CM Methodology reckons with being used repeatedly. Therefore, the first step of the CM Methodology is its update.

2.2 Phase 2 - Identification of MTs/GSCs

MTs/GSCs were identified through extensive searches and syntheses of secondary sources that were used to gradually develop documents summarising the findings of selected studies dealing with MTs and GSCs - cards of MT/GSC areas.

The first step was to identify the MT/GSC studies. The starting point was provided by three MT/GSC metastudies[5] that were drawn up in various sectors and had different focuses, i.e. indicated different sources. As a supplement, targeted searches were carried out on the websites of institutions that regularly publish MT/GSC studies[6].

The criteria for including a study were:

- diverse types of authoritative sources[7] and views of the world,
- a time horizon relevant for the needs of the research (10 to 30 years),
- sources focused in general on MTs/GSCs with varying levels of scope and specialisation,
- studies with a transparent methodology,
- ideally using participatory methods.

This resulted in a corpus of 38 studies (see Annex 1), which was then converted into a database format indicating basic information on the study and on the organisation that published it. For each of the 38 studies, the information was synthesized to describe every MT and GSC covered in the study. That resulted in a working overview of MTs/GSCs, containing around 500 entries. Each entry represented one MT/GSC in one study. The content of this working MT/GSC overview was continuously discussed and reflected on by the project team to ensure a homogeneous approach by all analysts.

Subsequently, each of the MTs/GSCs was thematically categorised by means of the STEEP-V framework[8]. That enabled preliminary structuring of the MTs/GSCs by topic, and that was the basis for the first draft of MT/GSC clusters. However, the categories according to STEEP-V were very wide and some MTs/GSCs could be included in more than one of them. Therefore, another iteration of the clustering was made to eliminate duplications and define areas as internally homogeneous and mutually heterogeneous as possible, according to the MECE principle[9]. The iteration of clustering was carried out in two internal workshops of the project team, and resulted in another draft of the MT/GSC clusters.

Each of the MT/GSC clusters thematically defined a MT/GSC card that was then written for it. That gave rise to two sets of MT/GSC cards: 20 MT cards and 23 GSC cards (the names of the cards are provided in Annex 2). Here, the pilot implementation procedure differs from the procedure proposed

[5] CIMULACT (2018), Sami Consulting (2020), Oxfam (2020)

[6] In particular, international organisations (UN, OECD and EU), national governments, academic centres, multinational corporations and consulting firms, organisations active in Future studies and foresight.

[7] For the needs of the CM Methodology, the authoritative sources are studies published by:

- academic centres,
- international and multinational organisations: EU institutions, organisations in the system of the UN, OECD, NATO,,
- governments and national organisations of OECD and G20 member states,
- multinational corporations and private entities in the field of foresight,
- renowned non-governmental non-profit organisations.

[8] S: Society; T: Technology; E: Economics; E: Environment; P: Policy; V: Values and culture

[9] MECE = mutually exclusive and collectively exhaustive

in the final CM Methodology - following a reflection on the piloting procedure, the Methodology reckons with only one set of cards of MT/GSC areas.

The MT and GSC cards were drawn up in the following structure:

- MT cards
    a. Developments to date
    b. Future prospects
    c. Expected impacts
    d. Situation in the Czech Republic
- GSC cards
    a. Problems of the future
    b. Global and European goals 2030-2050
    c. Possible directions for solutions
    d. Situation in the Czech Republic

In addition, each card contained its name, an abstract, list of sources as well as references to thematically related cards.

In each point of their structure, the cards summarised findings from the MT/GSC studies covered by the background search and, to supplement them, additional studies focused on specific topics within the relevant themes, so-called sectoral studies, were compiled. The criteria for including a sectoral study were the same as for the MT/GSC studies, but the publications did not have to be focused exclusively on the future developments in the given area. To identify them, the team used the library of sources on the website ESPAS Orbis or Competence Centre on Foresight (Megatrends Hub). Moreover, targeted searches were carried out on websites of selected authoritative institutions. This resulted in a corpus of around 350 publications that were ordered by topic.

The formation of the cards was continuously consulted with experts from the expert team who commented on the emerging content, recommended sources and proposed specifications. In the final CM Methodology, the role of the expert team is strengthened by designating expert supervisors for each card and by a recommendation that each area has both a male and female expert in the expert team.

The main output of Phase 2 - Identification were sets of 20 MT cards and 23 GSC cards, each around 5 pages (A4 size) long. The cards were proofread and graphically designed to be user friendly as much as possible. Each card had all paragraphs numbered for fast and clear orientation in the text during consultations with experts, colour design indicating the STEEP-V categories, and a prominently marked code of the card in the header, consisting of the MT or GSC abbreviation and a serial number.

The MT/GSC cards were then sent to all participants of Phase 3 - Verifying and supplementing the MT/GSC areas.

2.3 Phase 3 - Verifying and supplementing the MT/GSC areas

Phase 3 - Verifying and supplementing the MT/GSC areas had the form of a world café workshop involving experts who covered a large number of specialisations, and subsequent individual consultations with selected experts.

The world café workshop took place online on 25 March 2021. The workshop was attended by 75 experts who were nominated in cooperation with the contracting authority and the project team. The

nominations were made using the four eyes principle: each nominee had to be confirmed by at least two members of the project team, or by the contracting authority and the project manager. In the nomination process, the expertise necessary for expert discussion of the cards was considered.

The world café workshop lasted 5 hours and was divided into two blocks with a break. Each block was launched by an introduction to the project and its purpose, and by clarifying the technicalities, which enabled the participants to take part in only a half of the workshop. The discussion in one block covered a half of the cards. The discussion ran parallel at 11 discussion tables, with each table having 2-3 thematically close MT/GSC cards. Each discussion table hosted 3-5 experts, a moderator and a recorder. Each block was divided into two discussion rounds. At the end of the workshop, all 11 discussion tables discussed the thematic definition of the MT/GSC cards to validate the MT/GSC clustering that had been done by the project team.

To organise the course of the world café workshop, instructions were drawn up for the participants, and separate instructions were made for moderators and recorders. Those documents were shared with the participants before the workshop. The moderators and recorders were instructed beforehannd.

Based on the outputs of the world café workshop, a methodological shift was made against the working version of the CM Methodology and the cards were significantly restructured. One set of cards of MT/GSC areas was compiled. Their structure used elements from both MT cards and GSC cards whereby the MT/GSC clusters were changed and the number of cards reduced to 18 cards of MT/GSC areas. The structure of the cards of MT/GSC areas was adjusted:

- Developments to date
- Future prospects
- Expected impacts and related future challenges
- Global and European goals 2030-2050
- Possible directions for solutions
- General overview of the situation in the Czech Republic

Following the change in the MT/GSC clusters, modifications were made to the names of the cards of MT/GSC areas, abstracts, references to thematically related cards and lists of sources. Moreover, the content points of the paragraphs on the cards of the MT/GSC areas were named to ensure that each paragraph in the card structure had its sub-heading capturing the main idea of the paragraph.

Account was also taken of other recommendations of experts on the thematic definition of the cards. We can mention three main recommendations intended to strengthen the topics evaluated by the project team as insufficiently covered so far based on the forecasting studies of MTs/GSCs. The topics were: agriculture, disinformation and information war, and building a cohesive society. Those topics were given a larger number and size of the content points on the relevant cards of MT/GSC areas.

The world café workshop was followed up by individual consultations with selected experts. The majority of the individual consultations were arranged as a natural continuation of the world café workshop. Other consultations were held with experts who could not take part in the world café but were interested, experts recommended by the world café participants for partial topics that were perceived as needed, and with experts identified for the partial topics by the project team. The individual interviews involved 38 experts, of which some consulted more than one MT/MCS area card.

That resulted in 18 cards of MT/MCS areas, each around 10 pages (A4 size) long (see Chapter 3). The cards were proofread and graphically designed for use in Phase 3 - Prioritising the MT/GSC areas. The graphic design highlighted the parts Future prospects and Expected impacts and the related challenges of the future, and placed less emphasis on the parts Possible directions for solutions and General overview of the situation in Czechia for greater clarity during the prioritisation.

2.4 Phase 4 - Prioritising the MT/GSC areas

The prioritising of the MT/GSC areas shows the relative mutual significance of the MT/GSC areas when it is evaluated from Czechia's point of view. Phase 3 - Prioritising the MT/GSC areas was carried out using the Delphi method of expert deliberation. A support input for the prioritising were the results of civic participation gained through a forecasting tournament[10]. The Delphi expert deliberation ran in three rounds.

The main prioritisation criterion according to the CM Methodology was the quality of life, experts were to assess the significance of the MT/GSC areas in terms of the expected impacts of the MT/GSC on the quality of life in Czechia.

2.4.1 - Civic participation

Civic participation was ensured through a so-called forecasting tournament. Forecasting is a participative method for informed estimates of future developments, events, trends or outputs of scientific studies. The forecasting tournament involved 238 trained participants. The forecasting made use of iterative discussions between the participants, which increases the quality of the forecasting outputs. The participation was anonymous to eliminate the influence of any social pressures.

The recruitment of the participants was targeted at students, doctoral students and the staff of higher education institutions in Czechia. The resulting group of participants was relatively young and highly educated - 59.3% of the participants were under 35 years of age and 68.2% of them had a graduate or higher level of education.

The group was diversified in terms of disciplines. The most frequently represented fields of the respondents were Economics and business (24x), Computer and information sciences (23x), Political sciences (16x), Physical sciences (12x), Mathematics (8x), Law (7x), Other social sciences (7x), Sociology (6x), Psychology and cognitive sciences (5x), Educational sciences (5x) and Biological sciences (5x). Another 16 FORD fields were represented by 1-4 participants. For 34% of participants, the field was not identified.

Before starting the participation, all participants were trained in forecasting and acquainted with the technical interface for the forecasting tournament. They also received the 18 cards of MT/GSC areas and a document explaining the context of the project and the process of the future Delphi.

The participants were asked two compulsory questions (see below, questions "Allocation of funding" and "Popularity") in a questionnaire, and then one optional question (see below, question

[10] To implement the forecasting tournament, a use was mode of some results of project TL04000315 - Expert prediction team for intensive estimation in unexpected situations (abbreviated as OPTIONS in Czech).

"Prediction"), shaped as a forecasting question. For the forecasting questions, the participants were invited to provide arguments in a comment. The questions were worded as follows:

- Allocation of funding: *"Choose exactly 6 areas that will, in your opinion, have the greatest impact on the quality of life in Czechia in the next decades and, therefore, public funding should be preferentially allocated to understanding them and addressing them".*
- Popularity: *"Which 6 areas, do you estimate, will be selected by the highest number of participants in Question 1 in this questionnaire? The collective score will be derived from a ranking list based on how many times the given area was selected. Again choose exactly 6 areas."*
- Prediction: "*Which of the following 18 areas will rank in the first 6 places of the ranking list compiled on the basis of scores given by experts in the FUTURE-PRO project?*"

The opinions of participants on question "Allocation of funding" are set out in Annex 3 for illustration. For implementing the CM Methodology, the key comments were those provided for question "Prediction". Out of the answers to "Prediction", at least one valid prediction was provided by 134 participants. The participants were financially motivated to provide quality estimates - out of 50% of participants with the best Brier score, 15 were chosen by lot after ending the Delphi to be rewarded with a cheque for CZK 1,500. The average participant spent 95 minutes answering the questions.

The comments received for the "Prediction" question were provided to experts in Delphi as additional support material for prioritising the MT/GSC areas. The comments are shown in Annex 4. They concerned three basic thematic areas that were most often discussed by the participants - personal opinions, the method of creating own prediction and comments on the prioritisation method.

Beyond the scope of the CM Methodology, the civic participation was extended to include participation of applicants and promoters in the Zeta programme of TA CR. The main aim was to obtain text inputs and opinions from a group of young scientific minds working in diverse fields. Over 2,500 potential respondents were addressed, out of which 212 expressed their interest. Inputs delivered in an on-line questionnaire were obtained from 51 respondents. That group of respondents was also young and relatively highly educated, similarly to the forecasting tournament - 63.5% of respondents were under 35 years of age and 98% of them had graduate or higher level of education. Women formed 43.1% of the respondents.

The respondents answered the same main question as participants of the forecasting competition, i.e. "Allocation of funding", and in the text part they then provided arguments, data, references and other context information influencing their answers. They also specified what impacts and challenges are, in their opinion, the most important for the future quality of life in Czechia. In the second part of the questionnaire, they could propose research questions that should, in their opinion, be explored by SSHA research.

