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DELIVERABLE

4.1

# Co-creation workshops of the GoNano project: Background material

*INCLUDING THE INFORMATION MATERIAL IN ENGLISH, AND THE TRANSLATED MATERIAL FROM THE CZECH REPUBLIC*

GONANO DELIVERABLE 4.1

*DOA TITLE: BACKGROUND REPORT FOR EACH OF THE SELECTED TOPIC AREAS*

**GoNano is a Coordination and Support Action funded by the European Union under the NMBP Programme of Horizon 2020, Grant Agreement n° 768622.**

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|---|---|
| **Work Package:** | WP4 - Co-creation with professional stakeholders |
| **Deliverable number:** | 4.1 |
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| **Planned delivery date:** | 02/19 |
| **Actual delivery date:** | 02/19 |
| **Dissemination level:** | PU |

# CONTENT

# 1 INTRODUCTION

Nanotechnology is considered as one of the most promising technologies of today's society. It offers great promises for solutions on environmental, health, and food challenges. Although a number of products already contain nanoparticles, innovations that have a major influence on society are still in their developmental phase. These innovations are often disconnected from the people who will be affected by them, as they are being developed in laboratories and other secluded arenas (Foley et al. 2017). The Horizon2020 European project 'Governing Nanotechnologies through Societal Engagement' (GoNano) project is built on the assumption that nanotechnologies are more likely to gain broad acceptance if they take public values and concerns into account at early stages of innovation. Therefore, a co-creation methodology has been designed, where wishes, needs and product suggestions of both citizens and professsional stakeholders are taken into account.

The background material presented in this report was developed for the first round of stakeholder workshops. These stakeholder workshops are part of a co-creation process where citizens and professional stakeholders (representatives from industry, policy, civil society and research) create suggestions for future nanotechnology products and research in the areas of 'health', 'energy', and 'food'. The goal of the co-creation process is to demonstrate how responsiveness to societal values, needs and concerns can be built into nanotechnology research and innovation (R&I) processes resulting in products that are judged as socially desirable, sustainable, and acceptable (Bechtold et al. 2018).

The stakeholder workshops on health were organized in the Netherlands on February 12, March 5, and March 7, 2019, on food in the Czech Republic on February 28, 2019, and on energy in Spain on March 7, 2019. These workshop build on the outcomes of citizen workshops, which were organized in Autumn 2019 in the same countries on the same themes (for more information about the Citizen Workshops, see Hebáková et al. 2019).

For more information about the GoNano project, please visit: http://gonano-project.eu/.

## 1.1 AIM OF BACKGROUND MATERIAL

The purpose of the background material was to inform stakeholders about the co-creation process of GoNano, nanotechnologies and the outcomes of the citizen workshops. From earlier analysis of various EU and national engagement initiatives, Shelley-Egan et al. (2018) concluded that the following criteria should be taken into account to engage stakeholders in co-creation:

- The purpose of the initiative should be made clear to stakeholders;
- Defining what is at stake is key;
- Discussions should be specific enough to affect the decisions of actors;
- Various publics should possess general knowledge of the subject;
- The process of what happens with the input should be transparent.

The background material provided the required information to the workshop participants. By distributing the background material before the workshop, stakeholders with various backgrounds could acquire a base-level of knowledge on nanotechnology, co-creation, and the social needs and values of citizens. Furthermore, the background material emphasized the use, importance, and urgency of stakeholder engagement and the potential value of including societal needs and values in the development of nanotechnologies.

## 1.2 DEVELOPMENT OF BACKGROUND MATERIAL

The development of the background material was an iterative process between the pilot partners (TC CAS, RMIT, and UT) and the work package and task leaders (DPF and UT, respectively). An initial structure and outline of the content of the background material was provided by the task leader and work package leader in November 2018. Partners were involved in the analysis and translation of information from different sources into relevant input for the background material in several online meetings and via email exchange in the period Nov 2018 – Jan 2019. After several revisions, final versions were agreed by all partners and produced in February 2019.

The content of the background material was based on various sources:

- An ex-post evaluation on mutual learning (Shelley-Egan et al 2018);
- Key developments and product scenarios in nanotechnology within Health, Energy, and Food (Pimponi et al. 2018);
- Description of the co-creation methodology applied in GoNano (Bechtold et al. 2018);
- Developments in regulation and policy (Bauer et al. 2018);
- Information material created for the citizen workshops in the three pilot countries (D3.1, Bitsch et al. 2018);
- Results of the three citizen workshops (Hebáková et al. 2019).

A similar layout for all three background materials was chosen to ensure consistency. This layout was based on the background material of the citizen workshops (see Bitsch et al. 2018).

Pilot partners were free to adjust the content according to their own needs. While the explanation of the co-creation method was similar in the three information materials, the explanation and application of nanotechnologies was adjusted to the context of the pilot countries and the set-up of the workshops. Furthermore, the reports of the outcomes of the citizen workshops differed among the pilot countries.

As the stakeholder workshops in the three pilot countries differed in theme, specificity, length and types of stakeholders, the degrees of freedom for adjustments were necessary to make the background material as effective as possible. In the Czech Republic, one stakeholder session including three thematic areas in the context of food was organized. In Spain, a similar setup was chosen, but

tailored to fit the specific questions related to energy. In the Netherlands, three smaller stakeholder workshops were organized. Each workshop focused on a different thematic area in the context of health. One of these themes was for example 'diabetes', for which stakeholders connected to this field were invited. The information about the application of nanotechnologies mentioned in the background material for this workshop was adjusted to the thematic area. In Spain, participants connected to nanotechnology and Energy were invited, without being immediately linked to a specific thematic area. Therefore, all participants received the same background material.

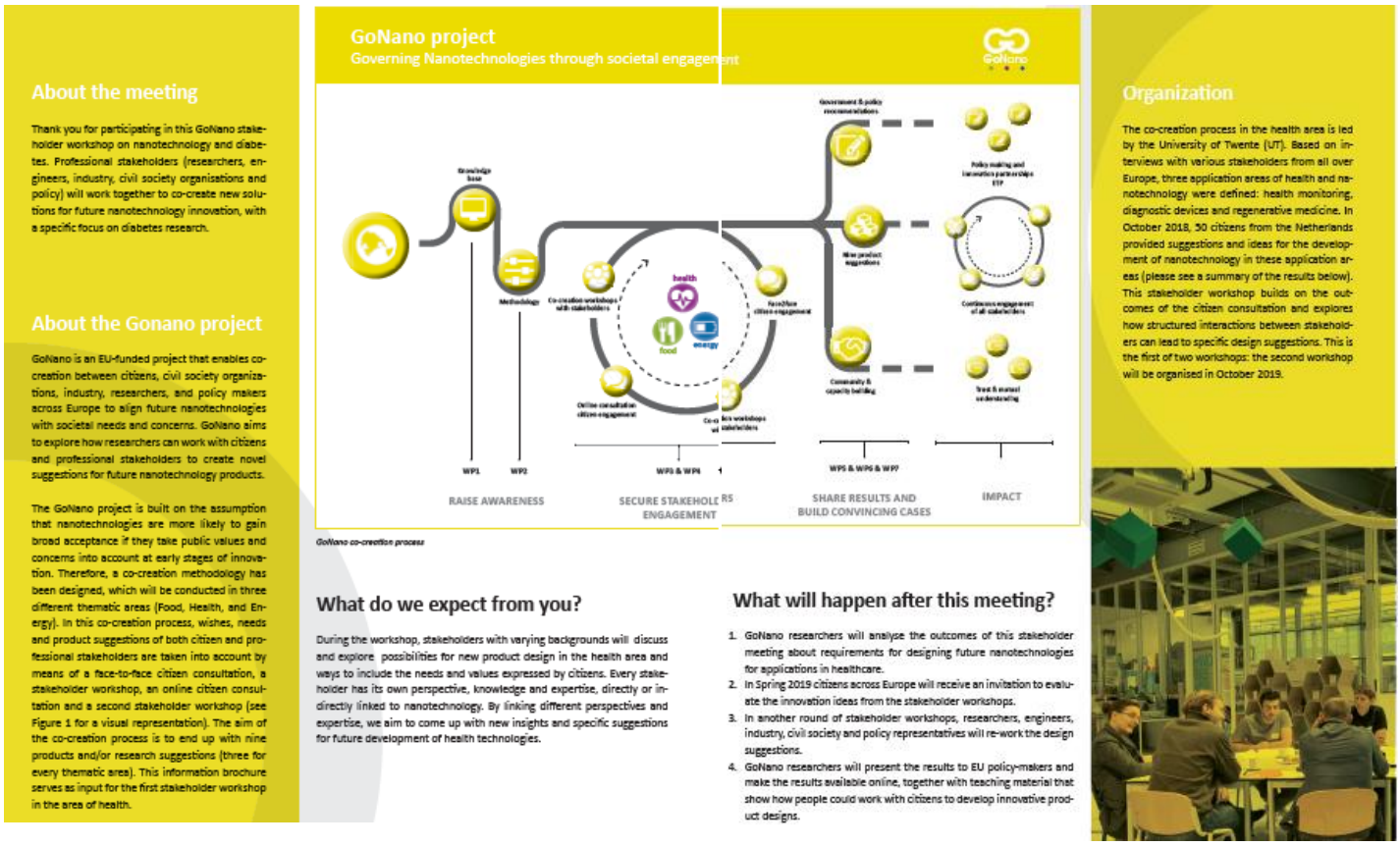
The three pilot partners also differed in the way they reported on the results of the citizens. Every pilot partner made a translation of these results into relevant input for stakeholders. Based on an inductive approach (Corbin and Strauss 2008), categories, labelled as social values, and subcategories, labelled as social needs, were distilled from the output of the citizen workshop. While in Spain the social values and social needs were published in the background material, in the Czech Republic social values, social needs, and specific examples were published, and in the Netherlands categories, social values, social needs, examples, as well as contradictions within the social needs were published. Decisions upon this section in the information material were made based on a trade-off between the time needed for stakeholders to read the information versus the extensiveness of information.

## 1.3 STRUCTURE OF THIS REPORT

In the following, the input and background of the different parts of the information materials are briefly introduced. In Chapter 2, the choices related to the explanation of GoNano, the co-creation process, and the stakeholder workshop are described. Chapter 3 explains the choices made on the explanation of nanotechnology, including application areas, and ethical, legal, social and regulatory issues. In Chapter 4, the results of the citizen workshop are introduced. In chapter 5 the programme of the workshop is explained. The English version of the background materials of the three pilot countries can be found in Annex 1. The information material for the workshop in Prague was translated in Czech, the translation can be found in Annex 2.

# 2 GoNano, co-creation, and the stakeholder workshop

Stakeholders that were invited to the stakeholder workshops received a personalized invitation in which the aims of GoNano and the purpose of engaging in the co-creation process was shortly explained. The information material provided further details on the aims of the GoNano project, an overview of the overall co-creation process, and what was expected of their contributions during the workshop on page 2 and 3 of the information material (please see figure 1). To make the GoNano co-creation process as transparent as possible, the infographic of the process was included, as well as the steps that will be taken after the stakeholder workshop. Furthermore, a short paragraph about the organizers of the workshops was included. This latter paragraph was adjusted to the pilot country.



## About the meeting

Thank you for participating in this GoNano stakeholder workshop on nanotechnology and diabetes. Professional stakeholders (researchers, engineers, industry, civil society organisations and policy) will work together to co-create new solutions for future nanotechnology innovation, with a specific focus on diabetes research.

## About the Gonano project

GoNano is an EU-funded project that enables co-creation between citizens, civil society organizations, industry, researchers, and policy makers across Europe to align future nanotechnologies with societal needs and concerns. GoNano aims to explore how researchers can work with citizens and professional stakeholders to create novel suggestions for future nanotechnology products.

The GoNano project is built on the assumption that nanotechnologies are more likely to gain broad acceptance if they take public values and concerns into account at early stages of innovation. Therefore, a co-creation methodology has been designed, which will be conducted in three different thematic areas (Food, Health, and Energy). In this co-creation process, wishes, needs and product suggestions of both citizen and professional stakeholders are taken into account by means of a face-to-face citizen consultation, a stakeholder workshop, an online citizen consultation and a second stakeholder workshop (see Figure 1 for a visual representation). The aim of the co-creation process is to end up with nine products and/or research suggestions (three for every thematic area). This information brochure serves as input for the first stakeholder workshop in the area of health.

## GoNano project

Governing Nanotechnologies through societal engagement



GoNano co-creation process

## What do we expect from you?

During the workshop, stakeholders with varying backgrounds will discuss and explore possibilities for new product design in the health area and ways to include the needs and values expressed by citizens. Every stakeholder has its own perspective, knowledge and expertise, directly or indirectly linked to nanotechnology. By linking different perspectives and expertise, we aim to come up with new insights and specific suggestions for future development of health technologies.

## What will happen after this meeting?

1. GoNano researchers will analyse the outcomes of this stakeholder meeting about requirements for designing future nanotechnologies for applications in healthcare.
2. In Spring 2019 citizens across Europe will receive an invitation to evaluate the innovation ideas from the stakeholder workshops.
3. In another round of stakeholder workshops, researchers, engineers, industry, civil society and policy representatives will re-work the design suggestions.
4. GoNano researchers will present the results to EU policy-makers and make the results available online, together with teaching material that show how people could work with citizens to develop innovative product designs.

## Organization

The co-creation process in the health area is led by the University of Twente (UT). Based on interviews with various stakeholders from all over Europe, three application areas of health and nanotechnology were defined: health monitoring, diagnostic devices and regenerative medicine. In October 2018, 30 citizens from the Netherlands provided suggestions and ideas for the development of nanotechnology in these application areas (please see a summary of the results below). This stakeholder workshop builds on the outcomes of the citizen consultation and explores how structured interactions between stakeholders can lead to specific design suggestions. This is the first of two workshops: the second workshop will be organised in October 2019.

*Figure 1 – Introduction to GoNano, organization and expectations (see Annex 1)*

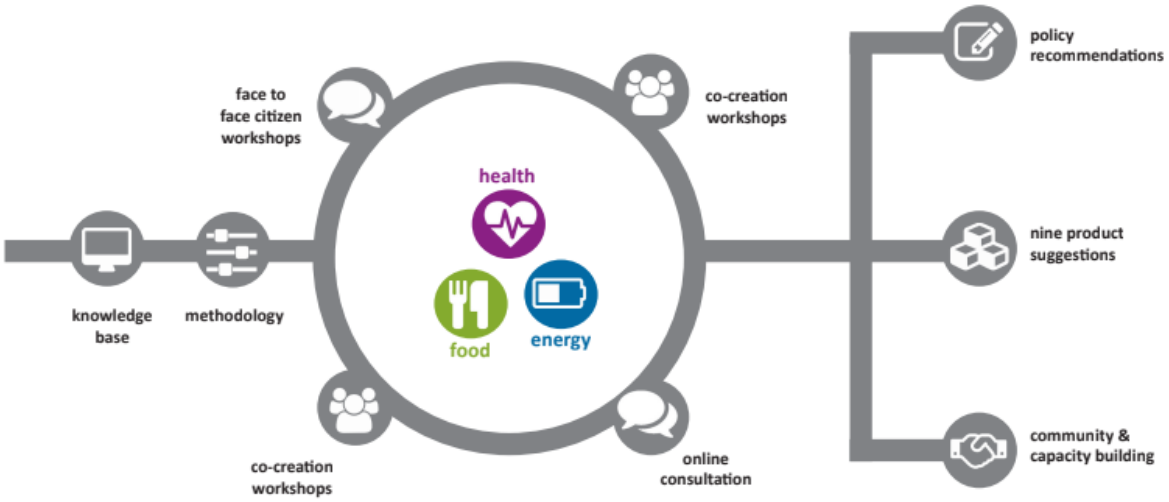



*Figure 2 – Visualization of the GoNano co-creation process (see Annex 1)*

# 3 NANOTECHNOLOGIES, APPLICATION AREAS, REGULATORY DEBATE

Stakeholders were invited based on their background in nanotechnology (e.g., researchers), the thematic areas of the pilot countries – Food, Energy, and Health (e.g., policy makers, industry), the application area (e.g., CSO, businesses), or all three subjects. Therefore, the level of knowledge on nanotechnology, its application areas, and regulatory issues varied among the stakeholders. Information about these topics was included in the background material, to make sure every participant would have a basic level of knowledge before participating in the workshop.