The Delphi expert deliberation and the scoring by TA CR Zeta applicants or promoters ran parallel. Therefore, the experts in Delphi did not receive this input. The participation of TA CR Zeta applicants and promoters brings an independent and complementary view of the results. The aggregated opinions of the respondents are set out in Annex 5, a summary of their textual comments in Annex 6.

2.4.2 - Delphi deliberation of experts

The Delphi expert deliberation was the main method of prioritising the MT/GSC areas. The Delphi method is based on a multi-round deliberation of experts where experts provide their inputs in each round and before the next round they receive from the project team aggregated inputs from all other participating experts, and they can adjust their scoring based on those inputs. Experts provide their inputs anonymously (only the project team has information about the author). That reduces the effect of group thinking and the influence of the status of the participating experts, which is an important advantage of Delphi against other methods of collective decision-making. In the pilot implementation of the CM Methodology, the Delphi process had three rounds.

Apart from the 18 MT/GSC cards, the preparations for Delphi included compiling a support material that summarised and referred to information sources providing useful context for prioritising the MT/GSC areas. The support material had three parts. The first part "Quality of life, living conditions and resilience"[11] summarised the prioritisation criteria. This concerned mainly the concept of well-being according to OECD (OECD How's Life 2020), which works with 11 indicators of well-being (referred to as the quality of life in this document)[12]. The second part "Weak signals of technological development"[13] mentioned sources for the so-called weak signals of development[14]. The third part dealt with the Sustainable Development Goals[15]. As opposed to the pilot implementation, the final version of the CM Methodology has the compilation of the support material included as the first step of Phase 1 - Identification of MTs/GSCs due to the expected benefit of the material also for drawing up the cards of MT/GSC areas.

[11] 1 - How's life? 2020 - Measuring Well-being (OECD); 2 - OECD Economic Surveys: Czech Republic 2020 (OECD); 3 - Strategic Foresight Report (European Commission)

[12] Income and wealth, Work and job quality, Housing, Health, Knowledge and skills, Environment quality, Subjective well-being, Safety, Work-life balance, Social connections, Civil engagement.

[13] 4 - Trends in key enabling technologies (Technology Centre of the Czech Academy of Sciences); 5 - Weak signals in Science and Technologies: 2019 Report (European Commission - Joint Research Centre); 6 - Science & Technology Trends 2020-2040 (NATO); 7 - Applications of Wild Cards and Weak Signals to the Grand Challenges & Thematic Priorities of the European Research Area (iKnow ERA Toolkit)

[14] Weak signals of development are signals that have not yet been widely covered in mainstream literature but may become breakthrough in the future.

[15] 8 - Sustainable development report 2020 (SDSN-EEP)

The group of experts for Delphi was built with regard to the following criteria:

- The group is heterogeneous in terms of expertise so that all STEEP-V areas are evenly covered[16].
- The group is heterogeneous at least in terms of gender and age.
- The experts have doctoral degrees or at least 5 years' experience in the field.
- Some of the experts are specialised in several fields or are capable of interdisciplinary work.
- The experts have demonstrable interest and ability to deliberate the future that is characterised by uncertainty and complexity.
- The experts have moral credit.
- The experts are able to work with the key aspects of the prioritisation (normative frameworks of the quality of life, sustainable development and resilience).

The Delphi expert deliberation involved 25 Czech experts, of which 1 expert did not take part in the third Delphi round for personal reasons. The names of experts in Delphi are provided in Annex 7. Annexes 8-10 set out aggregated fields of expertise and socio-demographic characteristics of the participating experts. Before starting, all experts agreed to the ethical commitment of an expert in Delphi:

> "In Delphi under project "Megatrends and grand societal challenges", I will proceed to the best of my knowledge and conscience. I will not favour my personal interests nor the interests of my institution. I will act with utmost impartiality and with an honest interest in achieving the goal of Delphi to ensure the quality of life in Czechia in the future decades."

Each expert received materials developed in Phase 1 - Preparation, and information on the Delphi process. Before the Delphi expert deliberation itself, the participating experts received the cards of MT/GSC areas, the support material, results of the forecasting tournament and detailed instructions for Delphi. The main communication/contact person for the participating experts was the project manager. The communication had four functions: (i) introducing and explaining the purpose of Delphi, (ii) detailed explanation of the Delphi mechanism and procedure, (iii) ongoing organisational communication, and (iv) ad hoc communication to address problems.

[16] The fields of expertise of experts in Delphi according to the STEEP-V and FORD classification:

- Society: Psychology and cognitive sciences, Educational sciences, Sociology, Social and economic geography, Media and communication, Other social sciences, Medical and healthcare sciences
- Technology: Engineering and technologies, Computer and information sciences
- Economy: Economics and business, Mathematics
- Environment: Physical sciences, Chemical sciences, Earth and related environmental sciences, Biological sciences, Other natural sciences, Agricultural and veterinary sciences
- Politics and geopolitics: Political sciences, Law, Sociology
- Culture and values: History and archaeology, Languages and literature, Philosophy, ethics and religion, Art, Other humanities

The Delphi process was anonymous - none of the participating experts had access to information on which inputs came from which expert. Delphi was technically arranged using Google Drive for sharing background documents and for entering inputs from participating experts.

The experts gave their opinions in all three Delphi rounds. The wording of the questions is provided in Chapter 3 Outputs of the project. The prioritisation used the following assumption: "In question "SSHA support", please assume that it is within the means of Czech science to address the expected impacts and challenges from the given MT/GSC area. I.e. assume the general solvability by research, development and innovation."

To answer the questions, the experts had a four-point scale: definitely yes, rather yes, rather no, definitely no. In the first two rounds, the experts justified their answers and indicated the challenges that are, in their opinion, significant for Czechia in the given area. Between the first and second round, the experts were asked to read the aggregated anonymised inputs from the other experts and to adjust their own answers to the above questions in the second round as they deemed suitable. They could also emphasise challenges that were marked by other experts and so give them more weight. In the third round, based on observations of the pilot implementation, a supplementary question was added about the overall significance. It was answered by 20 experts.

When analysing the inputs after the first round, cases were identified where different experts used the same argument for prioritising different MT/GSC areas. Therefore, before the second Delphi round, the experts received a specification of overlaps between MT/GSC areas. The specification is set out in Annex 11.

For the final scoring in the third Delphi round, the experts had a limit of 38 points for the 18 MT/GSC areas and they could allocate 0-3 points to each of the MT/GSC areas. This manner of scoring was the main method of prioritisation and the experts were informed about the limited points in advance. At the same time, the experts scored the 6 most significant MT/GSC areas (TOP 6). After the third round, the scores given within the limited points method were summed up for each MT/GSC area and the number of experts who placed the MT/GSC area among the six most significant in the TOP 6 scoring were added up. Then, those scores were converted to percentages where 100% was the maximum score with the given number of participating experts.

The list of challenges with a significance for Czechia was compiled iteratively. The starting point were the inputs from experts in Delphi who considered the cards of MT/GSC areas that included the described expected impacts of MTs and the related challenges on a global scale. In the first round of Delphi, the experts named those challenges from the cards of MT/GSC areas, which they saw as a challenge for Czechia and they could specify and complement those challenges. The obtained inputs (together with the quantitative scores) were restructured so as to create overviews of all expert inputs in the first Delphi round for each MT/GSC area. The experts received those overviews as input for the second Delphi round. The experts were invited to read the overviews and update their inputs from the first Delphi round. Subsequently, the project team coded the updated inputs and grouped them into a list of challenges significant for Czechia. The coding was made using triangulation - it was carried out by four members of the project team independently, and the final list resulted from a discussion of the project team. The list was ordered according to the frequency with which the challenge was mentioned by the experts in Delphi. To be validated, the compiled list of challenges with a significance for Czechia was shared with the experts as background material for the third Delphi round. This way, the final list of challenges significant for Czechia, set out in the results, was created.

The Delphi procedure was reflected on and the CM Methodology was adjusted accordingly and so it slightly differs from the pilot procedure. The questions were modified and their distribution across the Delphi rounds was changed.

3 - Outputs of the project

The text below presents the results of the CM Methodology pilot implementation. The main outputs include 18 identified MT/GSC areas and their cards, a list of priority MT/GSC areas for Czechia and a list of challenges for Czechia, identified in each area.

3.1 - Identified MT/GSC areas and cards of MT/GSC areas

Based on an extensive search in foreign sources and verification with Czech experts, the pilot implementation of the CM Methodology identified the following 18 MT/GSC areas: Climate, the Environment, Resources, Energy, Demography, Health, Education and Employment, Migration, Urbanisation, Values, Economics, Consumption, Poverty and Inequalities, Geopolitics, Democracy and Governance, Conflicts, Science and Innovation, Digitisation and Artificial Intelligence and Automation. Annex 12 compares the identified MT/GSC areas with results of selected foreign MT/GSC studies.

A card of the MT/GSC area was drawn up for each of the identified MT/GSC areas. All 18 cards of MT/GSC areas are set out in a separate document "Cards of the areas of megatrends and grand societal challenges". All cards of MT/GSC areas have an identical structure (see Table 2 below).

Title on the card	**Contents**
1. Developments to date	*Statistical data on historical development*
2. Future prospects	*Expected development in the next 10 to 30 years*
3. Expected impacts and related future challenges	*Estimated impacts* *Challenges and opportunities arising from the likely impacts*
4. Global and European goals	*Goals adopted at global and European level (SDGs, EU 2050,...)*
5. Possible directions for solutions	*Solutions having the potential to mitigate the impacts* *Partial solutions for the identified challenges*
6. General overview of the situation in the Czech Republic	*Statistical indicators* *Local impacts in Czechia, if they are directly addressed by existing academic or publicly available grey literature*

Table 2 - The structure of the cards of MT/GSC areas

This structure allows us to recognise the fact that to identify future prospects, it is beneficial to have a good understanding of the developments to date. The expected direct or related impacts are also described. The long-term global and European goals enable us to recognise how MTs reflect in the grand societal challenges that should be taken into account in public policies. The next part sets out the possible directions for solutions addressing the above-mentioned impacts and challenges that are

discussed in foreign literature. The final part contains general information on the situation in Czechia on the basis of available studies and data.

3.2 - Prioritising the MT/GSC areas

Prioritisation of the MT/GSC areas through the Delphi method fulfils the requirement of the contracting authority to identify megatrends and grand societal challenges with a significance for Czechia. Table 3 presents aggregate results of the Delphi process after the third, final round. Delphi was used to answer the following three questions (their wording used in Delphi is provided in quotation marks):

- Which MT/GSC areas should be preferentially financed from public sources (Allocation of funding): "The area will have a very significant impact on the quality of life in Czechia in the next decades and, therefore, public funding should be preferentially allocated to understanding it and addressing it".
- Which MT/GSC areas should be addressed by SSHA with the support of public funding (SSHA support): "Czechia should preferentially allocate public funding for this area compared to the other areas to support research, development and innovation by SSHA (social sciences, humanities and arts)."
- Which MT/GSC areas will have a very significant impact on the quality of life in Czechia (Overall significance): "The area will have a very significant impact on the quality of life in Czechia in the next decades."

Table 3 presents the results of the prioritisitation that was carried out in two ways: scoring with a limited number of points, and selection of the 6 most significant areas (Top 6).

	Allocation of funding		Support of SSHA		Overall significance
	Score [% of max. score]	Top 6 [% of experts]	Score [% of max. score]	Top 6 [% of experts]	Score [% of max. score]
Education and employment	99%	96%	99%	96%	100%
Digitisation, AI and automation	94%	58%	90%	58%	90%
Values	81%	46%	90%	71%	82%
Democracy and governance	82%	54%	89%	58%	87%
Science and innovation	92%	63%	88%	54%	90%
Environment	96%	88%	85%	54%	93%
Poverty and inequalities	82%	38%	83%	63%	77%
Health	75%	38%	83%	42%	83%
Demography	69%	17%	74%	29%	70%
Climate	68%	38%	69%	21%	70%
Economics	63%	21%	63%	21%	73%
Urbanisation	47%	17%	57%	8%	47%
Consumption	50%	0%	56%	13%	48%
Geopolitics	50%	4%	51%	4%	57%
Migration	46%	8%	51%	0%	45%
Energy	58%	4%	47%	0%	55%
Conflicts	53%	4%	44%	0%	50%
Resources	50%	8%	44%	8%	50%

Table 3 - Overall results of Delphi

Charts 1 and 2 visually compare the results of Delphi for questions Allocation of Funding (X axis) and SSHA Support (Y axis) obtained in two methods (Chart 1 - scoring with limited points vs Chart 2 - Top 6). It is apparent from the results that both methods of answering (giving a score and selecting top 6 areas) yield similar results. In the Top 6 answering, a stronger dominance of the area Education and Employment can be observed.