## 3.1 NANOTECHNOLOGIES AND APPLICATION AREAS

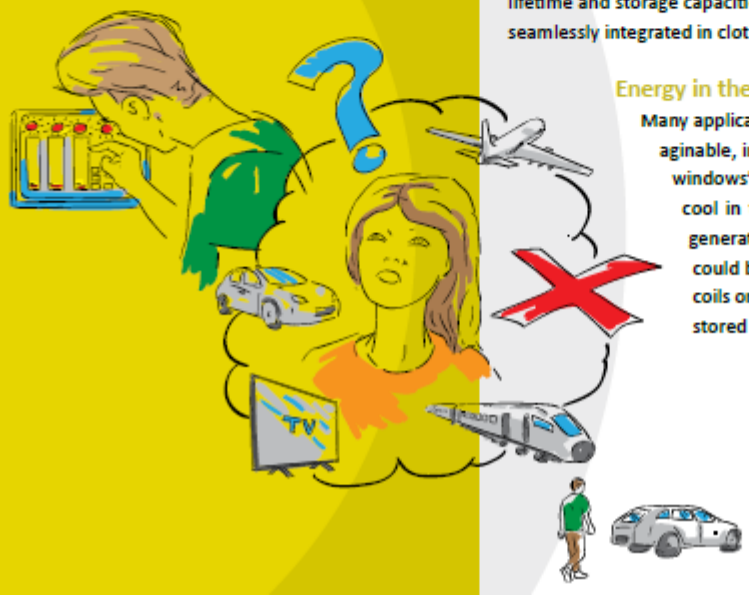
In the section about nanotechnology, the working principles and potential of the technology were explained (see Figure 3). The focus was mainly on a wide array of possibilities with nanotechnology in the thematic area. These possibilities were derived from the literature (Gehrke et al. 2015; Singh et al. 2017; Siegrist et al. 2007), from expert interviews (Pimponi et al. 2018), and from the report 'Re-finding industry' of the high-level strategy group on industrial technologies (European Commission, DG Research & Innovation 2018).

Furthermore, a specific description of three application areas was included (see Figure 3). These applications are the most promising in the thematic area (food, energy and health), and were already selected for the citizen workshop based on interviews with stakeholders (Pimponi et al. 2018). The description of the application areas was based on the text used for the information material of the citizen workshop (Bitsch et al. 2018), and included specific examples relevant to the stakeholders. In the Netherlands, for example, the application areas of monitoring devices for health, regenerative medicines, and diagnostic devices were explained and linked to the context of diabetes. To make the section more attractive, one of the visualizations that were made for the scenarios for the citizen workshop (Bitsch et al. 2018) and other visualization of the applications, were included in this section.

## Nanotechnologies and energy

Nanotechnology is the study, design, creation, manipulation and use of materials, devices or systems at extremely small scales of 1-100 nanometre (nm). By way of comparison, a human hair is approximately 80,000 - 100,000 nm wide.

At this scale, new and existing materials can be improved by altering their physical, chemical, electrical, mechanical, optical or magnetic properties. As an enabling technology, nanotechnology can potentially be applied in a wide range of areas, ranging from manufacturing to environmental remediation and from medicine to food production. In the area of energy, nanotechnologies are expected to provide solutions for energy production, heating and cooling, storage and transport. Key issues driving innovation in energy storage include the need for very quick charge, higher energy and power density as well as a longer life cycle and the possibility to recycle materials of storage systems. Nanomaterials such as carbon nanotubes, graphene, carbon nanofibers and carbon nanohorns could potentially lead to optimised batteries and supercapacitors (i.e. advanced capacitors that have higher energy storage capacity than conventional ones) by their high intrinsic conductivity and high energy intensity.




## Application areas

**Based on the outcomes of interviews with stakeholders across all over Europe conducted as part of the GoNano project, three important application areas of nanotechnology in energy were selected and discussed with citizens in the citizen consultation: green energy production, portable energy devices, and energy in the home.**

### Green energy production

In the field of photovoltaics, nanotechnology could help produce solar energy harvesting systems with higher energy conversion efficiency, for instance by tailoring the properties of the active photovoltaic layer to better match the solar spectrum. In the development of novel active layers, nanotechnology can allow a secondary lower/higher bandgap or partially recuperate higher-than-bandgap energies of photons before they thermalize to the bottom of the energy band.

A second field which shows much promise is wind energy, where weight reduction is one of the most important goals. The development of cost effective, new lightweight materials on the basis of nanocomposites, with excellent stiffness/weight ratio, will enable larger sized blades, thus allowing increasing the power and the energy produced at low/medium speeds. An example could be new bio-based materials for sandwich panels that can be used as core materials for blades.

### Portable energy devices

Nanotechnology could also enable energy production from wearable devices, for instance by harvesting human kinetic energy through nanofibers integrated in clothing. Nanotechnology could also enhance the efficiency, lifetime and storage capacities of batteries to the extent that they can be seamlessly integrated in clothing.

### Energy in the home

Many applications of nanotechnology in the home are imaginable, in addition to the use of solar panels. 'Smart windows' with a nano-coating would keep your house cool in the summer and warm in the winter – and generate electricity at the same time. This energy could be stored in the building, in wireless charging coils on the floor or in the furniture. It could even be stored for wireless charging of electronic devices.

*Figure 3 – Nanotechnologies and application areas (see Annex 1)*

## 3.2 REGULATORY DEBATE

In both the Cezch Republic and the Netherlands, a section about the regulatory debate was added to make sure that other stakeholders had some knoweledge about regulations regarding nanotechnology as well (see Figure 4). The description of the regulatory debate on nanotechnology was based on D5.1, and applied to the specific thematic area (food in Czech Republic, health in the Netherlands) (Bauer et al. 2018).

In the Spanish background material this section was not included, as the pilot partner expected that the stakeholders would not read the material if it would be too lengthy.

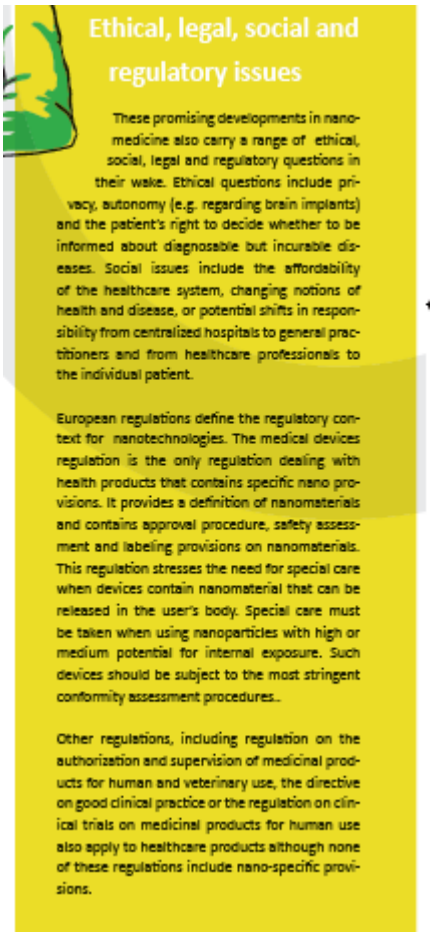



*Figure 4 – Regulatory debate (see Annex 1)*

# 4 OUTCOMES OF THE CITIZEN WORKSHOP

This section of the background material first explained the organization and the aim of the citizen workshop, followed by an explanation of the outcomes of the citizen workshop. The reporting on these outcomes was different in all three pilot countries, because the set-up of the stakeholder workshops, the length, and the types of stakeholders differed per country. The reason for this variation was because of differences in culture, thematic context, and wishes and needs of stakeholders. The paragraphs below describe how the three pilot countries translated the results of the citizen workshop (see Hebáková et al. 2019) into input for the stakeholder workshops.

## 4.1 THE NETHERLANDS

In the Netherlands, the citizen workshop was recorded, including all table discussions. These recordings were transcribed, and based on an inductive approach (Corbin and Strauss 2008), main categories, labelled as social values were distilled. Based on these categories the transcripts were coded, and frequently mentioned illustrative examples could be linked to the social values (defined as social needs). Furthermore, specific suggestions/requirements which were mentioned by the citizens were linked to the social values. In the background material every social value is shortly described, in combination with specific design suggestions/requirements linked to the social value (see Figure 5). After the categorization of all outcomes, the researcher defined various inconsistencies and or discrepancies within the needs and suggestions of citizens. These were grouped and defined as dilemmas (see Figure 5). During the workshop stakeholders were asked to respond to these dilemmas.

**Accessibility**

Participants were afraid that health technologies could polarize society in terms of rich vs. poor, digital skilled vs. non-digital skilled, and religious vs. non-religious. They posed their concerns, that a considerable group of people would not know how to use monitoring and diagnostic devices, and that the digital gap would influence accessibility to health technologies. Furthermore, regarding regenerative medicines, citizen emphasized that this could lead to a differentiation between religious and non-religious people. They made a comparison with vaccinations.

**Suggestions / requirements mentioned by the participants:**

- In case of expensive treatments, such as regenerative medicines, availability should be based on health criteria, not financial criteria (similar to donor organs);
- Don't let religious principle be leading in the development of health technologies, but always give freedom of choice;
- Focus on the user experience when designing the reading device of monitoring and diagnostic devices. Make sure that results are easy to understand, and not multi-interpretable;
- Educate and train people in how to use monitoring and diagnostic devices.

**Privacy and security of data**

Participants posed major concerns regarding the privacy and security of personal data that would be collected with monitoring and diagnostic devices. They were especially afraid that data would be available for health insurance companies. Participants were ambiguous about the role of the government in this regard. On the one hand, they thought the government should take the lead in the implementation and regulatory framework of monitoring and diagnostic devices. On the other hand, they thought these devices should be implemented by the market and they would feel less inclined to use a monitoring device when the government would actively encourage these to use.

**Suggestions / requirements mentioned by the participants:**

- Make sure that in the design of the device it is clear for users how to use their data / what happens with their data (in terms of collection, storage, and sharing);
- Include IT-specialists in the development of sensor technologies, and make sure data is collected and stored in a secure way;
- Anticipate in regulations on all data that might be available with monitoring and diagnostic devices;
- Be careful when communicating from a governmental perspective about these devices (similar with electronic medical record).

**Costs**

Participants emphasized in several discussions that it was important to take into account the costs of the healthcare system. They were ambiguous whether nanotechnology would limit the costs, or increase the costs. On the one hand, they saw possibilities with prevention of diseases instead of focusing on curing of diseases. Also they saw the potential of personalized medicines. On the other hand, they were afraid that processing all health data could lead to an increase of costs, and that people might become too much focused on their health (including misinterpretations of data). These monitoring and diagnostic technologies might lead to an increase of visits to the GP.

**Suggestions / requirements mentioned by the participants:**

- Make sure technologies are used in a way that they unburden the health professional, not give an extra burden to them;
- Make sure technologies complement the health professional, and not substitute the professional;
- Make monitoring and diagnostic devices only available for high-risk groups;
- Use technologies to educate and demonstrate people how lifestyle influences their health.

**Conclusion**

Based on the input of citizens several dilemmas can be detected to take into account when further developing health technologies:

- Autonomy and accessibility to health technologies vs. availability for high-risk groups
- Focus on prevention of diseases vs. limited use of monitoring/diagnostic devices
- Shift to prevention of diseases vs. autonomy of citizen to make use of a technology
- Easy understanding and usable interface vs. possibility to adjust setting and custom-made technology
- Ownership of data vs. inclusion of health professional in monitoring data
- Educate and inform citizens about health technologies (deficit model) vs. creating autonomy, empower citizens and including them in the design (RRI)

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*Figure 5 – Outcomes citizen workshop the Netherlands (see Annex I)*

## 4.2 Czech Republic

In the Czech Republic, a similar approach as in the Netherlands was adopted. Based on the report of the output of the citizen workshop (Hebáková et al. 2019), social values were distilled. Social needs were subsequently linked to these social values. These social needs are a specification of the social values, mentioned by citizens. The social values and social needs were linked to one, two or all three specific application area(s) to which they could be applied. Specific suggestions made by citizens were categorized and grouped based on these social values and needs. To create a clear overview, these categories were published in a table (see Figure 6). The suggestions, social needs and social values formed the input for the debate about the outcomes of the citizens during the stakeholder workshop.

| Social values | Technology | Social needs expressed in workshop | Suggestions made by citizens |
|---|---|---|---|
| Safety, sustainability | All applications | **Control and certification system, strict rules for producing and using nanotechnologies** | Legislation should be centered around the needs of the citizen. |
| Human health, recyclability | All applications | **Biological degradability** | Nanoproducts should guarantee that they would be biologically degradable. |
| Safety, Reliability, Openness, Transparency | All applications | **Guaranteed safety of nanotechnologies when it comes to nanoparticles and their possible accumulation in the food chain** | New products have to serve customers and they have to be non-threatening to health. |
| Sustainability, circular economy | All applications | **Mind the context in the development of the technologies** | |
| Sustainability | All, nanofilters | **A solution to the global climate change** | The state should support nanofilters, also in the Third World. |
| Sustainability, affordability, wellbeing | Nanofilters | **Clean and affordable water (both in households and in the third world as well)** | Researchers should invent new methods to clean water and guarantee its abundance.<br>The media should inform transparently about both pros and cons. |
| Safety, Reliability | Smart food packages | **Food protection against bacteria and against the negative effects of the environment** | |
| Reliability | Smart food packages | **Prolonged shelf life of the food** | Researchers and producers: make packages that can preserve food for a long time. |
| Sustainability, responsibility | Smart food packages | **Substitute for plastics and other non-ecological packaging systems** | They could contribute to a more effective food production system that would be less demanding on the environment, and also that they would e.g. enable food to be transported over longer distance. |

*Figure 6 – Outcomes citizen workshop Czech Republic (see Annex I)*

## 4.3 SPAIN

In Spain, social values and social needs were distilled from the outcomes of the citizen workshop (see Hebáková et al. 2019). They were not specifically linked to each other as was done in the Netherlands and Czech Republic. Furthermore, the four most popular ideal technologies that were created by the citizens during the workshop were published in the background information material for the stakeholders (see Figure 7). Stakeholders debated these values, needs and ideal technologies.

### Outcomes of the citizen workshop

On 26 October 2018, citizens from around Barcelona gathered at RMIT University's European office to discuss the future of nanotechnology in energy. The workshop was divided in three rounds: during the first round, citizens gave their views on the use of nanotech–nologies in energy applications by discussing future scenarios based on the themes of green energy production, portable energy devices, and energy in the home. Subsequently, citizens designed their own ideal energy products and scenarios. In the final round, citizens wrote specific messages to stakeholders.