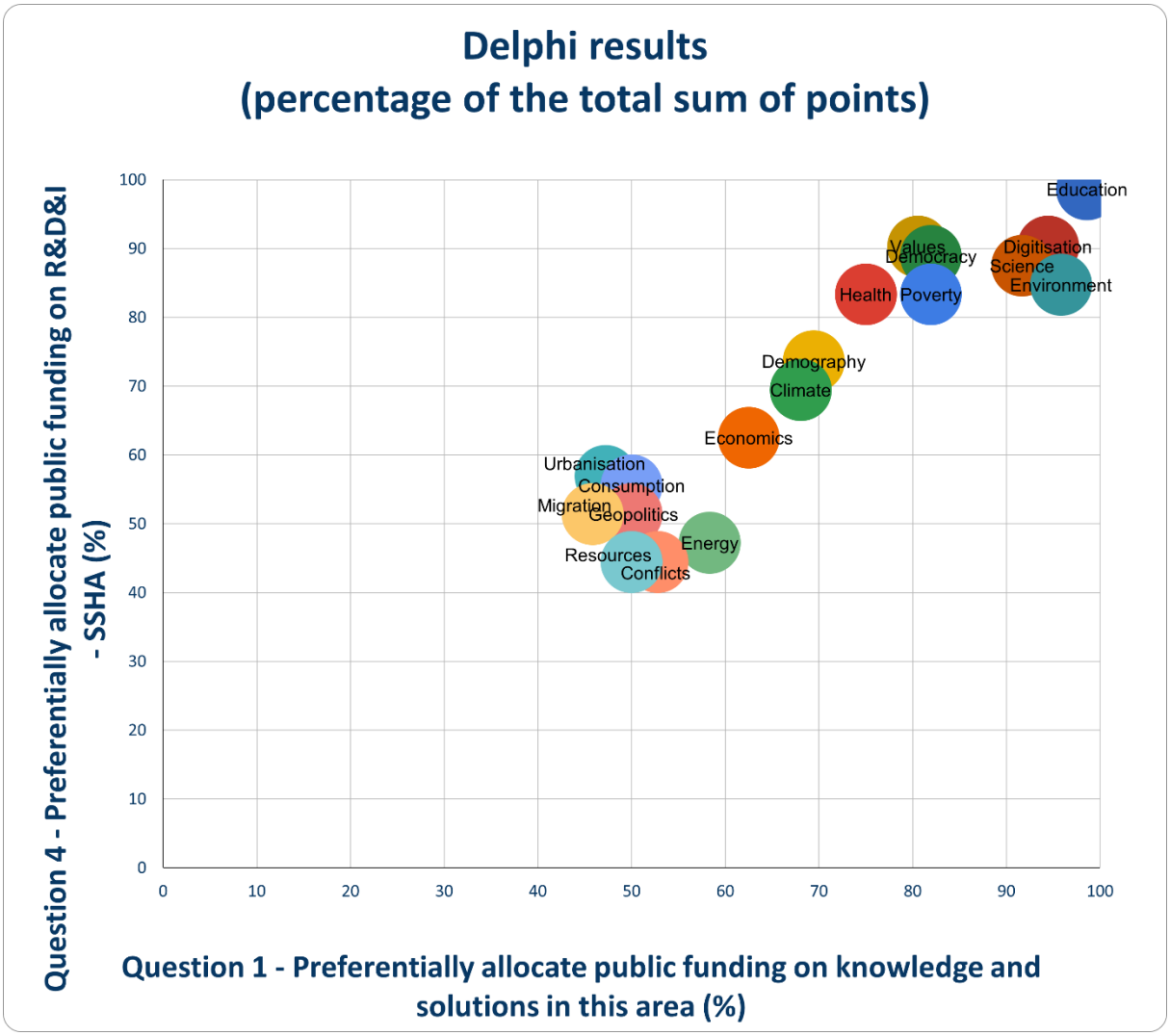


Chart 1 - Delphi results by % of the maximum score

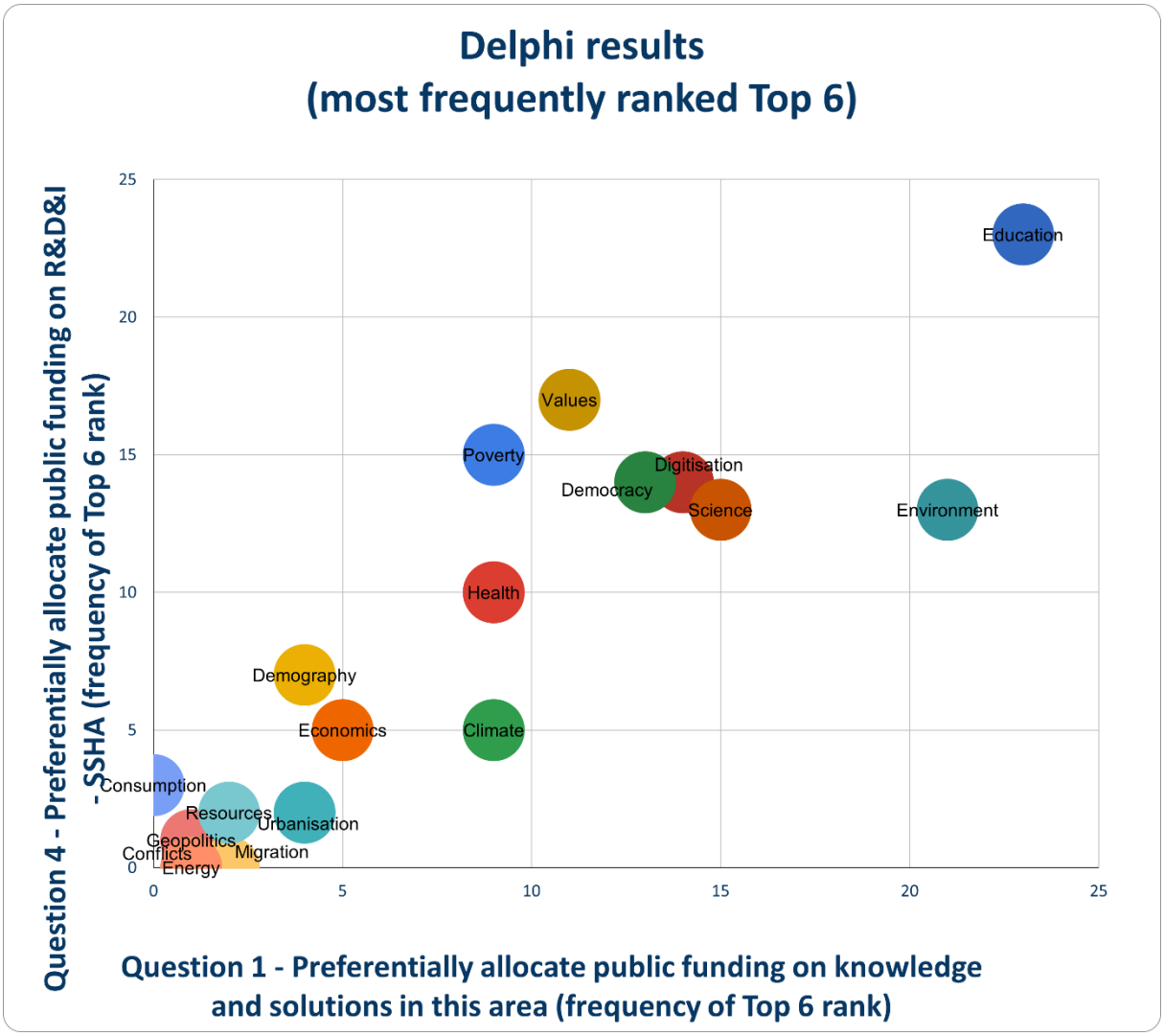


Chart 2 - Delphi results by frequency of ranking among the Top 6 most significant MT/GSC areas

The next stages of the result processing use the results of the main method of answering by means of scoring with limited points (total score limit). It is important to point out that the prioritising of MT/GSC areas through Delphi shows the relative (mutual) significance of the identified MT/GSC areas for Czechia. In Chart 1, it is possible to identify three clusters based on their significance. The first cluster consists of eight most significant areas: Education and Employment, Values, Digitisation and Artificial Intelligence and Automation, Democracy and Governance, Science and Innovation, Environment, Poverty and Inequalities, Health. MT/GSC areas of medium significance compared to the others form the second cluster: Demography, Climate and Economics. The third cluster contains the relatively less significant areas: Urbanisation, Consumption, Geopolitics, Migration, Energy, Conflicts, and Resources. The same clusters can be identified also with regard to the Overall significance (Table 3, last column). The same results were yielded by answers through the Top 6, with two minor differences only in the dimension of Allocation of Public Funding: the area Climate would belong to the cluster of the most significant areas, and Urbanisation to those of medium significance.

The results of the forecasting tournament (aggregated opinions of participants) largely match the Delphi results. The main difference is that the forecasting tournament participants included the Economics and Resources areas in the cluster of the highest significance (in this case the 9 areas with

the highest score), on the contrary, they do not consider the Values and Climate areas to be the most significant. The emphasis on Economics was influenced by the relatively strong representation of participants with economic education. A similar result was reached by the promoters or applicants from the ZETA programme who jointly prioritised also areas Resources, Economics, and in addition Energy, while they prioritised less the areas Democracy and governance, Values, and Poverty and inequalities.

Table 4 shows differences in the score for "SSHA support" and "Allocation of funding". The intensity of colour indicates the size of the difference. Green indicates a higher perceived relative importance of SSHA for addressing the given area. Yellow, on the other hand, indicates lower potential of SSHA compared to other options of allocating public funding. White shows a balanced position of SSHA compared to other options. Given the assumption that a multidisciplinary approach will be needed to address the majority of grand societal challenges, this is rather a complementary visualisation of the results.

	Allocation of funding	**Support of SSHA**	**Difference SSHA support - Allocation of funding**
	Score [points]	Score [points]	Score [points]
Education and employment	71	71	0
Digitisation, AI and automation	68	65	-3
Values	58	65	7
Democracy and governance	59	64	5
Science and innovation	66	63	-3
Environment	69	61	-8
Poverty and inequalities	59	60	1
Health	54	60	6
Demography	50	53	3
Climate	49	50	1
Economics	45	45	0
Urbanisation	34	41	7
Consumption	36	40	4
Geopolitics	36	37	1
Migration	33	37	4
Energy	42	34	-8
Conflicts	38	32	-6
Resources	36	32	-4

Table 4 - Difference between the scores for "SSHA support" and "Allocation of funding".

3.3 - List of challenges with a significance for the Czech Republic

The last mentioned output is the list of challenges with a significance for the Czech Republic (see Annex 13). This output contains specific challenges for each MT/GSC area. It is a qualitative output that cannot be viewed as a list of suggestions for future research or of hypotheses to be verified. The list of challenges with a significance for Czechia is structured by the cards of MT/GSC areas and for each MT/GSC area it is ranked in descending order based on how many times the challenge was mentioned by experts in Delphi. As it is a qualitative output, it sets out all challenges identified by the experts.

4 - Reflection on the methodological procedure

The project FUTURE-PRO: Megatrends and Grand societal challenges is a contribution to the systematic finding of the best solutions for important societal problems. Better ways and results of public decision-making have great potential to improve the quality of life for the current as well as future generations. Despite maximum efforts for balance, it is important to name certain limitations and distortions that could influence the project results, and to describe how the pilot implementation of the methodology is linked to the final version of the CM Methodology.

4.1 - Limitations and distortions

The coronavirus pandemic: The CM Methodology was implemented at the time of the coronavirus pandemic. The sources used were published in the vast majority before the COVID-19 outbreak. When designing the cards of MT/GSC areas, the project team worked with the most up-to-date information available, but it is possible that future information sources will strengthen some MTs/GSCs and weaken others. Another effect of the coronavirus pandemic was the transfer of all cooperation in the project to the online environment. It is possible that in certain phases, the in-person cooperation would bring slightly different results, e.g. in the initial clustering of MTs/GSCs where around 500 records from the working MT/GSC overview were processed and visualisations in real space might have been helpful. The online work supported the involvement of experts from various Czechia regions in consultations and in the prioritising, which can be evaluated positively. The coronavirus pandemic could also influence the answers of experts and the professional public e.g. in favour of the MT/GSC area Health, as health-related topics had disproportionate space in news coverage for logical reasons, compared to the other MT/GSC areas. It appears from interviews with experts and the overall results of Delphi that this limitation may not be substantial. The coronavirus pandemic could also reduce the available work capacity of some groups of people as they had to address complicated personal situations and so could not take part in the project. In the project team, the expert team and among the experts participating in Delphi, the coronavirus situation could cause exhaustion and fatigue, which could affect the results, given the extent of the background materials.