Based on the citizens' outputs from each of these sessions, various overarching concepts were deduced and are expressed below as social values and needs. The original citizens' outputs and a description of the workshop and methodologies can be found in the full briefing report, available at www.gonano-project.eu/


#### Social values

i.e. a universal idea of what is right (or wrong) and important to society:

- Respect the environment
- Practice sustainable development
- Promote sustainable development
- Promote research into new technologies
- High standards of health and safety
- Reduced energy use
- Increased energy efficiency
- More autonomy and control over personal energy use
- More energy from renewable sources
- Inclusive/accessible to all (practical language)
- Inclusive/accessible to all (reasonable cost)
- Better quality of life
- More co-creation, more engagement with citizens

#### Social needs

i.e. a specific societal problem that requires a particular response:

- Legislative support of green policies
- Public investment in new technologies
- Private investment in new technologies
- Educate the public on nanotechnology
- Educate the public on green energy
- Implement better recycling plans and sustainable product life cycles
- Eradicate or minimise the use of materials that cause or support conflicts
- Introduce simpler pricing formats for energy use
- More transparency in research and innovation activities

During the stakeholder workshop, you will be asked to add your own needs and values to those above, and to select the ones you think are most important for the development of nanotechnologies for energy applications – in general and in your own professional activities.

When given the freedom to create their own ideal energy products, citizens converged on a number of application areas where they think advances in nanotechnology can play a role. These application areas should therefore be of particular interest to technology developers because they have already achieved high levels of public awareness and acceptance.

1. Capturing and converting energy (solar and kinetic) to electrical energy for storage and use
2. Different ways of adapting structures around the home to make use of renewable energy. E.g. building integrated photovoltaics
3. Home climate systems that control the atmosphere around the home and also inform inhabitants of usage in simple terms
4. Smart home appliances and operating systems

Technologies or products that are more sustainable and do not adversely affect health or the environment

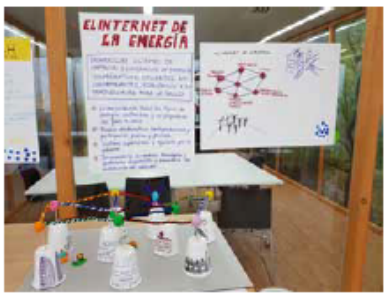


*Figure 7 – Outcomes citizen workshop Spain (see Annex I)*

# 5 PROGRAM AND METHODOLOGY

Four pillars of co-creation were defined, based on the GoNano co-creation methodology (see Bechtold et al. 2018) and the literature on co-creation and design thinking (e.g. Yoo et al. 2013): exploration, ideation, prototyping, and reflection. These four pillars formed the basis of the of the stakeholder workshop programme (please see the proposed programme in Annex III).

The programme and an explanation of the methodology were included in the background material (see Figure 8), to make the process as transparent as possible. Furthermore, the specified programme illustrated what is at stake, and provided the possibility for stakeholders to come well-prepared to the workshop, leading to a more specific discussion during the workshop. These considerations are in line with recommendations for effective public engagement activities as defined by Shelley-Egan et al. (2018).


*Figure 8 – Programme and methodology (see Annex I)*

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# ANNEX I – INFORMATION MATERIAL IN ENGLISH

# GoNano Stakeholder Workshop about nanotechnology and diabetes

## Information material

**Date**
12 February, 2019
11:00 – 15:00h
University of Twente, Designlab
Enschede

**Organizers**
A.M. Dijkstra, a.m.dijkstra@utwente.nl
S.R. Jansma, s.r.jansma@utwente.nl

UNIVERSITY OF TWENTE.

## About the meeting

Thank you for participating in this GoNano stakeholder workshop on nanotechnology and diabetes. Professional stakeholders (researchers, engineers, industry, civil society organisations and policy) will work together to co-create new solutions for future nanotechnology innovation, with a specific focus on diabetes research.

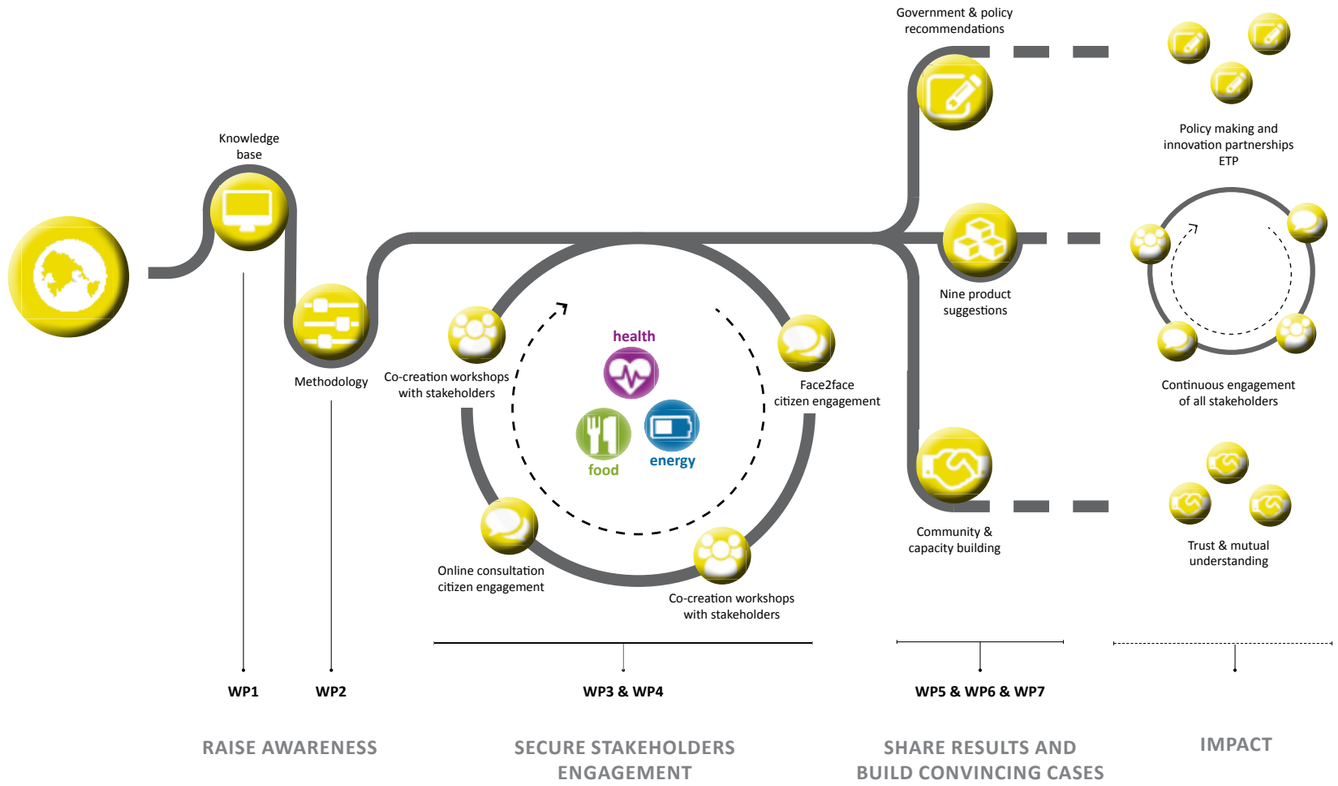
## About the Gonano project

GoNano is an EU-funded project that enables co-creation between citizens, civil society organizations, industry, researchers, and policy makers across Europe to align future nanotechnologies with societal needs and concerns. GoNano aims to explore how researchers can work with citizens and professional stakeholders to create novel suggestions for future nanotechnology products.

The GoNano project is built on the assumption that nanotechnologies are more likely to gain broad acceptance if they take public values and concerns into account at early stages of innovation. Therefore, a co-creation methodology has been designed, which will be conducted in three different thematic areas (Food, Health, and Energy). In this co-creation process, wishes, needs and product suggestions of both citizen and professional stakeholders are taken into account by means of a face-to-face citizen consultation, a stakeholder workshop, an online citizen consultation and a second stakeholder workshop (see Figure 1 for a visual representation). The aim of the co-creation process is to end up with nine products and/or research suggestions (three for every thematic area). This information brochure serves as input for the first stakeholder workshop in the area of health.

## GoNano project

Governing Nanotechnologies through societal engagement




*GoNano co-creation process*

## What do we expect from you?

During the workshop, stakeholders with varying backgrounds will discuss and explore possibilities for new product design in the health area and ways to include the needs and values expressed by citizens. Every stakeholder has its own perspective, knowledge and expertise, directly or indirectly linked to nanotechnology. By linking different perspectives and expertise, we aim to come up with new insights and specific suggestions for future development of health technologies.

## What will happen after this meeting?

1. GoNano researchers will analyse the outcomes of this stakeholder meeting about requirements for designing future nanotechnologies for applications in healthcare.
2. In Spring 2019 citizens across Europe will receive an invitation to evaluate the innovation ideas from the stakeholder workshops.
3. In another round of stakeholder workshops, researchers, engineers, industry, civil society and policy representatives will re-work the design suggestions.
4. GoNano researchers will present the results to EU policy-makers and make the results available online, together with teaching material that show how people could work with citizens to develop innovative product designs.





## Organization

The co-creation process in the health area is led by the University of Twente (UT). Based on interviews with various stakeholders from all over Europe, three application areas of health and nanotechnology were defined: health monitoring, diagnostic devices and regenerative medicine. In October 2018, 50 citizens from the Netherlands provided suggestions and ideas for the development of nanotechnology in these application areas (please see a summary of the results below). This stakeholder workshop builds on the outcomes of the citizen consultation and explores how structured interactions between stakeholders can lead to specific design suggestions. This is the first of two workshops: the second workshop will be organised in October 2019.

## Nanotechnologies and health

Nanotechnology is the study, design, creation, manipulation and use of materials, devices or systems at extremely small scales of 1-100 nanometer (nm). By way of comparison, a human hair is approximately 80,000 - 100,000 nm wide.

By working on such a small scale properties of existing materials can be manipulated and improved, or new materials with novel properties can be designed. These properties can be physical, chemical, electrical, mechanical optical or magnetic. Nanotechnology offers great promises for solutions on environmental, health and food challenges. In the area of health it is applied for detection of symptoms, monitoring, tissue regeneration, drug delivery and imaging. Various nanomaterials and structures are used, such as:

- Nanomaterials to make smart skin patches for wound healing;
- Nano-encapsulation for targeted delivery of drugs;
- Nanoparticles used as contrast agents improving MRI signals, or as drug delivery systems;
- Nanosensors enabling non-invasive measurements of large number of parameters, e.g. biomarkers from urine or breath;
- Nano-bio and synthetic technologies enabling regenerative medicines.

Based on these nanosystems and structures, which all are labelled as 'nanotechnologies', various potential applications are developed in the health area.

## Application areas

Interviews with various stakeholders conducted across Europe as part of the GoNano project, highlighted three important application areas for nanotechnology in health: monitoring devices for health, early-diagnostic devices and regenerative medicines.

### Monitoring devices for health

Nanosensors may help to create better insight in an individual's health status by measuring health values. Proponents of this technology expect that through the collection of health data, nanosensor might be promising for leading to a shift in the healthcare system from curing diseases to preventive healthcare. In the context of diabetes, nanosensors could increase the awareness of the consequences of an unhealthy lifestyle. For diabetes patients, nanosensors could make life easier by continuously monitoring their glucose levels. The devices could be designed in such a way that patients are automatically warned when their glucose levels are off, and that insulin get injected without the patient even noticing. Researchers or working on improving sensor technology in a way that it becomes smaller, and therefore more wearable, and in a way that it become more reliable and can even measure insulin levels.

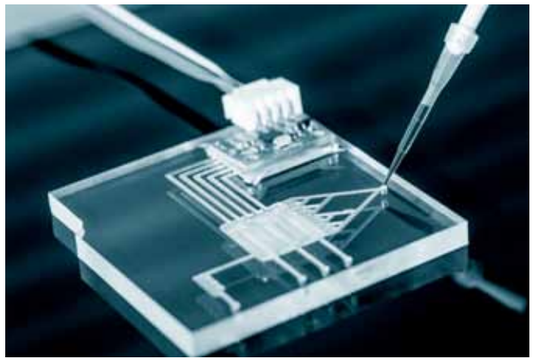
### Diagnostic devices

This area typically includes analytical systems for both in vitro and in vivo Devices for early diagnosis typically include the development of integrated multifunctional devices allowing for fast and cheap medical diagnostics. Based on nanotechnology, devices are being developed that can measure biomarkers in blood, urine or breadth in a cheap, fast and sensitive way. Devices are now being developed to be implemented in hospitals, but might be available for citizens in the future. In the context of diabetes, a lab-on-a-chip device could be developed to allow people to diagnose for diabetes (both type 1 and 2) at home.



### Regenerative medicine

Regenerative medicine focuses on the development of systems able to replace lost or impaired body functions such as engineering of artificial skin tissue, cartilage and bones for autologous implantation. Regenerative medicine also explores biocompatibility of implants through the development of efficient strategies based on nano technology to disrupt and prevent biofilm formation associated with a number of infectious diseases and implant-associated infections as well as through nano-functionalization of surfaces and intelligent, non-toxic, biodegradable or bioactive materials. In the context of diabetes type 1, researchers of RegMedXB are working on a proof-of-concept to regenerate insulin-producing β-cells in the islets of Langerhans of the pancreas.



## Ethical, legal, social and regulatory issues

These promising developments in nanomedicine also carry a range of ethical, social, legal and regulatory questions in their wake. Ethical questions include privacy, autonomy (e.g. regarding brain implants) and the patient's right to decide whether to be informed about diagnosable but incurable diseases. Social issues include the affordability of the healthcare system, changing notions of health and disease, or potential shifts in responsibility from centralized hospitals to general practitioners and from healthcare professionals to the individual patient.

European regulations define the regulatory context for nanotechnologies. The medical devices regulation is the only regulation dealing with health products that contains specific nano provisions. It provides a definition of nanomaterials and contains approval procedure, safety assessment and labeling provisions on nanomaterials. This regulation stresses the need for special care when devices contain nanomaterial that can be released in the user's body. Special care must be taken when using nanoparticles with high or medium potential for internal exposure. Such devices should be subject to the most stringent conformity assessment procedures..

Other regulations, including regulation on the authorization and supervision of medicinal products for human and veterinary use, the directive on good clinical practice or the regulation on clinical trials on medicinal products for human use also apply to healthcare products although none of these regulations include nano-specific provisions.

# Outcomes of the citizen workshop

On 24 November 2018, 50 citizens from all over the Netherlands gathered at the Designlab at the University of Twente to discuss the future of nanotechnology in healthcare. The session was divided in three rounds: 1) citizens gave their views on the use of nanotechnologies in healthcare by discussing different scenarios that included health monitoring, diagnostic devices and regenerative medicine, 2)citizens designed their ideal health technology, and 3) citizens came up with specific messages to stakeholders.

Based on the output of the citizens, various overarching concepts could be detected, including: safety, well-being, autonomy, accessibility, privacy and security of data, and costs. These concepts will be shortly described by giving a summary of the comments citizens made and linking design suggestions to them which were mentioned by the citizens during the workshop.

## Safety

Participants questioned whether some invasive technologies (e.g., implanted nano-chips) might be harmful or not. However, they emphasized that it was not a deal-breaker, in when these technologies could improvement treatment of diseases. This was also the case with regenerative medicines: participants had doubts about its safety as they were not familiar with the effects and working principles of the technology, but in general they could see the benefits of it.

**Suggestion/requirements mentioned by the participants:**

- Inform and educate people about working principles of nanotechnology and its potential risks;
- If possible, try come up with a non-invasive alternative.

## Well-being

Participants were positive about the potential for preventive healthcare with monitoring technologies. However, they emphasized that they did not find it an attractive idea to be constantly aware of health indicators in case of monitoring devices and or diagnostic devices. Also, they had concerns regarding the interpretation of data when these devices were used by citizens without a health professional, and how citizens could deal with a margin of error. Furthermore, participants emphasized that being aware of having a risk of getting a particular disease or being diagnosed with a disease in an early stage could negatively influence mental well-being, especially, when there is no treatment available.


**Suggestions/requirements mentioned by the participants:**

- Try to make a shift to prevention of diseases instead of focusing on curing of diseases in the healthcare system;
- Only give a signal when an anomaly is detected (monitoring devices);
- Connect the sensor technology to a device that is being monitored by a health professional or make sure that people use a (diagnostic or monitoring) device under supervision of a health professional;
- Only make early diagnostic tests and monitoring devices available for high-risk groups;
- Don't try to monitor and detect as many diseases as possible, but always keep human's well-being in mind.
- Limit the accessibility of home-test devices;
- Educate and inform people about how to use the devices, and how to interpret the data.

## Autonomy

Participants strongly felt that they should be able to decide themselves which diseases are being monitored or diagnosed for. They also were very clear that they wish to have autonomy over their health data in terms of collection, storage and sharing. Furthermore, participants emphasized that there should always be freedom of choice in whether to use a technology or not.

**Suggestions/requirements mentioned by the participants:**

- When designing a monitoring device, make sure that people can adjust the settings in the indicators that are being measured and the type of data that is being shown (e.g., set the margin of error, define signalling references, etc.);
- Make sure that regarding diagnostic devices that citizens can decide what types of diseases is being tested for;
- Make sure that it in the design of the device it is clear for users how to use their data / what happens with the data (in terms of collection, storage, and sharing);
- Learn from the lessons of the electronic medical record, and give citizens the choice whether they want to share their data with a health professional or not, but let hem always be the owner of the data;
- Never make a health technology obligatory to use.



## Accessibility

Participants were afraid that health technologies could polarize society in terms of rich vs. poor, digital skilled vs. non-digital skilled, and religious vs. non-religious. They posed their concerns, that a considerable group of people would not know how to use monitoring and diagnostic devices, and that the digital gap would influence accessibility to health technologies. Furthermore, regarding regenerative medicines, citizen emphasized that this could lead to a differentiation between religious and non-religious people. They made a comparison with vaccinations.

**Suggestions / requirements mentioned by the participants:**

- In case of expensive treatments, such as regenerative medicines, availability should be based on health criteria, not financial criteria (similar to donor organs);
- Don't let religious principle be leading in the development of health technologies, but always give freedom of choice;
- Focus on the user experience when designing the reading device of monitoring and diagnostic devices. Make sure that results are easy to understand, and not multi-interpretable;
- Educate and train people in how to use monitoring and diagnostic devices.

## Privacy and security of data

Participants posed major concerns regarding the privacy and security of personal data that would be collected with monitoring and diagnostic devices. They were especially afraid that data would be available for health insurance companies. Participants were ambiguous about the role of the government in this regard. On the one hand, they thought the government should take the lead in the implementation and regulatory framework of monitoring and diagnostic devices. On the other hand, they thought these devices should be implemented by the market and they would feel less inclined to use a monitoring device when the government would actively encourage these to use.

**Suggestions / requirements mentioned by the participants:**

- Make sure that in the design of the device it is clear for users how to use their data / what happens with their data (in terms of collection, storage, and sharing);
- Include IT-specialists in the development of sensor technologies, and make sure data is collected and stored in a secure way;
- Anticipate in regulations on all data that might be available with monitoring and diagnostic devices;
- Be careful when communicating from a governmental perspective about these devices (similar with electronic medical record).



## Costs

Participants emphasized in several discussions that it was important to take into account the costs of the healthcare system. They were ambiguous whether nanotechnology would limit the costs, or increase the costs. On the one hand, they saw possibilities with prevention of diseases instead of focusing on curing of diseases. Also they saw the potential of personalized medicines. On the other hand, they were afraid that processing all health data could lead to an increase of costs, and that people might become too much focused on their health (including misinterpretations of data). These monitoring and diagnostic technologies might lead to an increase of visits to the GP.

**Suggestions / requirements mentioned by the participants:**

- Make sure technologies are used in a way that they unburden the health professional, not give an extra burden to them;
- Make sure technologies complement the health professional, and not substitute the professional;
- Make monitoring and diagnostic devices only available for high-risk groups;
- Use technologies to educate and demonstrate people how lifestyle influences their health.

## Conclusion

Based on the input of citizens several dilemmas can be detected to take into account when further developing health technologies:

- Autonomy and accessibility to health technologies vs. availability for high-risk groups
- Focus on prevention of diseases vs. limited use of monitoring/diagnostic devices
- Shift to prevention of diseases vs. autonomy of citizen to make use of a technology
- Easy understanding and usable interface vs. possibility to adjust setting and custom-made technology
- Ownership of data vs. inclusion of health professional in monitoring data
- Educate and inform citizens about health technologies (deficit model) vs. creating autonomy, empower citizens and including them in the design (RRI)

# Timetable

Stakeholder workshop

| | |
|---|---|
| 10:30 – 11:00 | Registration, coffee |
| 11:00 – 11:15 | Welcome |

## EXPLORATION

| | |
|---|---|
| 11:15 – 11:30 | Introduction + motives participants |
| 11:30 – 11:45 | 3 pitches of participants<br>- Sensor technologies for diabetes<br>- Early diagnostics of diabetes<br>- Artificial pancreas |

## IDEATION

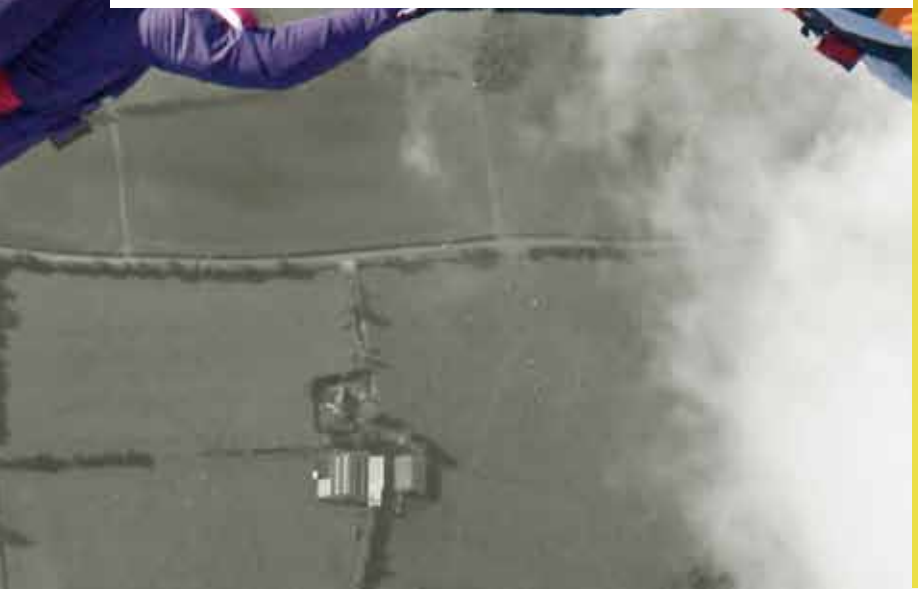
| | |
|---|---|
| 11.45 – 12.10 | Results and debate citizen consultation |
| 12.10 – 12.30 | Impact citizen consultation on own work |

| | |
|---|---|
| 12.30 – 13.15 | Lunch, networking |

## PROTOTYPING / REFLECTION

| | |
|---|---|
| 13:15 – 14:15 | Concrete design suggestions for product/ technology |
| 14:15 – 14:45 | Presentation storyboards + reflection |

| | |
|---|---|
| 14.45 – 15.00 | Closure |



# Methodology

The programme is based on the four pillars of co-creation:

**Exploration**, where participants get to know each other and their work and explore the wishes, needs and values and messages expressed by the citizens as well as their own needs and interests.

**Ideation**, where participants imagine and co-create responses to the wishes, needs and values and messages expressed by the citizens by imagining revisions/adaptations of ongoing research and innovation trajectories, building on the varied expertise around the table.

**Prototyping**, where participants generate a storyboard that visualizes how the resulting research lines and product suggestions are modified in relation to the wishes, needs and values and messages expressed by the citizens and suggests concrete actions to be taken by the stakeholders present to realise this vision.

**Reflection**, where participants present and reframe their storyboards, reflect on the ways in which the citizen's needs have shaped the storyboards, identify actions to be taken in preparation for the next workshop and reflect back on the overall workshop objectives.

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GoNano is a Coordination and Support Action funded by the European Union under the NMBP Programme of Horizon 2020, Grant Agreement n° 768622.

GoNano potraviny

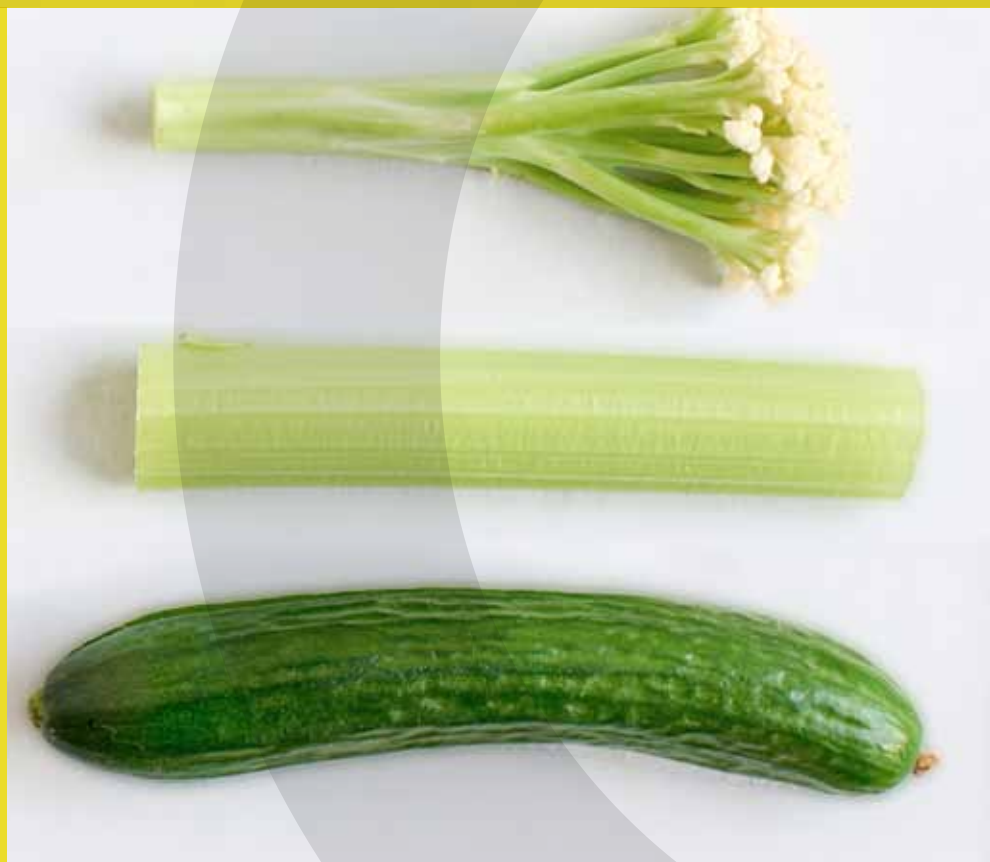
# GoNano stakeholder workshop: Future food and nanotechnologies

## information material

28 February 2019
9:30 – 17:00
Technology Centre CAS

Lenka Hebakova: hebakova@tc.cz
Marek Pour: pour@tc.cz
Iva Vancurova: vancurova@tc.cz

TECHNOLOGICKÉ CENTRUM AV ČR



## About the meeting

This workshop on future food and nanotechnologies is part of a series of events and activities organised under the EU project GoNano, which aims to achieve better alignment between the multiple stakeholders involved in nanotechnology research and innovation.
In this workshop, researchers, engineers, industry, civil society organisations and policy makers will work together to co-create new design requirements for future applications of nanotechnology in the food area.

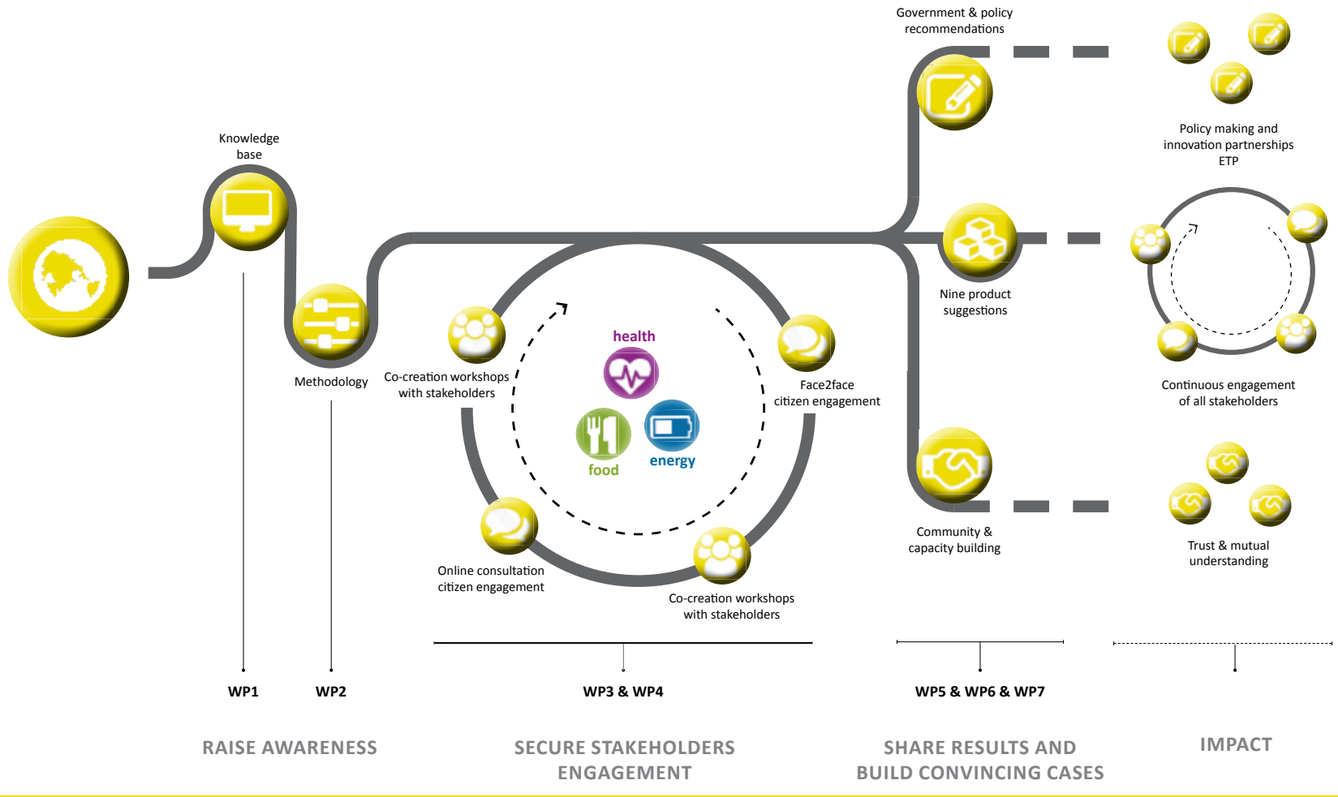
## About the GoNano project

GoNano is an EU-funded project that enables a process of co-creation between citizens, civil society organizations, industry, researchers, and policy makers across Europe to align future nanotechnologies with societal needs and concerns. GoNano aims to demonstrate how researchers can work with publics and professional stakeholders to create novel suggestions for future nanotechnology products.