Diversity: The project team and the expert team of the promoter consisted dominantly of men, the project manager was a woman. The promoter took active steps to ensure the needed diversity, mainly in building the Delphi expert panel, nevertheless, it is possible that this aspect influenced the results. In the CM Methodology implementation, a question was posed whether to take into account the representation of regions in compiling the Delphi expert team. Upon reflection, this factor was not taken into account with regard to the total size of the expert group (25 people). However, the CM Methodology recommends this consideration in chapter Development and Update of the CM Methodology where a higher number of Delphi participants is proposed.

Composition of the Delphi expert panel: It was found that among the experts in Delphi there is a correlation between the self-assessed level of expertise and the resulting score for significance of the related MT/GSC area. The composition of the expert team in Delphi always has limitations, it is an unavoidable aspect of this method, which cannot be removed, only reduced. The promoter took steps to ensure the most diverse and most numerous possible composition of the expert team, within the limitations of the project. Still, it can be seen as a limitation that expertise from MT/GSC areas Health, Urbanisation and Conflicts was represented less in the expert panel. In compiling the expert panel, the

promoter took care to invite experts who had the corresponding professional and ethical credit. The names of the participating experts are transparently indicated, as well as their aggregated data on fields of expertise (self-assessment) and their socio-demographic data (see Annex 2). In the above-mentioned expansion of the CM Methodology, there is a recommendation of considering a higher number of Delphi participants through a parallel implementation of Delphi in diverse groups, which could further support the validity of the quantitative results of Delphi.

Time: The time available for the implementation was a strong limitation. The phases (2-4) of the CM Methodology were implemented within 5 months. A comparison with similar projects implemented abroad, made as part of the Background Research for the CM Methodology, showed that such period is at the lower limit of their time range.

Distortion of the project team: The professional interests of the project team members include education, artificial intelligence, sustainability, public administration, ethics, management, geopolitics, economy or the environment. It is possible to assume that thanks to the diverse composition of professional interests of the team members, the one-sided thematic distortion was eliminated.

Distortion of the sources used: The starting point for identification of MTs/GSCs were MT/GSC studies. Therefore, it is apparent that the coverage of the topics corresponds to the topics addressed in those studies. The MT/GSC studies are usually published as "grey literature" and they always reflect the interests and views of the world of their authors. In designing the cards of MT/GSC areas, the project team also used sectoral studies.

4.2 - Methodological results of the CM Methodology pilot implementation

Apart from the actual content results, the pilot implementation was used to draw up the final version of the CM Methodology (see Output 1). The pilot implementation was reflected on and taken into account in finalising the Methodology. This step is described in a separate document "Reflection on the pilot implementation of the CM Methodology" (only in Czech), setting out the key insights and lessons learnt from the CM Methodology piloting, including how they were integrated.

Following the background research for the Methodology (see the document "Background Research for the CM Methodology") and the piloting of the methodology, key recommendations were formulated for further development of the CM Methodology. Those recommendations include making an analysis of weak signals, visioning, increasing the number of Delphi participants and creating scenarios and carrying out impact studies. The recommendations are discussed in more detail in the CM Methodology (see Output 1).

5 - Conclusion

In line with foreign practice and based on an extensive search of sources, the pilot implementation of the CM Methodology brought results that can be used as an important input for other follow-up FUTURE-PRO projects. Such results include mainly the definition of 18 MT/GSC areas including their structured description, identification of 8 priority areas significant for the future quality of life in Czechia and an initial list of challenges identified for each area.

The result of prioritising the MT/GSC areas as part of the CM Methodology piloting can be compared with the priority thematic clusters in the EU programme Horizon Europe 2021-2027 and with the National priorities of oriented research, experimental development and innovation. The comparison is shown in Table 5. Both programmes are intended to support science in general, the results of the CM Methodology are focused on SSHA. The key difference from both programmes is the different definition of the areas and the lower priority given to research of climatic change and energy.

	Priority areas	Corresponding MT/GSC priority areas according to the CM Methodology
Horizon Europe 2021-2027	Cluster 1: Health	Health
	Cluster 2: Culture, Creativity and Inclusive Society	Education and employment Values Poverty and inequalities Democracy and governance
	Cluster 3: Civil Security for Society	/
	Cluster 4: Digital, Industry and Space	Digitisation, AI and automation
	Cluster 5: Climate, Energy and Mobility	/
	Cluster 6: Food, Bioeconomy, Natural Resources, Agriculture and Environment	Environment
	/	Science and innovation
National priorities of oriented research, experimental development and innovation	Competitive knowledge-based economy	Education and employment
	Sustainability of energy and material resources	/
	High-quality living environment	Environment
	Social and cultural challenges	Values Poverty and inequalities Democracy and governance
	Healthy population	Health
	Secure society	/
	/	Science and innovation Digitisation, AI and automation

Table 5: Comparison of MT/GSC priority areas according to the CM Methodology with the priority areas defined in the programmes Horizon Europe and the National priorities of oriented research, experimental development and innovation

The results of the CM Methodology pilot implementation are one of the FUTURE-PRO steps towards formulating ambitious research missions that would be linked to societal challenges significant for Czechia and the solution of which would improve the quality of life in Czechia in the long term. To make use of the results of the CM Methodology piloting, it is assumed that follow-up steps will be taken to formulate such research missions. It is already apparent from the interconnection of the MT/GSC areas that such missions will have the character of so-called wicked problems. To solve such problems, stakeholders will need to develop a structured discussion on the desirable future of Czechia and establish the quality of life, resilience and sustainable development as normative frameworks that are broadly supported. Following that, it will be necessary to encourage the paradigm of inter-sectoral cooperation and to focus on joining the efforts of various sectors in interdisciplinary research so that the research and development has impacts in real world[17].

As mentioned in the introduction to this document, in terms of preparations for the future, it is key to understand the future challenges that are visible already today, based on the current state of knowledge, and to create conditions for responding to them so that we are not only passive observers but that we improve our position of active co-creators of the future with normative goals to sustain and improve the quality of life. The fostering of openness and sensitivity to such challenges appears essential. This approach is also in line with the usual approaches to change management where the first step towards a change is to understand and evoke the urgency of the change. The cards of MT/GSC areas may help in this sense as information material for a wider (professional) public across fields of expertise.

The results should be viewed in a broader context of contemplations on the future. Although the identification and prioritisation of MTs and GSCs is important, it is apparent that the future will bring expected as well as unexpected situations and that we must enhance and develop such structures in the society and public institutions, that are flexible, operational and resilient vis-à-vis the unexpected challenges of the future.

[17] A logical part of those steps appears to be the involvement of Czech science and research in international projects that have the ambition to contribute to the quality of life not only in Czechia but also in the EU and the world. This aspect is beyond the scope of this project and may become a starting point for follow-up projects.

6 Annexes

Annex 1: Identification of MTs/GSCs - List of baseline studies of MTs and GSCs

Project	Organization	Year
Global Trends to 2030: Can the EU meet the challenges ahead?	ESPAS	2015
SOER 2015	EEA	2015
An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy	OECD	2016
Megatrends 2016 - The future happens now	SITRA	2016
The 6 megatrends: What concerns unite our global executives?	Willis Towers Watson	2016
Global trends: The Paradox of Progress	National Intelligence Council	2017
Global Trends to 2035 - Geo-politics and international power	EPRS	2017
Beyond the Noise: The Megatrends of Tomorrow's World	Deloitte	2017
The global forces inspiring a new narrative of progress	McKinsey & Company	2017
Trends and global forces	McKinsey & Company	2017
Global Trends - Challenges and Opportunities in the Implementation of the Sustainable Development Goals	UNDP	2017
State of the Future 19.1	The Millennium Project	2017
Megatrends - The forces shaping our future	Blackrock	2018
Global Strategic Trends	UK Ministry of Defence	2018
Drivers of Change	Sami Consulting	2018
What's after what's next? - The upside of disruption - Megatrends shaping 2018 and beyond	Ernst & Young	2018
Global Trends to 2030: Shaping the Future in a Fast-Changing World.	ESPAS	2018
Global Trends to 2035 - Economy and Society	EPRS	2018

Global Trends 2018-2023	AT Kearney	2018
Megatrend Analysis: Putting the Consumer at the Heart of Business	Euromonitor International	2018
The Next Generation of Emerging Global Challenges	Policy Horizons Canada	2018
Global trends to 2030: Challenges and Choices for Europe	ESPAS	2019
Here they are: the most important trends of the 2020s	SITRA	2019
Drivers of change of relevance for Europe's environment and sustainability	EEA	2019
The world in 2040 - The future of healthcare, mobility, travel and the home	Allianz	2019
The AXA 2019 Foresight Trendbook	AXA	2019
Driving systems change in turbulent times	Forum for the future	2019
Megatrends for the future of business	Sydney business insights	2019
Sustainable Development Outlook 2019: Gathering storms and silver linings	UN DESA	2019
Interconnections of global trends	German Federal Government	2019
Global Risks 2035 Update: Decline or New Renaissance?	Atlantic Council	2019
Global megatrends - Mapping the forces that affect us all	Oxfam	2020
Global Trends 2020	IPSOS	2020
Megatrends 2020 and beyond	Ernst & Young	2020
The Megatrends Hub	EU Commission - JRC	2020
Megatrends	PwC	2020
Megatrends Update - Understanding the Dynamics of Global Change	Z Punkt	2020
The 2020 Future Risks Report	AXA	2020

Hyperlinks functional as of 1 July 2021

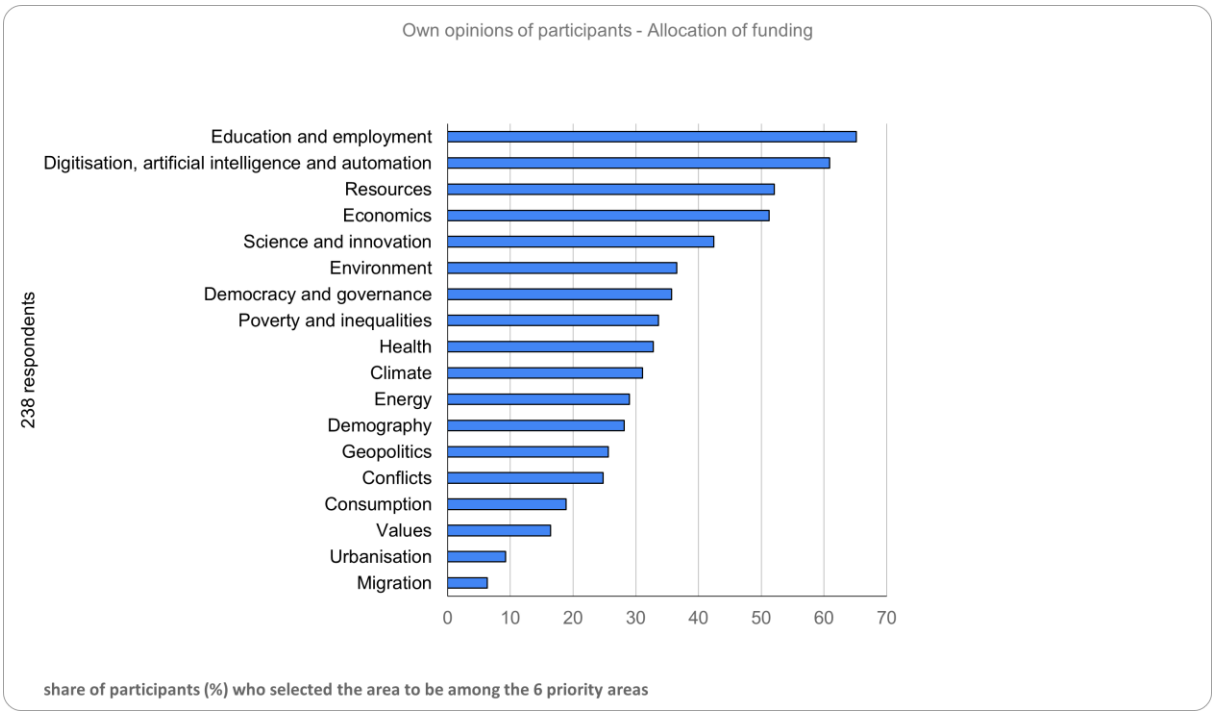
Annex 2: Identification of MTs/GSCs - Names of MT cards and GSC cards