The GoNano project is built on the assumption that nanotechnologies are more likely to gain broad acceptance if they take public values and concerns into account at early stages of innovation. To test this assumption, a co-creation methodology will be explored in three different application areas of nanotechnology (Food, Health, and Energy). In this co-creation process, wishes, needs and product suggestions of both citizen and professional stakeholders are taken into account by means of a face-to-face citizen consultation, a stakeholder workshop, an online citizen consultation, and a second stakeholder workshop (see Figure 1 for a visual representation). The aim of the co-creation process is to end up with nine product and/or research suggestions (three for every thematic area).

## GoNano project

Governing Nanotechnologies through societal engagement




*GoNano co-creation process*

## What do we expect from you?

A varied group of stakeholders will explore possibilities for new product designs in the three different areas, building on the social needs and values identified in earlier stages of the project. Every stakeholder has its own perspective and knowledge and expertise, either directly or indirectly linked to nanotechnology. By linking different perspectives and expertise, we aim to develop new insights and specific suggestions for future development of food technologies. TC CAS will be the facilitator of the workshop, and all stakeholders are active participants in the co-creation process.

## What will happen after this meeting?

1. GoNano researchers will analyse the outcomes of this stakeholder meeting about requirements for designing future nanotechnologies for food applications.
2. In Spring 2019, citizens across Europe will receive an invitation to evaluate the innovation ideas from the expert workshops.
3. In another round of expert workshops, researchers, engineers, industry, civil society and policy representatives, will re-work the design suggestions.
4. GoNano researchers will present the results to EU policy makers, and make the results available online, together with teaching material that show how people could work with citizens to develop innovative product designs.

## Organization

The co-creation process in the food area is led by the Technology Centre of the Czech Academy of Sciences (TC CAS). Based on interviews with various stakeholders from all over Europe, three thematic areas of nanotechnology and food were defined: food packaging, novel foods, and nanofilters. In October 2018, 48 citizens from the Czech Republic were asked to provide suggestions and ideas for the development of nanotechnology in these application areas. This information material contains a summary of the results. The stakeholder workshop builds on the outcomes of the citizen consultation and explores how structured interactions between stakeholders can lead to specific design suggestions. This is the first of two workshops: the second workshop will be organised in October 2019. It will follow up on the design suggestions and subsequent online consultations with citizens.

## Nanotechnologies and food

Nanotechnology is the application of technology at the nanoscale, which ranges from 1 to 100 nanometres. By way of comparison, a human hair is approximately 80,000-100,000 nanometres wide. The study, use and manipulation of materials at this scale enables the design of new and existing materials with novel physical, chemical, electrical, mechanical optical or magnetic properties. Nanotechnology is an enabling technology: its tools and methods can be applied across a range of scientific and engineering disciplines such as chemistry, biology, physics, medicine and materials science.

Nanotechnology offers potential solutions for environmental, health and food challenges. In the area of food it is applied in processing, preservation, packaging, handling and storage of food. Various nanomaterials and structures are utilized for these applications, including: Based on these nano-systems and structures, which are all labelled as 'nanotechnologies', various applications are being developed. Direct use of nanotechnology in food refers to the incorporation of substances in food, and must also be declared as such. Examples are colour improvement, fragrances, anti-oxidants, preservatives, and biologically active components (such as vitamins and omega-3). Another category of direct use of nanotechnology in food is synthetic food such as the production of artificial meat through growing tissue or by the use of stem cells. Indirect use of nanotechnology comprises the use of nanostructured materials in packaging technology and sensors.

## Application areas

**Based on the outcomes of interviews with stakeholders across Europe conducted as part of the GoNano project, three important application areas of nanotechnology in food were selected and discussed with citizens in the citizen consultation: food packaging, novel foods, and nanofiltration.**

### Food packaging

Much is expected of nanotechnologies in the context of sustainable packaging systems. Nanomaterials could contribute to reducing the amount of material needed and prolonging the shelf life of food products. The use of micro, nano, and smart bio-materials is expected to provide packaging systems with superior performance and reduced environmental impact. Possible applications include biodegradable packaging, transparent polymers and packaging with improved gas-barrier properties.

Smart packaging solutions, i.e. packaging that provides information about the quality of the contained food, could be realized using nano-sensors. Similarly, nanocoatings could improve mechanical, thermal, electrical, barrier and chemical properties. It could serve to make food packaging self-healing, self-cleaning, high-gloss, anti-scratching, super hydrophobic, corrosion-resistant, anti-fouling, stain-resistant, anti-odour, anti-microbial, conducting or water-repellent.

Reducing the degradation of food by smart packaging may reduce the environmental impact of packaged foods, but concerns have been raised about potential migration of nanoparticles from the packaging material to the food, resulting in possible contamination.




### Novel foods

Nanoscale approaches might also yield new insights into the structure of ingredients, for example to improve food processing systems used to fractionate raw materials into functional ingredient classes. The possibility to have minimally processed, highly functional ingredients could reduce the use of additives and processing aids. Nano-encapsulation through nanomicelles allow ingredients with specific nutritional properties to be incorporated in specific matrix phases, and could be building blocks for new 'functional foods': novel ingredients/novel foods with specific functionalities, such as increasing the content of healthy substances (e.g. vitamins, carotene), changing specific properties (e.g. reducing allergy risks), enable targeted delivery/release of nutrients.

### Nanofiltration

Worldwide population growth and climate change require innovative water treatment technologies in order to ensure the supply of clean water. Nanotechnology offers the potential of long-term solutions to increase energy efficiency and lower costs, through the adaptation of advanced filtration materials that enable greater water quality and reuse. Nanoadsorbents and nanotechnology-enabled membranes offer great potential to be used on a large scale, based on their stages in research and development, commercial availability, costs of nanomaterials involved and compatibility with existing infrastructure.

Even though nanotechnology offers great potential for water treatment, there are potential drawbacks, too. Major practical challenges are the cost of nanostructured materials along with the difficulty of scaling up nano-based treatment processes for commercial use. In addition, health and safety issues around the use of nanomaterials have to be addressed in the domestic water industry, particularly with respect to the direct application of nanoparticles into the receiving natural bodies of water. Nanofunctionalized materials may carry unforeseen risks as nanoparticles might leach into the environment where they can accumulate over long periods of time.



## Regulatory debate

The agro-food industry is highly regulated with particular focus on food safety and quality. Several EU regulations related to food safety include provisions addressing nanomaterials.

**Novel Food regulation:** The Novel Food Regulation lays down rules for the placing of novel foods on the market within the Union. Use of engineered nanomaterials is considered as producing a novel food and therefore subject to the novel food regulation.

**Food additives regulation:** This regulation mandates the European Food Safety Agency (EFSA) to carry out a new evaluation of additives previously authorised but whose particle size has been modified by the use of nanotechnologies. EFSA adopted new guidelines for the evaluation of food additives in 2012 that provide specific information for the characterisation of nanomaterials.

**Plastic food contact materials regulation:** This regulation provides for a case-by-case assessment of substances in the nanoform (which are not specifically defined). The regulation further provides that substances in the nanoform shall only be used if explicitly authorised and mentioned in the specifications in Annex 1 of the regulation.

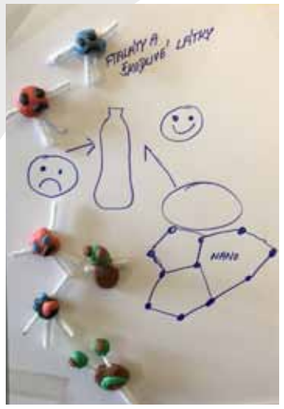
**Active and intelligent food contact materials regulation:** This regulation includes an approval procedure and safety assessment provisions and also provides for a case by case assessment of substances in the nanoform.

**Provision of food information to consumers' regulation:** This regulation provides for a specific definition of nanomaterials and a labelling requirement for all ingredients, including food additives, present in food products in their nanoform. Labelling consist of adding the word "nano" next to the name of the ingredient in the ingredients' list.

# Outcomes of the citizen workshop

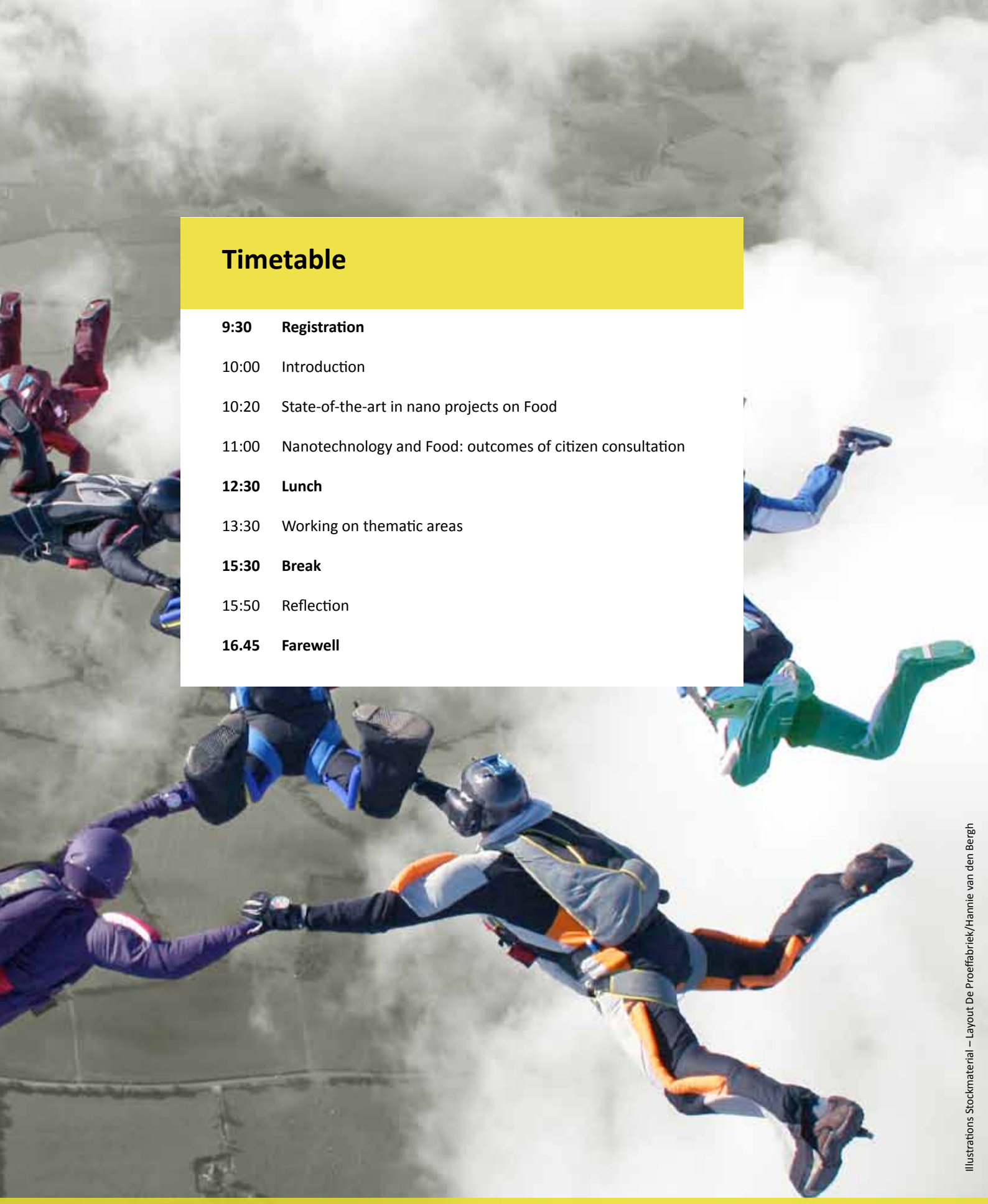
On 20 October 2018, 48 citizens from across the Czech Republic from various backgrounds (age, education, professions) gathered to discuss the future of nanotechnologies in three food application areas:
1) Smart food packages
2) Nanofilters
3) Novel foods

Participants discussed possible future scenarios to formulate their wishes and concerns related to the future applications, and to formulate messages to the key stakeholders which will eventually produce and work on these applications in nanotechnologies.

| Social values | Technology | Social needs expressed in workshop | Suggestions made by citizens |
|---|---|---|---|
| Safety, sustainability | All applications | **Control and certification system, strict rules for producing and using nanotechnologies** | Legislation should be centered around the needs of the citizen. |
| Human health, recyclability | All applications | **Biological degradability** | Nanoproducts should guarantee that they would be biologically degradable. |
| Safety, Reliability, Openness, Transparency | All applications | **Guaranteed safety of nanotechnologies when it comes to nanoparticles and their possible accumulation in the food chain** | New products have to serve customers and they have to be non-threatening to health. |
| Sustainability, circular economy | All applications | **Mind the context in the development of the technologies** | |
| Sustainability | All, nanofilters | **A solution to the global climate change** | The state should support nanofilters, also in the Third World. |
| Sustainability, affordability, wellbeing | Nanofilters | **Clean and affordable water (both in households and in the third world as well)** | Researchers should invent new methods to clean water and guarantee its abundance. |
| | | | The media should inform transparently about both pros and cons. |
| Safety, Reliability | Smart food packages | **Food protection against bacteria and against the negative effects of the environment** | |
| Reliability | Smart food packages | **Prolonged shelf life of the food** | Researchers and producers: make packages that can preserve food for a long time. |
| Sustainability, responsibility | Smart food packages | **Substitute for plastics and other non-ecological packaging systems** | They could contribute to a more effective food production system that would be less demanding on the environment, and also that they would e.g. enable food to be transported over longer distance. |

| Social values | Technology | Social needs expressed in workshop | Suggestions made by citizens |
|---|---|---|---|
| Customization | Smart food packages | **Personalized advertisement on the packages** | Producers can use smart food packages as a opportunity. |
| Sustainability, human health | Novel foods | **Substitute for chemical treatment of the foods (herbicides etc.)** | Researchers should invent new methods to treat crops. |
| Sustainability, reliability | Novel foods | **Effective food, substitute for food supplements** | Researchers should adjust food for specific clients (athletes, people with allergies etc.). |

## Timetable

| | |
|---|---|
| **9:30** | **Registration** |
| 10:00 | Introduction |
| 10:20 | State-of-the-art in nano projects on Food |
| 11:00 | Nanotechnology and Food: outcomes of citizen consultation |
| **12:30** | **Lunch** |
| 13:30 | Working on thematic areas |
| **15:30** | **Break** |
| 15:50 | Reflection |
| **16.45** | **Farewell** |

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# GoNano Innovation and Co-Creation Workshop:
# Nanotechnology for Energy

## Information material

**Date**
21 February, 2019
10:00 – 17:00h
Media-TIC Building, level 5,
c/Roc Boronat, 117
08018 Barcelona, Spain

**Organiser**
Craig Richmond
craig.richmond@rmit.edu.au

## About the meeting

The GoNano Innovation and Co-Creation Workshop is part of a series of events and activities organised under the EU project GoNano, which aims to achieve better alignment between the multiple stakeholders involved in nanotechnology research and innovation.