MT cards	GSC cards
MT1 - Earth's climate variations	MSC1 - Crucial, yet vulnerable cities
MT2 - Energy consumption growth	MSC2 - Insufficiently addressed climate crisis
MT3 - Environmental degradation	MSC3 - Democracy under pressure
MT4 - Depletion of natural resources	MSC4 - Impacts of digitisation and automation on work and society
MT5 - New migration flows	MSC5 - Education system adaptation
MT6 - Population ageing	MSC6 - Unpreparedness for the new nature of work
MT7 - Population growth	MSC7 - Low-emission energy production and consumption
MT8 - Urban sprawl	MSC8 - Adverse effects of humans on the environment
MT9 - Growing consumerism and responsible consumption	MSC9 - Equal access to high-quality and nutritious food
MT10 - Shifting focus of the world economy	MSC10 - Geopolitical tension
MT11 - Weakening global economic growth	MSC11 - New ethical dilemmas and cultural challenges
MT12 - Decrease in extreme poverty and increase in inequality	MSC12 - Poor health and mental discomfort
MT13 - Increasing interdependence of states	MSC13 - Increasing inequality within states
MT14 - New forms of and reasons for conflicts	MSC14 - Infrastructure failure risks
MT15 - Transformation of liberal democracy	MSC15 - Insufficiently addressed migration
MT16 - Transformation of individual and societal values	MSC16 - Unsustainable use of natural resources and ecosystem services
MT17 - Accelerating and ubiquitous digitization and automation	MSC17 - Poverty and the risk of falling into poverty
MT18 - Innovation and technological acceleration	MSC18 - Extensive breadth and speed of technological change
MT19 - Changing importance of education and human capital	MSC19 - Unpreparedness for the new nature of security threats
MT20 - Improving health and the onset of new health threats	MSC20 - Social instability[18]
	MSC21 - Sustainable consumption
	MSC22 - Ensuring sustainable economic growth
	MSC23 - Water scarcity

[18] In clustering the MTs/GSCs, social instability was evaluated as a separate topic for a GSC card. During the processing of the cards, this approach was reviewed and, due to overlaps, the content of this card was added to other existing GSC cards.

Annex 3: Civic participation - Own opinions of the forecasting tournament participants

The question asked was: "Choose exactly 6 areas that will, in your opinion, have the greatest impact on the quality of life in Czechia in the next decades and, therefore, public funding should be preferentially allocated to understanding them and addressing them".



Annex 4: Civic participation - Summarised comments of the tournament participants

(1) How own predictions were created

The majority of respondents who commented on creating their predictions admit that they preferred an intuitive approach to creating a more complicated system of evaluation. "For this question I cannot really describe specifically my procedure, it seems too complex to me," writes one of the commenting respondents and adds that he based his estimate on a combination of reading the background materials from the organisers and a long-term observation of the key areas for the Czech Republic. Several other respondents commented on their procedure in a similar way.

Several respondents have come up with their own method of making a prediction and describe it. Three more complex prediction procedures stand out:

a) One of the participants proceeds so that he first evaluates each megatrend on a five-point scale (very low/ low/ medium/ high/ very high) in three aspects (impact of the topic on the quality of life, potential of public investment to achieve a positive change, and "a chance that something will go terribly wrong"). Subsequently, based on the quantitative output of the scoring, he distributed the percentages.

b) Another participant described a procedure where he first estimated the ratios in which experts would answer on a 0-3 scale, based on those ratios he then simulated 10,000 panels with 10-20 members and evaluated how many times a category appeared among the first six. Based on that he distributed the percentages.

c) It is worth mentioning another participant's system modelling the voting of a panel of 15 experts who score each megatrend on a 0-3 scale (according to baseline probabilities blurred by "random noise") and the result is then modified by means of sanity check.

(2) Personal opinions

The second topic that repeatedly appeared in the comments is the issue of own opinions (or values). Many commenting participants regarded the comments as a place to display their opinions and opinion spectra or as a space for a brief reflection on various topics. The opinions of the commenting persons vary considerably.

While one sees economics as the "alpha and omega that will affect most of the other areas", another one holds the thesis that "the economics will run on (...) and is of course important but rather as a whole - an aggregate - than as one priority area." Based on such different opinions it can be assumed that the two participants voted in very different ways. Another participant directly sets out: "Warning: The following text may seem controversial in many aspects" and then he expresses very critical opinions on the particular megatrends. This participant considers digitisation to be the key megatrend and believes that, in the next decades, artificial intelligence will have an impact on all aspects of the society (and, therefore, on all the other megatrends).

(3) Comments on the prioritisation method

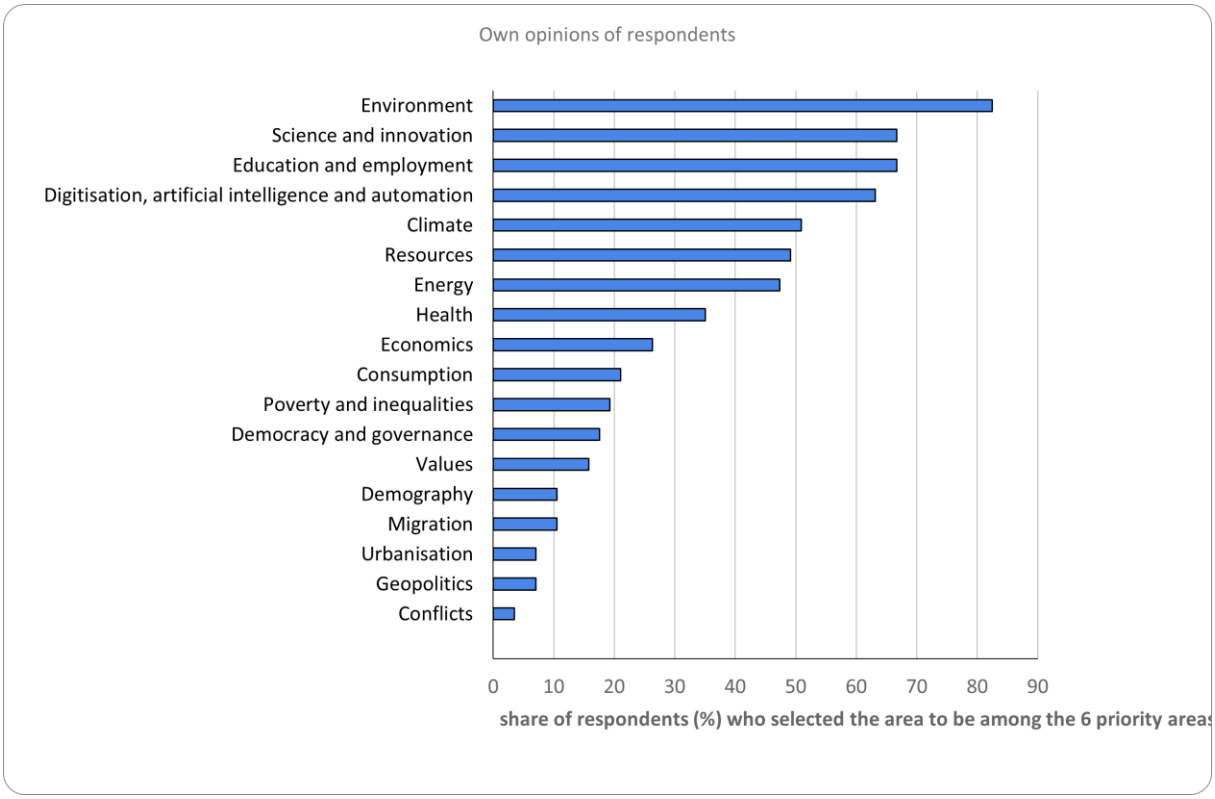
Another topic was the difficulty of prioritising at such a high level of generality. Most often the respondents mentioned the mutual interconnection of the megatrends. There were comments such as "Many of these megatrends are very similar to each other, but in some cases even very easily interchangeable or arising from one another", or "there are correlations among the categories where one category is a subset of another or, on the contrary, two categories can be "squeezed" under an outlined trend because they are closely related. It is undeniable that one of the most significant trends is ensuring power supply. If we call it a set, then subsets are climate and the environment. Some respondents take a constructive approach to this issue and ponder on how to adapt the thinking about the interconnection prediction or on how this phenomenon will be treated by experts.

Some comments criticised the formulation of questions, e.g. "I perceive the question as not an entirely appropriate merger of two separate questions. The first concerns an opinion on the impact of the areas on the quality of life in Czechia. The second asks for an opinion on whether public funding should be preferentially spent on "understanding and addressing" the area. I personally see these as different issues." One of the comments expressed a negative view on the unclear time frame: "Should this series of questions show direction for the year 2035, 2040 or 2050?" According to this opinion, "in today's fast changing world, every five years are a big difference with different challenges."

A large part of this criticism is probably supported by the fact that the reading of all the provided background documents would require more time than many respondents could provide, nevertheless, we consider the criticism important and so we are sharing it here.

Annex 5: Civic participation - Results of TA CR Zeta

The question asked was: "Choose exactly 6 areas that will, in your opinion, have the greatest impact on the quality of life in Czechia in the next decades and, therefore, public funding should be preferentially allocated to understanding them and addressing them".



Annex 6: Civic participation - Summarised comments from TA CR Zeta

(1) First part

In terms of the information sources influencing the answers of respondents, the most frequently mentioned are the cards of megatrends and grand societal challenges and other background documents provided by Czech Priorities. Several times it was mentioned that respondents draw their conclusions based on their personal "perception of the situation and general perception within Czechia". The respondents rarely mention specific literature, several times they mention literature in their field in general.

The respondents clearly mark climate, digitisation / technological innovation and education as the three areas that are, in their opinion, the most crucial for the future quality of life in Czechia. The issue of climate is seen as key because if problems associated with it are not solved, "further development of the quality of life in Czechia will not be possible at all". This argument is repeatedly tied directly to the issue of innovation (and science in general) that are perceived by the respondents as a way of solving climate-related potential problems. This opinion is linked in the respondents' reactions also to other areas, while the area of innovation, digitisation and AI "serves as support to the other areas - alternatively can be understood as an integral part of many areas." The importance of education and employment is also a frequently recurring trend in the textual answers. Quality education is associated with a higher quality of labour force in Czechia and, therefore, with many areas for which a higher quality of education would be positive. Among other things, the respondents often mention the need to protect democracy and combat influences that threaten it.

The factor of interconnection among the societal challenges reappears in the textual answers of many respondents - not only in the above-mentioned connection of climate with innovation, and education with various sectors, but also e.g. in the relationships between education and health, values and geopolitics, or innovation and consumption.

(2) Second part

In the second part, the respondents propose many research questions for SSHA - a large part of the questions arises directly from the first part and so is linked with the areas of climate, digitisation and innovation and education. Specific examples of the research questions:

- How strong are the impacts of extreme temperatures on the ecosystem of aquaculture, forestry and agriculture?
- Can consumption be reduced within the surplus or how can the surplus be used?
- What are the suitable science and research metrics?
- What are the pros and cons of electromobility? Can batteries be disposed of in an environmentally sound manner?
- Where is the borderline between flexibility of the educational process and its susceptibility to temporary influences of the societal or political situation?
- How to make the educational system capable of timely response to societal challenges and, at the same time, sufficiently resilient to the interests and influence of some circles in society?

Another topic interlinking many of the proposed research questions is inequality. Specific examples of such questions:

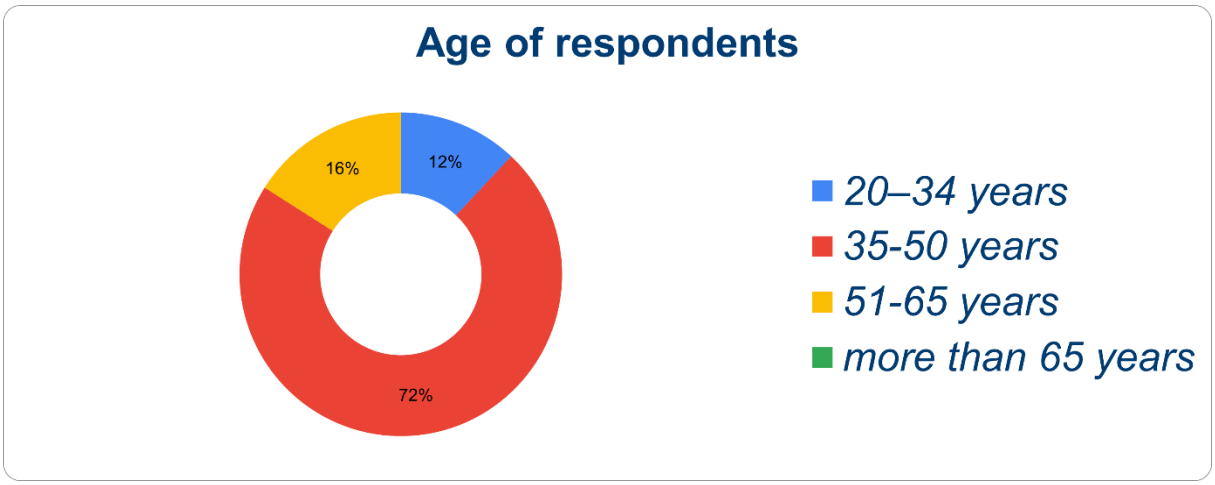
- Is there a socially appropriate inequality? If so, which?
- How to help inhabitants with a lower socio-economic status to improve their quality of life and reduce "inheritance of poverty"?
- Who or what influences the growing xenophobia and discrimination of ethnic minorities?