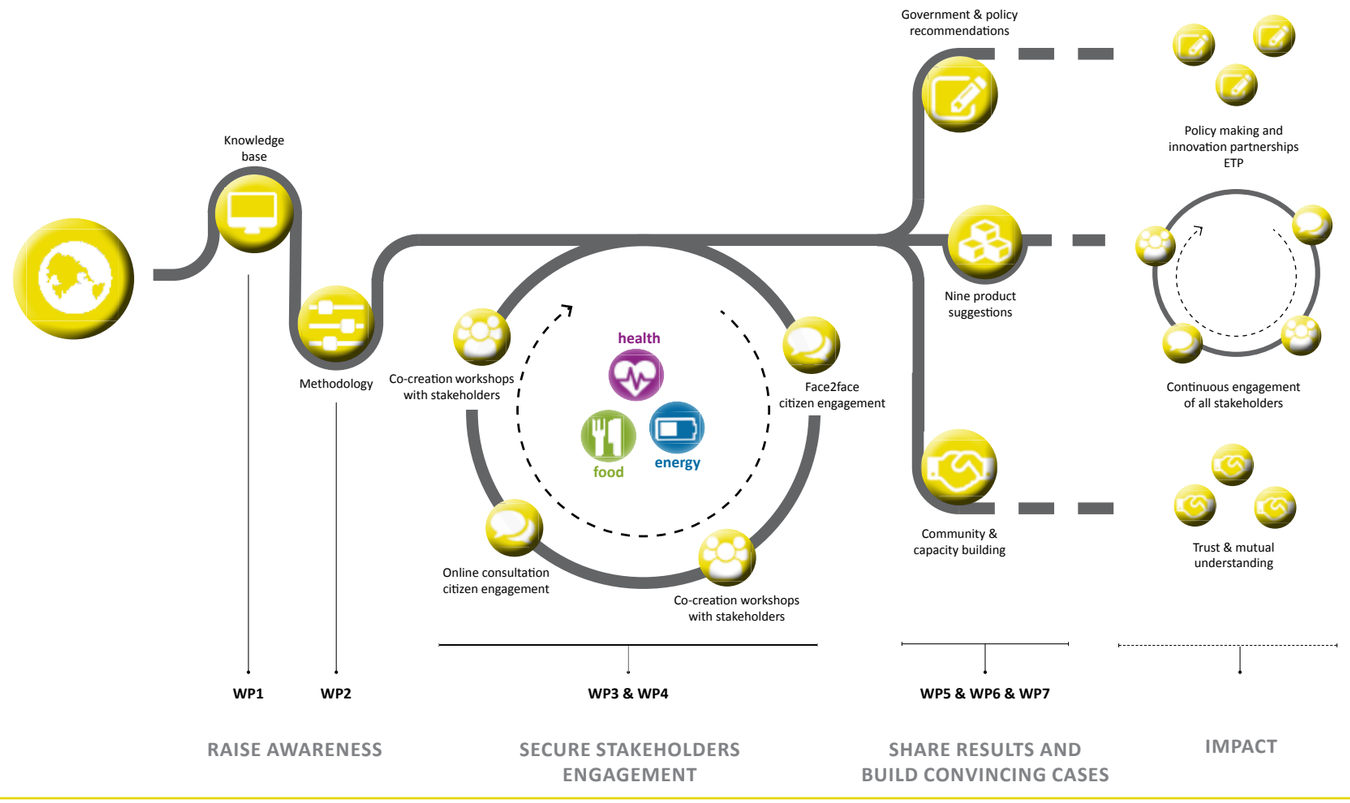
The workshops are a forum for bringing together the brightest minds from multiple sectors so they can create and cultivate new solutions for the biggest problems in society today.

## About the GoNano project

GoNano is an EU-funded project that enables co-creation between citizens, civil society organizations,
industry, researchers, and policy makers across Europe to align future nanotechnologies with societal needs and concerns. GoNano aims to explore how researchers can work with citizens and professional stakeholders to create novel suggestions for future nanotechnology products. The GoNano project is built on the assumption that nanotechnologies are more likely to gain broad acceptance if they take public values and concerns into account at early stages of innovation. Therefore, a co-creation methodology has been designed, which will be conducted in three different thematic areas (Food, Health, and Energy). In this co-creation process, wishes, needs and product suggestions of both citizen and professional stakeholders are taken into account by means of a face-to-face citizen consultation, a stakeholder workshop, an online citizen consultation and a second stakeholder workshop (see Figure 1 for a visual representation). The aim of the co-creation process is to end up with nine products and/or research suggestions (three for every thematic area). This information brochure serves as input for the first stakeholder workshop in the area of energy.

## GoNano project

Governing Nanotechnologies through Societal Engagement




*GoNano co-creation process*

## What do we expect from you?

During the workshop, stakeholders with varying backgrounds will discuss and explore possibilities for new product design in the health area and ways to include the needs and values expressed by citizens. Every stakeholder has its own perspective, knowledge and expertise, directly or indirectly linked to nanotechnology. By linking different perspectives and expertise, we aim to come up with new insights and specific suggestions for future development of health technologies.

## What will happen after this meeting?

1. GoNano researchers will analyse the outcomes of this stakeholder meeting about requirements for designing future nanotechnologies for energy applications.
2. In Spring 2019, citizens across Europe will receive an invitation to evaluate the innovation ideas from the expert workshops.
3. In another round of stakeholder workshops, researchers, engineers, industry, civil society and policy representatives, will re-work the design suggestions.
4. GoNano researchers will present the results to EU policy-makers, and make the results available online, together with teaching material that show how people could work with citizens to develop innovative product designs.

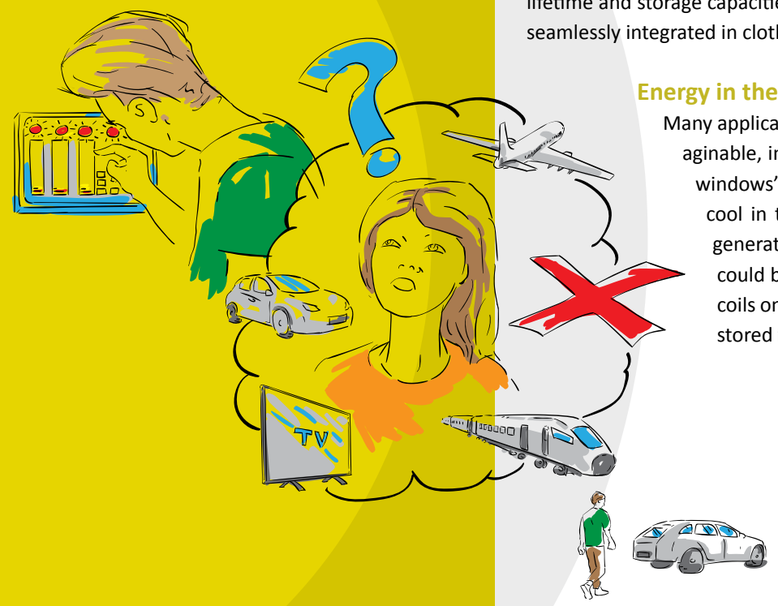
## Organisation

The co-creation process in the energy area is led by RMIT Europe in Spain. Based on interviews with various stakeholders from all over Europe, three application areas of energy and nanotechnology were defined: green energy production, energy portable energy devices, and energy in the home. In October 2018, 21 citizens from Spain were asked to provide suggestions and ideas for the development of nanotechnology in these application areas (please see a summary of the results below). This stakeholder workshop builds on the outcomes of the citizen consultation, and explores how structured interactions between stakeholders can lead to specific design suggestions. This is the first of two workshops: the second workshop will be organised in October 2019.

## Nanotechnologies and energy

Nanotechnology is the study, design, creation, manipulation and use of materials, devices or systems at extremely small scales of 1-100 nanometre (nm). By way of comparison, a human hair is approximately 80,000 - 100,000 nm wide.

At this scale, new and existing materials can be improved by altering their physical, chemical, electrical, mechanical, optical or magnetic properties. As an enabling technology, nanotechnology can potentially be applied in a wide range of areas, ranging from manufacturing to environmental remediation and from medicine to food production. In the area of energy, nanotechnologies are expected to provide solutions for energy production, heating and cooling, storage and transport. Key issues driving innovation in energy storage include the need for very quick charge, higher energy and power density as well as a longer life cycle and the possibility to recycle materials of storage systems. Nanomaterials such as carbon nanotubes, graphene, carbon nanofibers and carbon nanohorns could potentially lead to optimised batteries and supercapacitors (i.e. advanced capacitors that have higher energy storage capacity than conventional ones) by their high intrinsic conductivity and high energy intensity.




## Application areas

**Based on the outcomes of interviews with stakeholders across all over Europe conducted as part of the GoNano project, three important application areas of nanotechnology in energy were selected and discussed with citizens in the citizen consultation: green energy production, portable energy devices, and energy in the home.**

### Green energy production

In the field of photovoltaics, nanotechnology could help produce solar energy harvesting systems with higher energy conversion efficiency, for instance by tailoring the properties of the active photovoltaic layer to better match the solar spectrum. In the development of novel active layers, nanotechnology can allow a secondary lower/higher bandgap or partially recuperate higher-than-bandgap energies of photons before they thermalize to the bottom of the energy band.

A second field which shows much promise is wind energy, where weight reduction is one of the most important goals. The development of cost effective, new lightweight materials on the basis of nanocomposites, with excellent stiffness/weight ratio, will enable larger sized blades, thus allowing increasing the power and the energy produced at low/medium speeds. An example could be new bio-based materials for sandwich panels that can be used as core materials for blades.

### Portable energy devices

Nanotechnology could also enable energy production from wearable devices, for instance by harvesting human kinetic energy through nanofibers integrated in clothing. Nanotechnology could also enhance the efficiency, lifetime and storage capacities of batteries to the extent that they can be seamlessly integrated in clothing.

### Energy in the home

Many applications of nanotechnology in the home are imaginable, in addition to the use of solar panels. 'Smart windows' with a nano-coating would keep your house cool in the summer and warm in the winter – and generate electricity at the same time. This energy could be stored in the building, in wireless charging coils on the floor or in the furniture. It could even be stored for wireless charging of electronic devices.



## Outcomes of the citizen workshop

On 26 October 2018, citizens from around Barcelona gathered at RMIT University's European office to discuss the future of nanotechnology in energy. The workshop was divided in three rounds: during the first round, citizens gave their views on the use of nanotech¬nologies in energy applications by discussing future scenarios based on the themes of green energy production, portable energy devices, and energy in the home. Subsequently, citizens designed their own ideal energy products and scenarios. In the final round, citizens wrote specific messages to stakeholders.

Based on the citizens' outputs from each of these sessions, various overarching concepts were deduced and are expressed below as social values and needs. The original citizens' outputs and a description of the workshop and methodologies can be found in the full briefing report, available at www.gonano-project.eu/


## Social values

### i.e. a universal idea of what is right (or wrong) and important to society:

- Respect the environment
- Practice sustainable development
- Promote sustainable development
- Promote research into new technologies
- High standards of health and safety
- Reduced energy use
- Increased energy efficiency
- More autonomy and control over personal energy use
- More energy from renewable sources
- Inclusive/accessible to all (practical language)
- Inclusive/accessible to all (reasonable cost)
- Better quality of life
- More co-creation, more engagement with citizens

## Social needs

### i.e. a specific societal problem that requires a particular response:

- Legislative support of green policies
- Public investment in new technologies
- Private investment in new technologies
- Educate the public on nanotechnology
- Educate the public on green energy
- Implement better recycling plans and sustainable product life cycles
- Eradicate or minimise the use of materials that cause or support conflicts
- Introduce simpler pricing formats for energy use
- More transparency in research and innovation activities

During the stakeholder workshop, you will be asked to add your own needs and values to those above, and to select the ones you think are most important for the development of nanotechnologies for energy applications – in general and in your own professional activities.

When given the freedom to create their own ideal energy products, citizens converged on a number of application areas where they think advances in nanotechnology can play a role. These application areas should therefore be of particular interest to technology developers because they have already achieved high levels of public awareness and acceptance.

1. Capturing and converting energy (solar and kinetic) to electrical energy for storage and use
2. Different ways of adapting structures around the home to make use of renewable energy. E.g. building Integrated photovoltaics
3. Home climate systems that control the atmosphere around the home and also inform inhabitants of usage in simple terms
4. Smart home appliances and operating systems

Technologies or products that are more sustainable and do not adversely affect health or the environment

# Programme

| | |
|---|---|
| 09:30 – 10:00 | Welcome breakfast |
| **Introductions** | This part serves to welcome the participants, help them to get settled and familiarised with the event and with each other. |
| **Exploration** | This session consists of a discussion round where the participants will explore and evaluate the needs and values of the different stakeholder groups involved in nanotechnology/energy. |
| | Break |
| **Ideation** | In this session, participants formulate ideas and suggestions for activities, research lines and product suggestions related to the application of nanotechnology in the energy sector. |
| | Lunch break |
| **Prototyping** | In this session, participants generate their visions of how their ideas will be used, researched, developed, and/or manufactured. |
| **Reflection** | In this session, participants present their visions then reflect on the questions and feedback they receive. |
| 16:30 – 17:30 | Closing remarks and networking drinks |

Illustrations Stockmaterial – Layout De Proeffabriek/Hannie van den Bergh

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# ANNEX II – INFORMATION MATERIAL IN CZECH

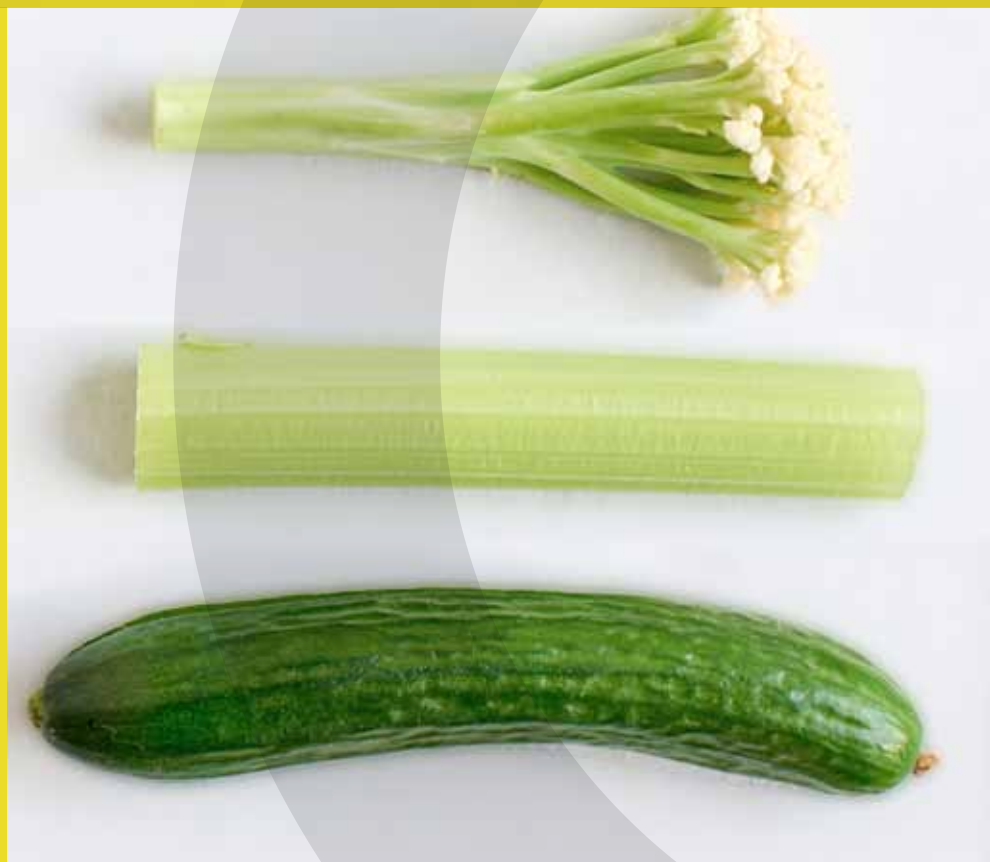
GoNano potraviny

# Expertní workshop projektu GoNano:
# Budoucnost potravin a nanotechnologií

28. února 2018
9:30 – 17:00
Technologické centrum AV ČR

Lenka Hebakova: hebakova@tc.cz
Marek Pour: pour@tc.cz
Iva Vancurova: vancurova@tc.cz

TECHNOLOGICKÉ CENTRUM AV ČR



## O workshopu

Workshop je zaměřen na možnosti budoucího využití nanotechnologií v potravinách. Během workshopu se setkáte s dalšími experty (výzkumníky, podnikateli, zástupci občanské společnosti, médií či státní správy) a pokusíte se společně formulovat návrhy budoucí podoby nanoproduktů v oblasti výroby, úprav a skladování potravin.