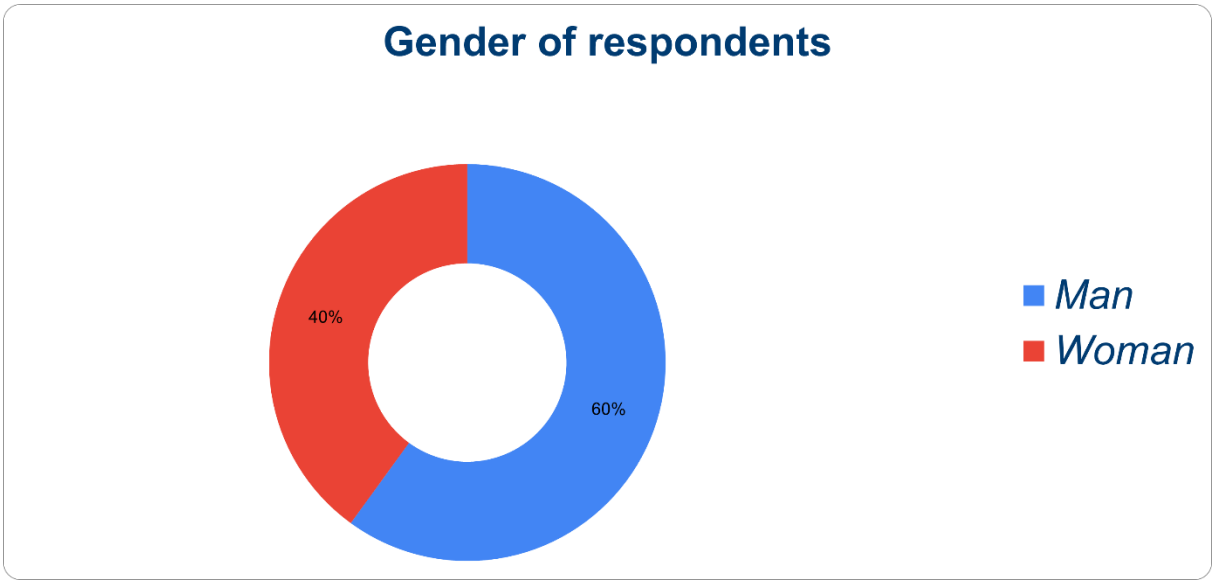
In connection with the questions related to inequality, the topic of xenophobia (but also homophobia or gender discrimination) recurred in the second part of the textual answers.

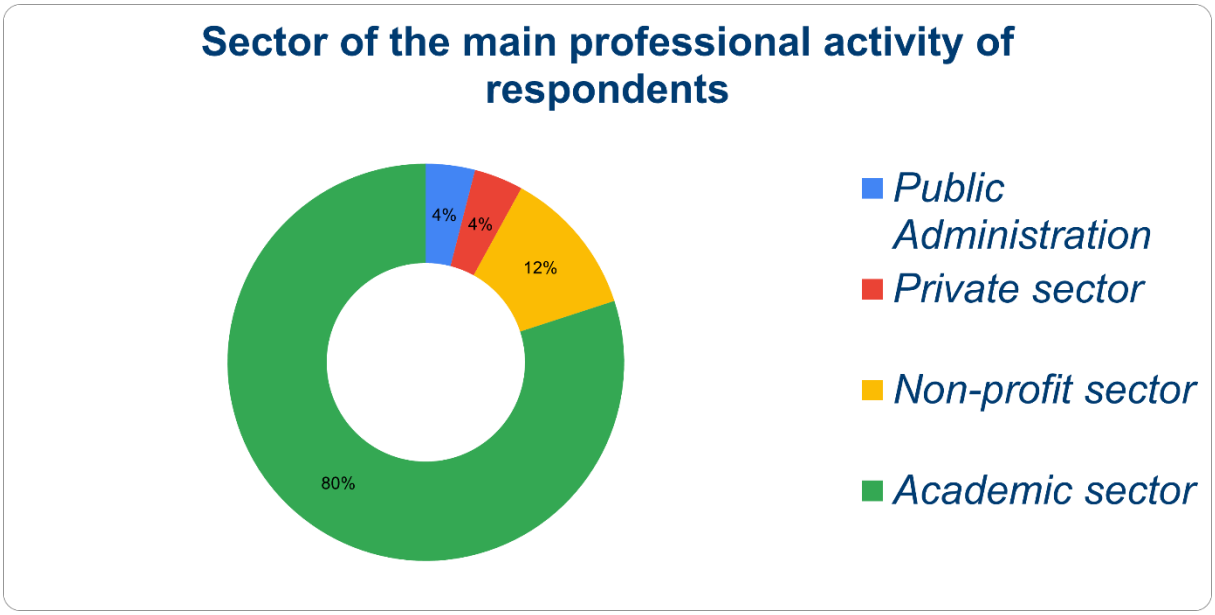
Annex 7: Deliberation of experts - Experts participating in the role of experts in Delphi

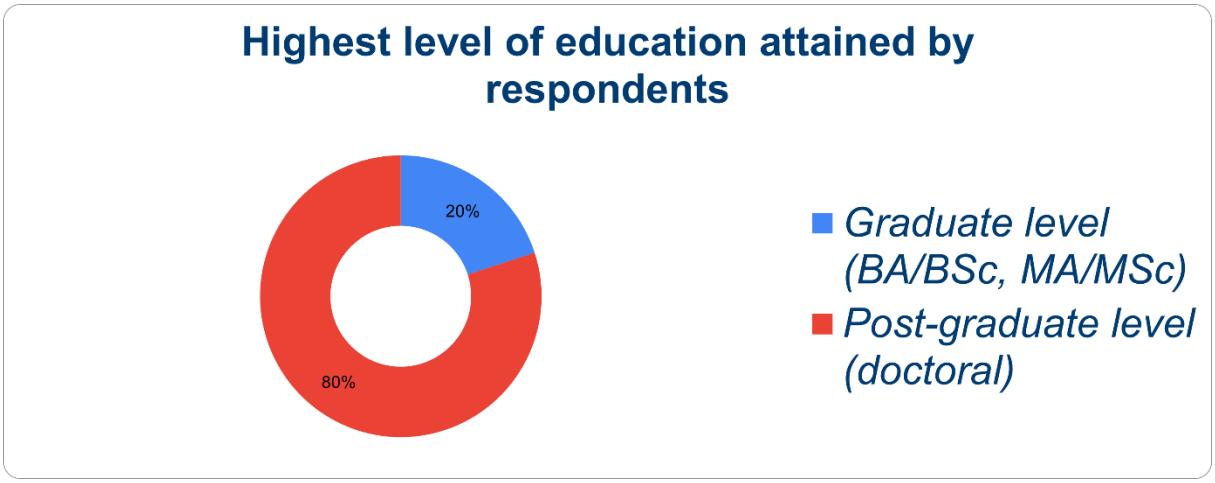
doc. PhDr. Jozef Baruník Ph.D.; Mgr. Karel Čada, Ph.D.; RNDr. Jana Dlouhá, Ph.D.; Mgr. Miroslav Havránek; Mgr. Marek Havrda M.A., M.P.A., Ph.D., RNDr. Šárka Hudecová, Ph.D.; doc. Petr Janský, Ph.D.; PhDr. Mgr. František Kalvas, Ph.D.; Mgr. Denisa Kera, Ph.D.; doc. RNDr. Ing. Miloš Kopa, Ph.D.; Marcel Kraus, M.Sc.; Mgr. et Ing. Jiří Lehejček, PhD.; Mgr. Jaromír Mazák, Ph.D.; doc. Václav Němec, Ph.D.; prof. Ing. Danuše Nerudová, Ph.D.; David Ondráčka M.A.; doc. Ing. Vladimíra Petráková, Ph.D.; Mgr. Barbora Petrová, Ph.D.; Ing. Martina Plisová, Ph.D.; Mgr. Eva Richter, Ph.D.; Ing. Jiří Schneider; Ing. Martin Srholec, Ph.D.; doc. RNDr. Jana Straková, Ph.D.; Mgr. et Mgr. Hana Tenglerová; doc. PhDr. Jan Váně, Ph.D.

Annex 8: Deliberation of experts - Socio-demographic characteristics of the experts in Delphi