## O projektu

GoNano je výzkumný projekt financovaný Evropskou unií v rámci programu H2020, jehož cílem je, aby aplikace nanotechnologií v budoucnu co možná nejlépe reflektovaly společenské potřeby a obavy. Projekt GoNano proto rozvíjí spolupráci výzkumníků a dalších expertů s širší veřejností za účelem tvorby návrhů možností budoucího využití nanotechnologií v potravinách.

Projekt GoNano staví na předpokladu, že nanotechnologie budou širokou veřejností tím lépe přijímané, čím více budou reflektovat hodnoty a obavy veřejnosti, a to zejména v raných fázích vývoje. Právě proto vznikla metoda „spolutvorby" (co-creation), která je v rámci projektu využita ve třech tematických oblastech, kde začínají být nanotechnologie v současnosti aplikovány (potraviny, zdraví a energetika). V procesu „spolutvorby" jsou reflektována přání, potřeby a návrhy výrobků ze strany občanů a expertů prostřednictvím série osobních setkání, občanských konzultací, online konzultací a expertních workshopů. Tento proces povede k návrhu šesti až devíti výzkumných směrů či produktů (dva až tři pro každou tematickou oblast).

## Projekt GoNano

Management nanotechnologií se zapojením širokého spektra společenských aktérů

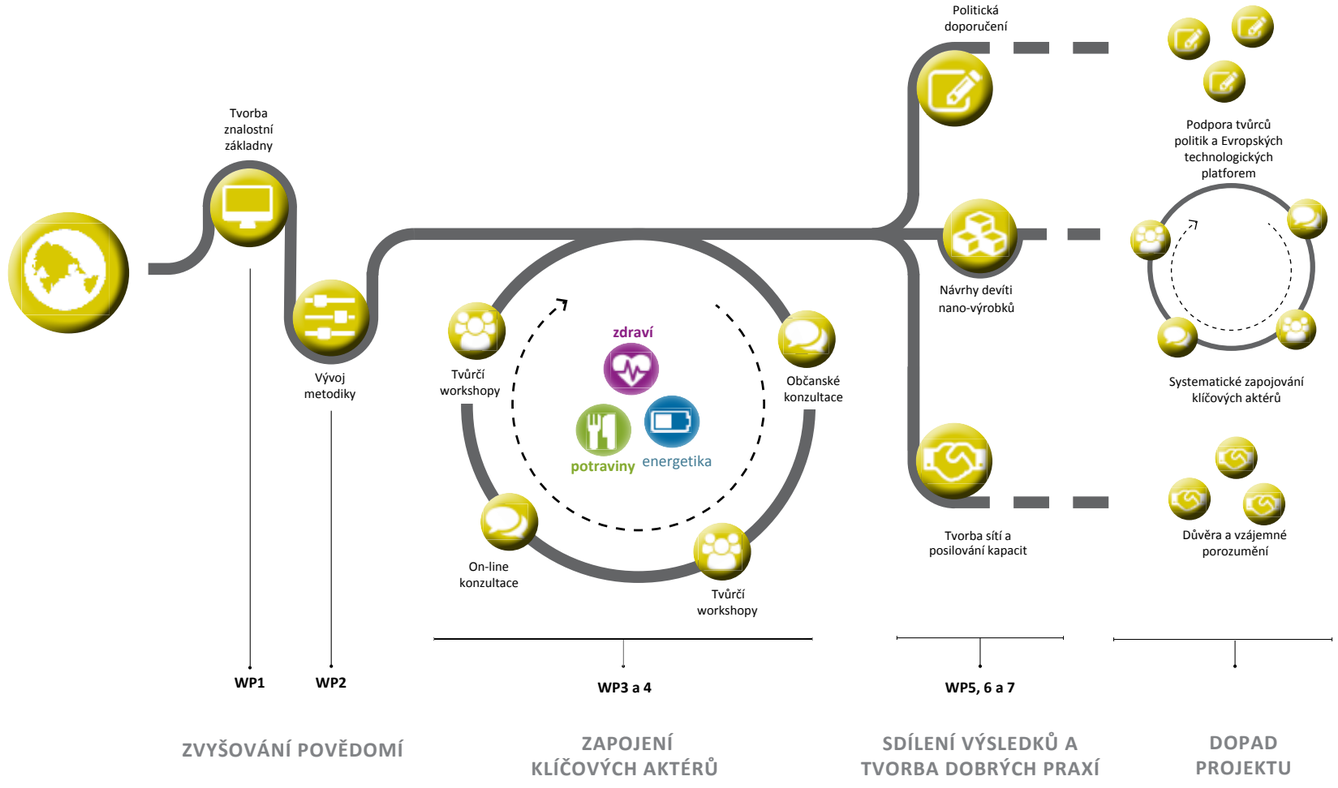



*Schéma procesu spolutvorby projektu GoNano*

## Co od vás očekáváme?

Prostřednictvím diskusí mezi různými experty budou v průběhu setkání formulovány návrhy produktů ve třech konkrétních oblastech aplikací nanotechnologií v potravinách, a to mj. i na základě občany formulovaných společenských potřeb a hodnot, vzešlých z dřívějších fází projektu. Každý expert má své specifické znalosti a vlastní pohled na danou problematiku. Právě skloubením různých odborných perspektiv si projekt GoNano klade za cíl vytvořit návrhy směrů budoucího vývoje nanotechnologií v potravinách. Technologické centrum AV ČR bude nestranným prostředníkem tohoto procesu.

## Co bude následovat po workshopu?

1. Výzkumníci projektu GoNano zanalyzují výstupy ze setkání expertů spolu s konkrétními požadavky a nápady týkajícími se budoucích aplikací nanotechnologií v potravinářství.
2. Na jaře 2019 se na evropské úrovni bude konat online konzultace, v rámci níž budou občané výstupy z expertních workshopů hodnotit.
3. V dalším kole expertních workshopů se výzkumníci, zástupci firem, občanské společnosti a veřejné správy opět setkají, aby výsledky online konzultace reflektovali při formulaci dosavadních návrhů.
4. Výzkumníci GoNano následně výsledky procesu zveřejní a budou je prezentovat představitelům na úrovni Evropské unie. Vypracují a zveřejní rovněž materiály k navázání spolupráce mezi aktéry a občany s cílem tvorby inovativních produktů.

## Organizace

Proces spolutvorby v oblasti potravin probíhá rovněž v České republice a vede ho Technologické centrum Akademie věd České republiky (TC AV ČR). Na základě rozhovorů s experty z celé Evropy byly identifikovány tři hlavní oblasti budoucích i současných aplikací nanotechnologií: inteligentní potravinové obaly, nanofiltry a potraviny nového typu. V říjnu 2018 se sešlo 48 občanů z celé České republiky, aby debatovali o návrzích a nápadech pro budoucí vývoj nanotechnologií v uvedených třech oblastech. Výstupy z těchto diskusí a návrhy občanů jsou jedním ze vstupů expertního workshopu. Jeho cílem je prostřednictvím strukturované diskuze dospět ke konkrétním návrhům inovací v jednotlivých aplikacích. Příští expertní workshop se uskuteční v říjnu 2019 a naváže na návrhy vzešlé z předchozích konzultací.

## Nanotechnologie a potraviny

Nanotechnologie obecně označují aplikace různých technologií v nanoměřítku (v rozmezí 1 až 100 nanometrů). Pro srovnání – lidský vlas je zhruba 80 000 až 100 000 nanometrů široký. Studium, využití a manipulace s materiály v tomto měřítku umožňuje vývoj jak nových, tak existujících materiálů s novými fyzikálními, chemickými, elektrickými, mechanickými, optickými či magnetickými vlastnostmi. Nanotechnologie jsou umožňující technologie: jejich nástroje a metody mohou být využity napříč širokým spektrem vědeckých disciplín, jako je kupř. chemie, biologie, fyzika, medicína či věda zabývající se materiály.

Nanotechnologie poskytují potenciální řešení z hlediska životního prostředí, zdraví a potravin. V oblasti jídla jsou nanotechnologie využívány při zpracovávání, uchovávání, balení, nakládání či uskladňování potravin. Využívány jsou různé nanomateriály a struktury, příkladem mohou být: nanočástice, nanovlákna, nanotrubice, nanojíly, nanoemulze, nanokapsle či nanosenzory.

Přímé využití nanotechnologií v potravinách znamená přímé začlenění nových látek do potravin, a proto musí být předem deklarováno. Příkladem mohou být různá vylepšení barev a vůní, antioxidanty, konzervanty a biologicky aktivní komponenty (jako jsou vitamíny a omega-3 mastné kyseliny). Další kategorií přímého využití nanotechnologií v jídle může být syntetické jídlo, jako umělé maso produkované růstovou tkání nebo za využití kmenových buněk. Nepřímé využití nanotechnologií kupř. značí různé nanostrukturované materiály v obalových technologiích a senzorech.

## Oblasti využití

**Na základě výstupů a rozhovorů s významnými nanotechnologickými aktéry uspořádaných v rámci projektu GoNano napříč Evropou byly vybrány následující tři oblasti aplikací nanotechnologií v potravinách: inteligentní potravinové obaly, potraviny nového typu a nanofiltry.**

### Inteligentní potravinové obaly

V současnosti jsou nanotechnologie zmiňovány zejména v souvislosti s udržitelnými obaly. Nanomateriály by se mohly podílet na redukování celkového množství materiálu potřebného pro prodloužení životnosti potravin. Očekává se, že využití mikro, nano, a inteligentních bioobalových materiálů zlepší vlastnosti obalů a zároveň sníží negativní dopad na životní prostředí v průběhu celého životního cyklu produktu. Možné oblasti aplikace zahrnují např. biologicky rozložitelné obaly, transparentní polymery nebo obaly se zlepšenou propustností plynů/vzduchu.
Nanosenzory v inteligentních potravinových obalech mohou poskytovat informace o kvalitě obsahovaného jídla. Obdobně mohou např. nanopovlaky zlepšit mechanické, tepelné, elektrické a chemické vlastnosti obalů. Ty by tak mohly nabýt samoregeneračních, samočistících, protinánosových; proti znečištění, zápachu či korozi odolných, antimikrobiálních či vodě odolných vlastností.
Snižování míry znehodnocování potravin prostřednictvím inteligentních obalů může rovněž vést ke snižování negativních dopadů na životní prostředí. V tomto ohledu nicméně panují obavy z možné migrace nanočástic z obalových materiálů do potravin, a tím i z jejich možné kontaminace.




### Potraviny nového typu

Pohled na potraviny v nanoměřítku může přinést mnoho nových poznatků o jejich vnitřní struktuře a v důsledku tak vést k zefektivnění procesu zpracování potravin tím, že již primární suroviny budou rozloženy na funkční složky. Celý proces zpracování potravin se tím zjednoduší; nebude již nutné do potravin přidávat další pomocné látky. Nanoenkapsulace prostřednictvím nanomicel umožní zakomponování složek potravin s konkrétními nutričními vlastnostmi do specifických potravinových matricí. Tyto matrice pak mohou tvořit základy funkčních potravin: potraviny nového typu s novými či změněnými vlastnostmi (např. se zvýšeným podílem zdravých látek (vitamínů, karotenu), anebo naopak sníženým podílem potenciálních alergenů. Tyto potraviny by se také mohly stát nosiči pro cílený přenos a uvolňování živin.

### Nanofiltry

Růst počtu obyvatel v kombinaci s globální změnou klimatu zvyšuje potřebu technologických inovací v oblasti úpravy pitné vody. Nanotechnologie jsou schopny prostřednictvím pokročilých filtračních materiálů zajistit vyšší kvalitu a efektivnější spotřebu vody, a tím přispět nejen k dlouhodobému řešení otázek spjatých s dostupností pitné a užitkové vody, ale i energetické náročnosti. Vzhledem k jejich povaze, stupni vývoje, komerční dostupnosti, nákladům na nanomateriály a kompatibilitě s existující infrastrukturou mají nanoabsorbenty a nanomembrány potenciál být využity ve větším měřítku.
Přes všechny tyto vyhlídky má využití nanofiltrů pro úpravu vody i své limity. Největší bariérou se zdají být vysoké náklady na výrobu nanomateriálů spolu s omezenými možnostmi rozšíření komerčního využití úpravy vody založené na nanomateriálech. Vedle těchto limitů panují také obavy ze zdravotní závadnosti a bezpečnosti nanomateriálů ve vodním hospodářství, především z možné kontaminace vody.
Málo je známo také o rizicích spojených s migrací nanočástic a jejich dlouhodobým ukládáním a akumulací v přírodním prostředí.



## Diskuze o regulačním rámci

Potravinářský průmysl a zemědělství jsou vysoce regulovaná odvětví, zejména z hlediska bezpečnosti a kvality potravin. Některá z těchto nařízení jsou zaměřena i na používání nanomateriálů.

**Nařízení o potravinách nového typu:** Toto nařízení definuje podmínky uvádění potravin nového typu na vnitřní trh EU. Používání umělých nanomateriálů při zpracování potravin je považováno za výrobu potravin nového typu, čímž tato výroba podléhá podmínkám stanoveným tímto nařízením.

**Nařízení o přídatných látkách v potravinářství:** Toto nařízení opravňuje Evropskou agenturu pro bezpečnost potravin (EFSA) kontrolovat již autorizované potravinářské přídatné látky, pokud byla velikost částic změněna prostřednictvím nanotechnologií. V roce 2012 přijala EFSA za účelem kontroly potravinářských přídatných látek nové pokyny, které obsahovaly konkrétní informace o specifikaci nanomateriálů.

**Nařízení o materiálech a předmětech z plastů určených pro styk s potravinami:** Toto nařízení zavádí posouzení jednotlivých případů látek v nanoformě (které nejsou přesně definované). Nařízení dále stanovuje, že látky v nanoformě mohou být používány, pouze jsou-li výslovně povoleny a uvedeny ve specifikacích v příloze tohoto nařízení.

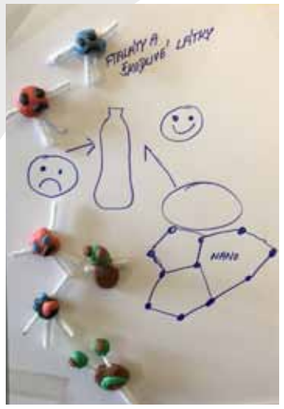
**Nařízení o aktivních a inteligentních materiálech a předmětech určených pro styk s potravinami:** Toto nařízení definuje proces povolování nové látky a pravidla pro posouzení její bezpečnosti. Rovněž zavádí posouzení jednotlivých případů látek v nanoformě.