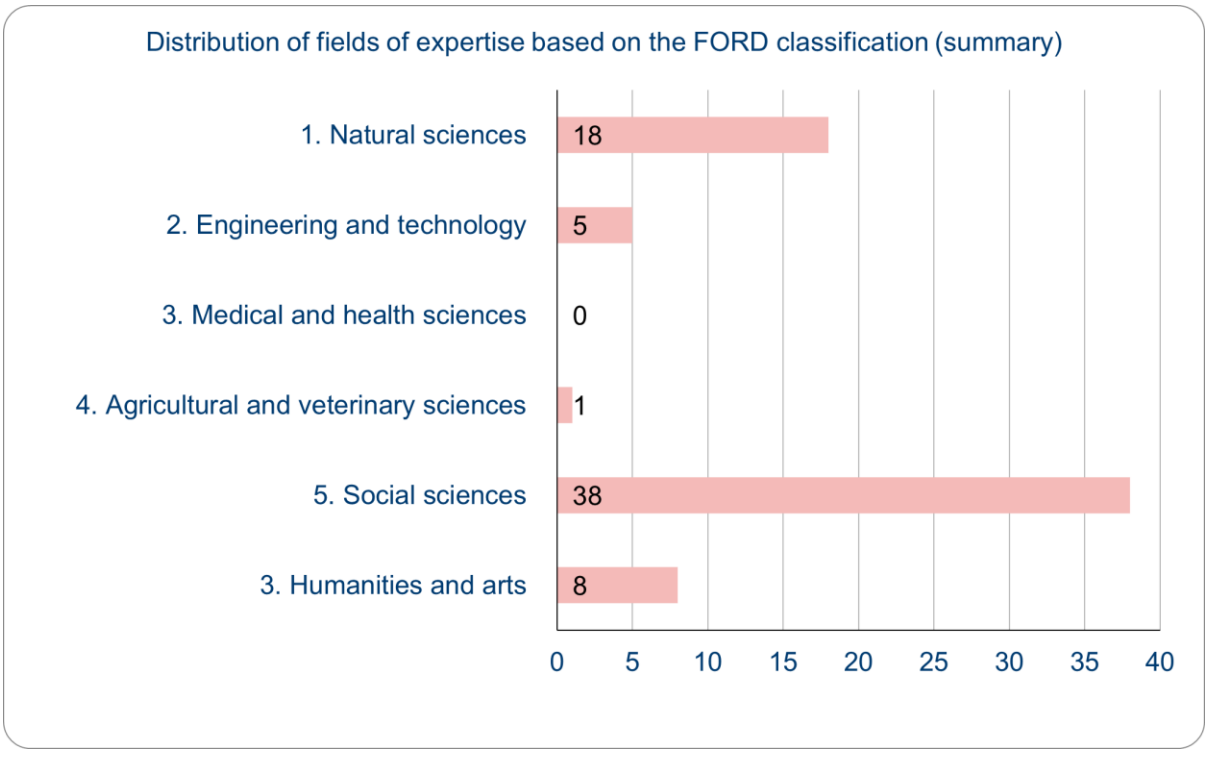


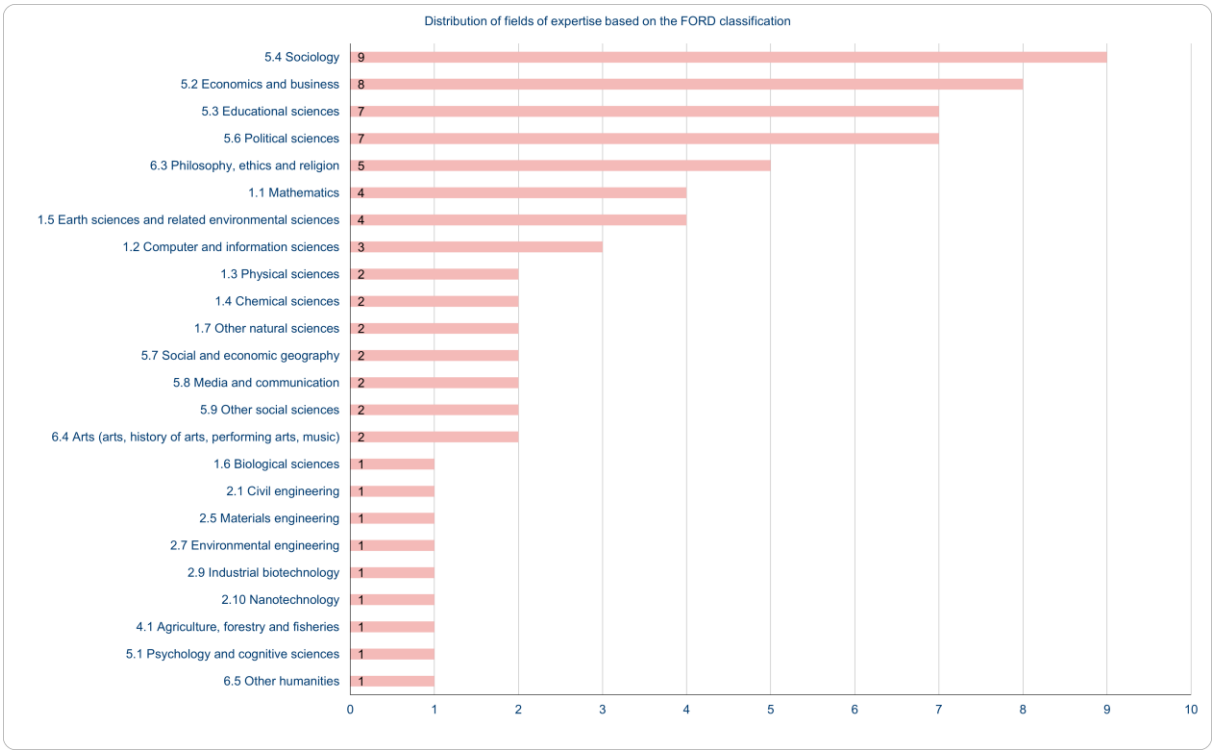




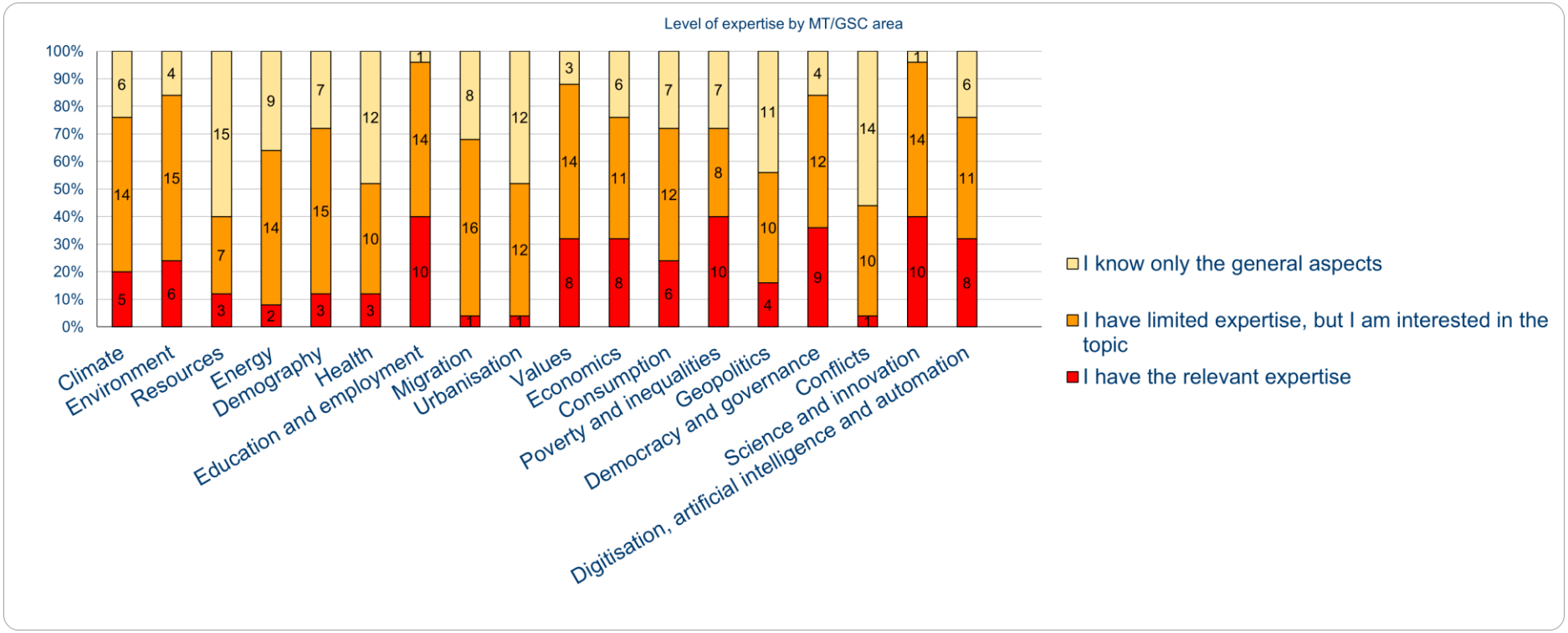


Annex 9: Deliberation of experts - Distribution of the fields of expertise according to the FORD classification




Distribution of fields of expertise based on the FORD classification
5.4 Sociology 9
5.2 Economics and business 8
5.3 Educational sciences 7
5.6 Political sciences 7
6.3 Philosophy, ethics and religion 5
1.1 Mathematics 4
1.5 Earth sciences and related environmental sciences 4
1.2 Computer and information sciences 3
1.3 Physical sciences 2
1.4 Chemical sciences 2
1.7 Other natural sciences 2
5.7 Social and economic geography 2
5.8 Media and communication 2
5.9 Other social sciences 2
6.4 Arts (arts, history of arts, performing arts, music) 2
1.6 Biological sciences 1
2.1 Civil engineering 1
2.5 Materials engineering 1
2.7 Environmental engineering 1
2.9 Industrial biotechnology 1
2.10 Nanotechnology 1
4.1 Agriculture, forestry and fisheries 1
5.1 Psychology and cognitive sciences 1
6.5 Other humanities 1
0 1 2 3 4 5 6 7 8 9 10

Annex 10: Deliberation of experts - Level of expertise by MT/GSC area



Annex 11: Deliberation of experts - Specification of MT/GSC areas after the first Delphi round

Impact or challenge	MT/GSC areas where it is used as an argument	MT/GSC area where its use is recommended
Inequalities in education	Poverty and inequalities, Education and employment	Education and employment
Inequalities in access to healthcare	Poverty and inequalities, Health	Health
Drought, soil and problems with water	Climate, Environment, Resources	Environment
Health and care for the ageing population	Health, Demography	Health
Participation of senior citizens in the labour market	Demography, Economics, Education and employment	Education and employment
Intergenerational inequality	Demography, Poverty and inequality	Demography
Unsustainable pension system	Demography, Poverty and inequality, Economics	Demography
Migration	Demography, Migration	Migration

Annex 12: Identification of MTs/GSCs - Comparing the MT/GSC areas with selected MT/GSC studies

Year	Title of the foresight study	Organization	1- Climate	2 - Environment	3 - Resources	4 - Energy	5 - Demography	6 - Health	7 - Education and employment	8 - Migration	9 - Urbanisation	10 - Values	11 - Economics	12 - Consumption	13 - Poverty and inequalities	14 - Geopolitics	15 - Democracy and governance	16 - Conflicts	17 - Science and innovation	18 - Digitisation, AI, automation	SUM
2016	An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy	OECD				1	2						2	1						1	**7**
2016	Megatrends 2016 - The future happens now				1		0					1	1								**3**
2017	Global Trends - Challenges and Opportunities in the Implementation of the Sustainable Development Goals	UNDP		1			1						3		1				1		**7**
2017	Global trends: The Paradox of Progress	National Intelligence Council	1				1					1	1				1	1	1		**7**
2018	Drivers of Change	Sami Consulting	1			1	1			1	1	1	2		1				2	1	**12**
2018	Global Strategic Trends	UK Ministry of Defence	1				1					1	1						1	1	**6**
2018	Global Trends to 2035 - Economy and Society	EPRS			1		1						1		1				1		**5**
2018	What's after what's next? - The upside of disruption - Megatrends shaping 2018 and beyond	Ernst & Young					1	1			2		1	1			2		5		**13**
2019	Drivers of change of relevance for Europe's environment and sustainability	EEA		1	1		1					1	1						1		**6**
2019	Global trends to 2030: Challenges and Choices for Europe	ESPAS	1			1	1				1		1			1			1		**7**
2020	Global Trends 2020	IPSOS	1				1						1		1	1			1	1	**6**
2020	Megatrends	PwC			1		1				1		1							1	**5**
2020	The Megatrends Hub	EU Commission	1		1		1	1	1	1	1		2	1	1		1	1	1		**14**
2021	Výzvy a Megatrendy (VÝME)	Czech Priorities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**18**

Annex 13: Deliberation of experts - List of challenges with a significance for the Czech Republic

Climate	
17	Climate change adaptation
9	Inequalities and ensuring a just transition to sustainability
6	Decarbonisation
6	Worsening drought
4	Climatic migration
4	Change at the individual level
4	Nihilism
4	Economic and social costs of climate change
3	Agricultural reform and food security
3	Perceiving global responsibility for the climate
3	Decline of biodiversity and vegetation zone shifts
3	Conflicts induced by climate change
3	Continuing warming and insufficient emission reduction
2	Increase in natural disasters and extreme weather
2	Unwillingness to change habits and opinions, inability to think innovatively
2	Adapting to EU policy
2	Transition to electromobility
1	Effective use of mitigation and adaptation funding
1	Automotive and agricultural lobbies impeding adaptation
1	Access to resources
1	Health risks induced by climate change impacts
1	Forestry adaptation and improving landscape management
1	Urban planning for climate change
1	Continuing prevalence of investment in fossil fuels
1	Ambivalence of technological solutions
1	The future of geoengineering
1	Deteriorating quality of life due to climatic impacts
1	Climate destabilisation and reduced ability to predict climate change
1	Exploring the CO2 sinks, e.g. in soil, vegetation and water

Environment	
15	Decline in biodiversity
11	Soil degradation
8	Forest degradation
8	Promotion and extension of organic farming
8	Drought, decline of water and its quality
8	Chemical pollution and health effects
5	Land-grabbing
4	Air pollution and health effects
4	Relationship and respect for nature
2	Preference for near-natural solutions
2	Landscape management as protection against an environmental crisis
2	Reducing resilience of ecosystems
2	Shifting the emphasis from efficiency and economic performance to well-being
1	Landscape diversification
1	Waste management reform
1	Lack of greenery in cities
1	Inefficient financial management
1	Diversification of the approach to the environment from the perspective of gender
1	Close links between the environment and the advancing climate change
1	Geoengineering opportunities
1	Change in education

Resources	
10	Transition to circular economy
8	Declining food self-sufficiency
7	Drought and soil degradation
6	Growing inequality, competition and conflicts
6	Unavailability of rare resources
4	Unsustainable use of resources
4	Declining food security
3	Growing water consumption
3	Wood overproduction and risk of wood unavailability
3	Declining water availability
2	Transition to renewable energy sources
2	Development of innovation for alternative raw materials
1	International trading opportunities
1	Growing importance of technology and knowledge
1	Decreasing quality of human capital
1	Declining biodiversity
1	Waste management
1	Reduction of fossil fuel extraction
1	Growing consumption and growing economies
1	Decarbonisation
1	Loss of biodiversity
1	Limitations of technological solutions
1	Depleted planet will not provide a place for pleasant living
1	Growing emissions from material production
1	Growing emissions from automotive production

Energy	
16	Development of nuclear energy and its security-related geopolitical context
8	Decarbonisation
7	Decentralisation of energy production
7	Acceleration of technological development and innovation
5	Development of battery technology
5	Ensuring a just transition to sustainability
4	Local energy productions
3	Speed of transition to renewable energy sources
3	Network stability and resilience
3	Growing energy consumption
3	Transition to green energy and economy
2	Growing demand for oil
2	Electromobility and further electrification
2	Electrification (comment?)
1	Power relations of the Czech energy sector
1	Low share of renewable sources compared to the EU
1	Effective use of EU funds
1	Cultural-ideological approach to energy
1	Energy poverty

	Demography
25	Sustainability of the pension system
13	Immigration
9	Intergenerational inequalities
9	Intergenerational solidarity and education systems
8	Fertility fluctuations
7	Employment of the older generation
6	Adapting the services and infrastructures to the ageing population
5	New distribution of life stages in the course of life
5	Political impacts of ageing population
5	Ageing population
5	Costs of ageing population
4	Asymmetrical growth and decline in world population
4	Demands made on the health system
4	Out-of-date family policies
3	Development cooperation in improving healthcare and equal access to education
3	Transformation of family structures
2	Feminisation of poverty
1	Support for women's employment
1	Transmission of diseases due to population density
1	Growing energy demand
1	Greater support of socially beneficial activities

Health	
20	Deteriorating mental health
18	Poor nutrition and lifestyle
14	Financing of the public health system
14	Inequalities in access to healthcare
10	Growing obesity
9	Adaptation of healthcare to technological progress
8	Impacts of ageing population
6	Threat of future pandemics
4	Distrust in healthcare
4	Outflow of physicians abroad and overloaded healthcare workers
4	Greater emphasis on prevention
3	Sustainable development
3	Commercialisation of healthcare
2	Chemicalisation of the environment
2	Resistance to antibiotics
1	Career advancement of physicians
1	Undervalued non-governmental healthcare organisations
1	Lessons learnt from pandemics as part of healthcare restructuring
1	Health problems arising from the online environment
1	Humanisation of healthcare

Education and employment	
20	Ensuring equal access to education and support for inclusive education
19	Adapting to changes in the labour market and ensuring competitiveness
14	Transformation of education towards a comprehensive personal development and individualisation of education
13	Underfunded education and insufficient motivation of teachers
12	Necessity of a quality policy of lifelong education
12	Gender inequalities
10	Reform of the education system, support for designing new methods of learning and digitisation of education
7	Lower administrative burden on educators
7	Developing the competences for active citizenship, meaningful personal life and self-realization
6	Teacher training
6	Supporting the development of soft skills and social competences
5	Development of language skills
5	Transformation and internationalisation of tertiary education
4	Increase in mental problems of students
4	Increasing the participation of disadvantaged persons in the labour market
4	Dissatisfaction with the education system
3	Better permeability of the education system including vocational education
2	Adapting the tertiary education to the growing number of students in it
1	A shift of emphasis in learning outcomes
1	Deteriorating quality of upper primary schools
1	Teaching in the overall context of knowledge of the world

Migration	
13	Risks of failed integration of migrants
13	Competitiveness of Czechia in the race for talent at global level
9	Rationalising the discussion on migration in the public space
9	Migration rejected by society, discrimination
6	Climatic migration
5	Difficulties with integration of migrants through education
5	Brain drain
5	Cooperation within the EU
4	Speeding up the visa process
4	Capturing the economic and demographic benefit of migration
4	Lack of data for rational management of migration
4	Polarisation of society and abuse of sentiments in society
3	Increasing flows from low-income countries
2	Increasing importance of international students
2	Extremism prevention
2	Use and integration of less qualified migrants
2	Insufficient development aid in countries of origin
2	Negative impacts of restrictive migration policies
2	Improving the quality of life of migrants
1	Negative impacts of irregular migration
1	Building trust in society
1	Building an effective system of international law based on human rights
1	Internal migration
1	Strengthening new forms of migration
1	Gender inequalities and gender-based violence
1	Future migration flows caused by regional war conflicts

Urbanisation	
22	Unavailability of housing
15	Deepening regional disparities
15	Pressures on transport, services and other infrastructure
13	Climate change adaptation and mitigation of adverse environmental impacts
12	Quality urban planning
7	Urban sprawl
6	Pressure of developers on new construction driven exclusively by commercial aspects
4	Agglomeration effect as a factor of economic growth and increased productivity
4	Quality of the environment
3	Averting residential segregation
3	Adapting cities to ageing population
3	Negative impacts of increased population density
3	Regionalisation and decentralisation
2	Poverty trading in the housing context (housing benefits exploited by housing owners)
2	Unequal distribution of public services

Values	
19	Declining trust between the state administration, institutions and citizens
16	Low social cohesion and tendency towards individualism
11	Radicalisation of society
10	Adaptation to technological progress
8	Populist tendencies
6	Growing danger of (dis)information
6	Adaptation to cultural and social changes
5	Emphasis on equality
4	Preserving ethics and moral values
2	Role of women and changes in family structures
2	Wide value disorientation
2	Environmental thinking
2	Cultural plurality at risk
2	Identity crisis
2	Deteriorated mental health
1	Ensuring flexibility of institutions
1	Consumerism
1	Emphasis on safety
1	Relationship between the elite and lower classes
1	Trust in science
1	Changing relationship of people to animal suffering
1	Changing relationship of people to alcohol and drugs
1	Xenophobia
1	Crisis of authority
1	Dominant position of economic values
1	Persisting role of symbols

Economics	
16	Transition to sustainable economy and an overall change in paradigm
9	Investment in building knowledge-based and circular economy
7	Impacts of automation on the labour market
6	Support of public and private investment
5	Dynamics of the growth of Czechia debt
5	Inequalities in access to economic activities
5	Political unsustainability of non-growth in democratic regimes
5	Reducing the impacts of climatic change
5	Reform of the tax system
4	Effective support of employment
4	Economic restructuring
4	Redistribution of the created wealth
4	Use of AI and digitisation for economic growth
3	Counter-cyclical measures and mitigation of economic crises
2	Deepening global competition
2	Low labour productivity
2	Quality of governance
1	Digitisation of state administration
1	Convergence with EU economies
1	Dependence on the automotive industry
1	Volatility of financial markets and currencies
1	Cyber security
1	More of independent Czech firms

Consumption	
14	Growing environmental burden caused by consumption
13	Changed value settings of the society
9	Food waste
8	Risk of indebtedness
7	Circular economy
5	General awareness-raising
5	Growing demand for energy and resources
4	Question of overall sustainability of consumption
4	More efficient consumption
4	Meaningful regulation
4	Consumption caused by the growing middle class
3	Model of economic growth as the originator of consumption
2	Consumption deepening inequalities
2	Innovation and modernisation
2	Problem of individualised offer
2	Orientation on services
1	Shared economy
1	Shortening of production chains
1	Finding new economic result metrics
1	Recycling support
1	Adapting the economy to the requirements of consumers for sustainable consumption
1	Transformation of political leadership
1	Change in corporate ethics

Poverty and inequalities	
12	Territorial inequalities and excluded localities
11	Inequalities related to education
11	Property executions and debt traps
6	Inequality between women and men
6	Intergenerational reproduction of social inequalities
5	Social and tax reforms
5	Impact on radicalisation, uncertainty, mistrust in institutions (#democracy)
5	Understanding the situation and effectiveness of measures
5	Erosion of the middle class
4	Unequal access to technologies
4	Discrimination (of ethnic minorities, age groups,...)
4	Obstacles for human capital development and increasing labour productivity
4	Adapting social systems to new forms of inequalities
4	Employment precariousness
3	Unclear impacts of technological changes
3	Availability of housing
3	Threat to long-term economic growth
3	Post-COVID economy
2	Increasing cost of measures to mitigate adverse impacts of inequalities
2	Weakening increase in social mobility
2	Unequal access to resources
2	Feminisation of poverty (mainly in old age)
2	Income inequalities
2	Need for systemic mitigation of poverty in developing countries
2	Perceiving and being able to live together in a world containing inequalities
1	Inequalities in health
1	Integration of goals in this areas with other goals
1	Position of single parents
1	Resistance related to the pressure on achieving a higher level of equality
1	Conceptualisation of work
1	Child poverty
1	Disinformation and fake news

Geopolitics	
14	Active membership in international and transnational organisations
7	EU institutional structure
7	Enhancing education and public discussion
6	Question of relations with the Russian Federation
6	Changing global order
5	New security threats
5	Cybersecurity
4	Economic threats
4	Limited geopolitical role of Czechia
4	Implementation of international law
3	Digitisation impacts on geopolitics
3	Joint foreign and security policy of the European Union
3	Growing power of China
3	Development of Africa
1	Consistency of the behaviour of the state and private actors in the international environment
1	Adapting to modern technologies
1	Geopolitical importance of the space
1	The issue of managing migration
1	The issue of adopting the euro
1	Environmental issues as a geopolitical determinant
1	Insufficient predictability
1	Disintegration of the EU
1	Demographic impacts
1	Value anchoring of foreign policy

Democracy and governance	
11	Public administration reform
11	Pressure on institutions and distrust towards them
11	Quality of governance and regulation (evidence-based, transparent, closer to citizens)
10	Effective civic education
9	Growing support of anti-system parties
8	Impact of social networks and misinformation on politics
8	Participation in the governance process
7	Pressure on social cohesion
7	Mistrust in democracy
6	More effective finding of consensus
6	Liberal democracy at risk
5	Growing inequalities
5	Growing extremism
5	Independence of the media
3	External threats to democracy
3	Coping with the change in values
3	Finding international solutions
2	Erosion and radicalisation of the middle class
2	Improving cooperation between the private and the public sectors
2	Strengthening the rule of law
2	Promoting equality as a governance principle
2	Clarifying the relationship between democracy and capitalism
2	Fostering civil society
2	Amending the Constitution and the Electoral Act
1	Public-service media under threat
1	Inconsistent compliance with standards
1	Harmonising the national and local politics
1	Rehabilitation of politics
1	More effective redistribution
1	Stabilised voter turnout
1	Democracy mechanisms in the EU are not projected to the national level
1	Excessive complexity of democratic politics

1	Responsible participation in the international community

Conflicts	
19	Cyber attacks
9	Technologies complicating security
8	Impacts of local conflicts (Middle East, Africa, Eastern Europe)
8	Increasing asymmetry of conflicts
7	Migration
5	Ensuring collective security through membership in NATO, EU and UN
5	(Dis)information as a threat
5	Vulnerability of infrastructure
4	Terrorism
4	Nuclear weapons
3	Defence expenditure
3	Global conflicts
2	Conflicts tied to the environment and climate
2	Unclear line between a conflict and peace
2	Threat of infiltrating key institutions
2	Rise of authoritarian regimes
1	Isolationism of Czechia
1	Space conflicts
1	Conflicts of values

Science and innovation	
12	R&D&I orientation on addressing societal challenges
11	Underfunded R&D&I
11	Support of trans- and interdisciplinarity
11	Gender inequality and its negative impacts on R&D&I
10	Focusing on high quality of scientific outputs
8	Internationalisation of science and research
8	Uncompetitiveness of higher education institutions in terms of Czech and foreign staff
5	Democratisation of science
4	Reducing the administrative burden
4	Low support for basic research
4	Searching for new ways to evaluate the work of scientists
4	Applying academic outputs in practice
3	Enhancing the innovation environment in Czechia
3	Building cumulative knowledge, supporting meta-analyses, replications, evidence databases
3	Evidence-based public policies
3	Shift to competitive advantage based on innovation (brain economy)
2	Ethical issues of research
2	Emancipation of social sciences, humanities and arts
2	Improving the lower levels of education
2	Focus on sustainable growth
1	Exploring the impacts of innovation on the society
1	Supporting good work climate in science
1	Adaptation of research infrastructures to crisis situations
1	Corruption in financing large infrastructure projects
1	Reform of higher education
1	Mistrust of a part of the public in science
1	Improving the conditions for free inquiry

Digitisation, artificial intelligence and automation	
20	Unpreparedness of people and states for labour market transformation
13	Negative impacts of digitisation on private and social life
13	Public administration digitisation
9	Deepening digital divide
6	Digital transition of production and services
5	Increasing cybersecurity risk
4	Insufficient regulatory framework for digitisation and cybersecurity
2	AI and gender inequality
2	Ethical principles for digitisation and automation
1	Digital rural areas
1	Insufficient dialogue about the overall direction of development
1	Utilisation of data
1	Digitisation of healthcare
1	Digitisation of energy
1	Electromobility and the related digital infrastructure

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