**Nařízení o poskytování informací o potravinách spotřebitelům:** Toto nařízení obsahuje definici nanomateriálů a stanovuje požadavky na označování všech složek potravin včetně potravinových doplňků přítomných v nanoformě. Nařízení stanovuje, že všechny složky vyskytující se v podobě umělých nanomateriálů musí být uvedeny v seznamu složek. Za názvy těchto složek se v závorce uvede slovo „nano“.

# Výsledky konzultace s občany

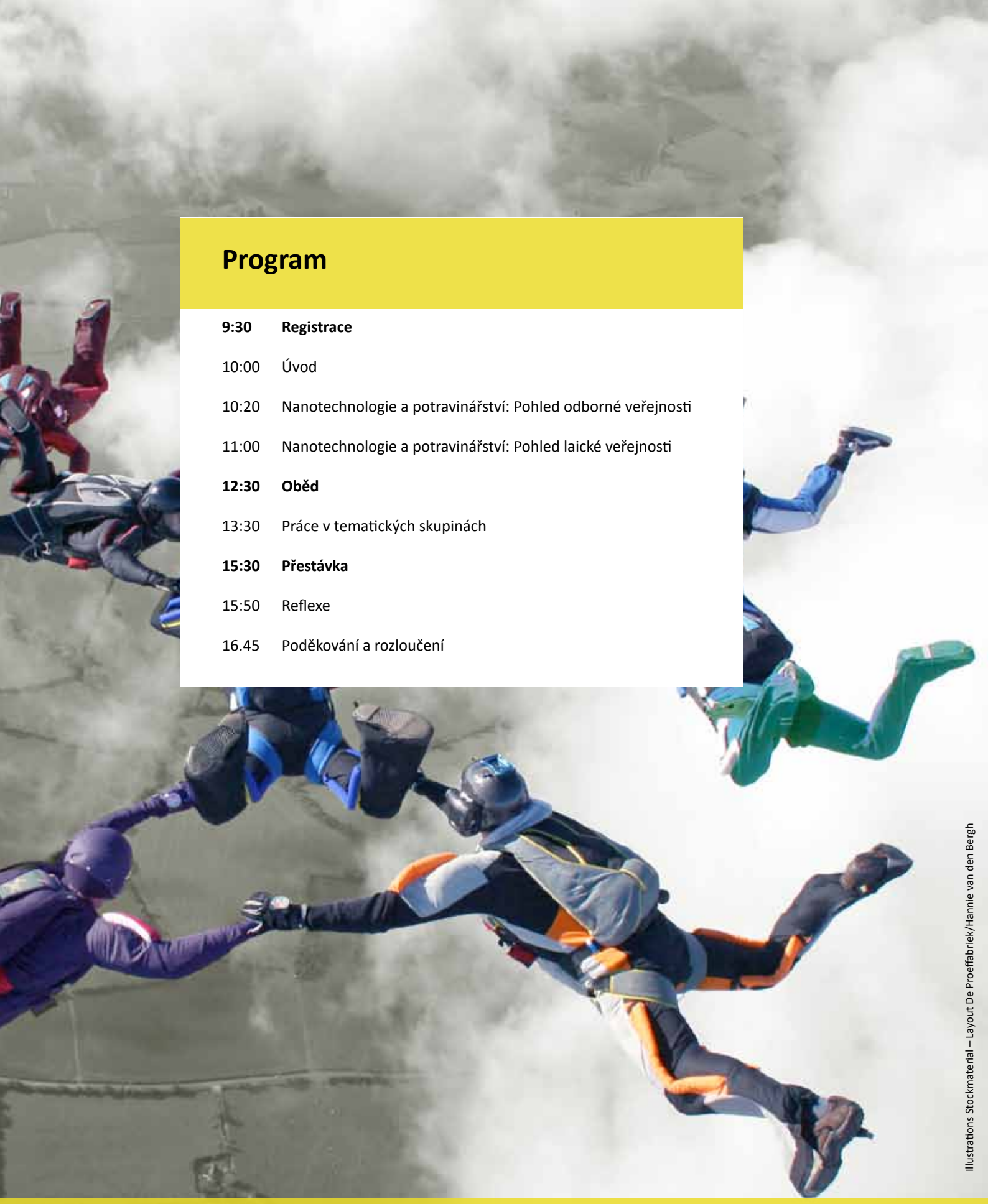
20. října 2018 se v prostorách Akademie věd ČR sešlo 48 občanů z celé České republiky, různých úrovní vzdělání, věku a profesí, aby diskutovali o budoucnosti ve třech oblastech aplikací nanotechnologií v potravinářství:
1) Inteligentní potravinové obaly
2) Nanofiltry
3) Potraviny nového typu

Občané se během konzultace zabývali možnými scénáři vývoje, aby pak následně formulovali své představy a potřeby pro budoucí podoby aplikací a aby stejně tak formulovali vzkazy klíčovým aktérům, kteří budou hrát důležitou roli v budoucnosti nanotechnologií.

| Společenské hodnoty | Aplikace | Společenské potřeby | Návrhy občanů |
|---|---|---|---|
| Bezpečnost, udržitelnost | Všechny aplikace | **Kontrolní a certifikační systém, jasná pravidla pro výrobu a používání nanotechnologií** | Legislativa by se měla zaměřit na potřeby občanů. |
| Zdraví, recyklovatelnost | Všechny aplikace | **Biologická odbouratelnost a samorozložitelnost** | Nanovýrobky by měly garantovat svou biologickou odbouratelnost a (samo)rozložitelnost. |
| Bezpečnost, spolehlivost, otevřenost, transparentnost | Všechny aplikace | **Zaručená bezpečnost nanotechnologií co se týče nanočástic a jejich možného hromadění v potravním řetězci** | Nové výrobky by měly sloužit zákazníkovi a neměly by ohrožovat zdraví. |
| Udržitelnost, cirkulární ekonomika | Všechny aplikace | **Vytváření nových návrhů technologií s ohledem na kontext (sociální, životní prostředí atp.)** | |
| Udržitelnost | Všechny aplikace (primárně nanofiltry) | **Řešení globálních klimatických změn** | Stát by měl obecně podporovat produkci nanofiltrů, a stejně tak by měl podpořit využití nanofiltrů v zemích třetího světa. |
| Udržitelnost, cenová dostupnost, kvalita života | Nanofiltry | **Čistá a dostupná voda (jak v domácnostech, tak v zemích třetího světa)** | Výzkumníci by měli navrhnout nové metody, jak čistit vodu a zaručit její dostatek. |
| | | | Média by měla informovat transparentně jak o výhodách tak nevýhodách nanotechnologií. |
| Bezpečnost, spolehlivost | Inteligentní potravinové obaly | **Ochrana jídla před kontaminací a před negativními vlivy prostředí** | |
| Spolehlivost | Inteligentní potravinové obaly | **Prodloužená trvanlivost potravin** | Výzkumníci a výrobci by měli vyvinout a vyrobit obaly, které udrží jídlo čerstvé na dlouhou dobu. |
| Udržitelnost, odpovědnost | Inteligentní potravinové obaly | **Náhrada plastů a dalších neekologických obalů** | Inteligentní potravinové obaly by mohly přispět k efektivnějšímu systému produkce, který by byl méně náročný na životní prostředí a který by zároveň umožnil transport potravin na dlouhé vzdálenosti. |

| Společenské hodnoty | Aplikace | Společenské potřeby | Návrhy občanů |
|---|---|---|---|
| Přizpůsobitelnost | Inteligentní potravinové obaly | **Personalizovaná reklama na obalu (dle zákazníka)** | Výrobci mohou využít inteligentní potravinové obaly jako marketingovou příležitost. |
| Udržitelnost, zdraví | Potraviny nového typu | **Náhrada za chemické ošetření potravin (herbicidy apod.)** | Výzkumníci by měli přijít s novými způsoby ošetřování v průběhu výroby potravin apod. |
| Udržitelnost, spolehlivost | Potraviny nového typu | **Efektivní jídlo, náhrada za doplňky stravy a přídatné látky** | Výzkumníci by měli přizpůsobit jídlo rozdílným cílovým skupinám (sportovcům, matkám, alergikům apod.). |

## Program

| | |
|---|---|
| **9:30** | **Registrace** |
| 10:00 | Úvod |
| 10:20 | Nanotechnologie a potravinářství: Pohled odborné veřejnosti |
| 11:00 | Nanotechnologie a potravinářství: Pohled laické veřejnosti |
| **12:30** | **Oběd** |
| 13:30 | Práce v tematických skupinách |
| **15:30** | **Přestávka** |
| 15:50 | Reflexe |
| 16.45 | Poděkování a rozloučení |

Illustrations Stockmaterial – Layout De Proeffabriek/Hannie van den Bergh

## SLEDUJTE NÁS ZDE

www.gonano-project.eu GoNanoEU GoNanoEU GoNano-project

GoNano je projekt typu Koordinační a podpůrné akce financovaný Evropskou unií v rámci programu NMBP (Horizont 2020) pod číslem 768622.

# ANNEX III - PROPOSED STRUCTURE FOR THE FIRST GONANO STAKEHOLDER WORKSHOPS

**(by DPF)**

This document proposes an overall structure for the programme of the first stakeholder workshops (T4.2), building on the DoA, D2.1, earlier discussions, agreed expected outcomes and draft programmes from pilot partners. Rather than providing minute-to-minute instructions (which was impossible given the maturity of the draft programmes), it presents an outline for the day, introduces the main objectives of the different sessions and suggests ways to achieve those objectives and produce expected outcomes. Partners are invited to create more detailed overviews of the day based on the overall structure presented here. They can choose to revise the programme according to their national needs (but would need to justify the change if they do).

## Overall structure

The programme is structured in five sessions: a general introduction, followed by four interrelated co-creation sessions:

- Session A: **Exploration**, where participants get to know each other and their work and explore the wishes, needs and values and messages expressed by the citizens as well as their own needs and interests.
- Session B: **Ideation**, where participants imagine and co-create responses to the wishes, needs and values and messages expressed by the citizens by imagining revisions/adaptations of ongoing research and innovation trajectories, building on the varied expertise around the table.
- Session C: **Prototyping**, where participants generate a storyboard that visualizes how the resulting research lines and product suggestions are modified in relation to the wishes, needs and values and messages expressed by the citizens and suggests concrete actions to be taken by the stakeholders present to realise this vision.
- Session D: **Reflection**, where participants present and reframe their storyboards, reflect on the ways in which the citizen's needs have shaped the storyboards, identify actions to be taken in preparation for the next workshop and reflect back on the overall workshop objectives.

## Introduction

*(plenary session, 30 min or so)*

The purpose of this session is for participants to become familiar with each other and settle in, and to introduce the objectives of GoNano.

There are many ways to introduce participants: participants could form pairs and introduce themselves to their partner, and subsequently ask each of the participants to introduce their partner to the rest of the table (10 minutes or so). Partners could also respond to trigger questions like: "what do you think you might need from the people in the room today?", or "What would you like to know from your neighbour?"

The introduction to GoNano probably requires a brief plenary presentation (10 minutes or so), followed by Q&A. Importantly, by the end of the session participants should have an idea of what the GoNano project is about (aim of the workshop, where we are now, what went on before (including the citizen workshops), and what will happen next), and especially what *this workshop* is about: the main hypothesis of GoNano is that the productive integration of societal considerations can add value to research and innovation. We are here today to test that hypothesis: we will explore to what extent the incorporation of the wishes, needs and values and messages expressed by citizens might lead to new insights and ideas for your own work. Please note that this is an *experiment*: we don't know whether this is at all feasible or what will come out: we merely aim to test our hypothesis. We will revisit the hypothesis towards the end of the meeting.

*Expected result for the next session:*

- participants are settled in and familiar with each other's backgrounds
- participants know what to expect today
- informed consent forms signed by all participants

*Expected output for the report:*

- participants and their backgrounds should be documented for the report, as this will have a significant impact on the discussions and outcomes.
    - (details on group composition is also needed to reflect on the inclusivity dimension later on: to what extent might group composition (gender, but also age, socio-economic background, etc., have influenced the discussion?)
- It would be nice to document telling quotes from participants on their expectations from the day.

## Session A: Exploration

*(match-making session, 60 min or so)*

In this session, participants first need to get to know each other and their work a bit better. Subsequently, they explore the wishes, needs and values and messages expressed by the citizens and combine it with their own needs and interests.

All participants are asked to write 1) their background and expertise and 2) a specific knowledge need or interest that requires the expertise of another type of stakeholder *[related to the objective of the day! For instance: "I am a chemist, and I need to talk to a policy maker on substance regulation"; or: "I am a producer, and I need a material scientist to talk about vapor deposition"]* on a post-it note. Brief pitches on the state-of-art of the technology could form part of this introductory session. Participants read the post-its on the wall, mingle first to discuss their background, expertise, needs and interests, and then form groups based on matching or complementary expertise (i.e. they feel that they have something useful to exchange). Subgroup size for example 4 or 5, depending on group size. Importantly subgroups have to be as diverse as possible (i.e. equal spread of expertise)! *(total 20 min or so to form groups)*

Subsequently, the subgroups are introduced to the messages from the citizens workshops. This could be done by presenting statements on a screen, handing out cards with the citizens messages or referring to the posters (as much supporting material from the citizen workshops as possible should be used: text, posters, videoclips, even the 'demonstrators' if possible). *[Remember that this step will require the 'translation' of the various wishes, needs and values and*

*messages from citizens into coherent and concise messages that stakeholders can understand - see Sikke's email of 1 Feb for suggestions on how to do this.]*

Subgroups are asked to familiarize themselves with these ideas, and then to select one idea that (somehow) connects to the expertise of the subgroup members and the reasons for them forming a group. They will work on this idea in the following session *(total 30 min or so to learn about ideas and select one)*.

*Expected result for the next session:*

- subgroups of stakeholders with complementary expertise
- specific citizen message selected

*Expected output for the report:*

- Evidence of how the groups were formed (who matches who, and why? What sorts of needs/interests are expressed by stakeholders?) Photos of combined post-its or groups, telling quotes with reasons why.
- Capture initial responses to citizen messages and reasons for selecting 'their' (through quotes, post-its, etc). Do they see the relevance? Does it inspire? Does it match their interests? Or not?
    - *Ditte and Sikke to prepare EngageSuite to capture this!*

## Session B: Ideation

*(subgroup work followed by a brief plenary, 60 min or so)*

Purpose: In this section, participants imagine and co-create responses to the wishes, needs and values and messages expressed by the citizens by imagining revisions/adaptations of ongoing research and innovation trajectories, building on the varied expertise around the table.

First, one of the subgroup members tries to explain to the others how the message from the citizens might impact their own work (this can be as 'open' and creative as possible: ranging from "we should explain citizens better, because they haven't understood" (which is to be expected) to "I am going to create the product in my factory tomorrow" and everything in between) and adds a description of this 'impact' on a sheet of paper directly below the original citizens message (could be in words or in a drawing). What is important, though, is that the others still recognize the original citizens message somehow), and that the suggested action or recommendation is directly related to this participant's own work!

Then, another subgroup member does the same: explaining how the message might impact their own work. This could *either* be a completely different suggestion (related to this participants' own work!), *or* it could add to the earlier suggestion (building on the expertise-matching above). This 'impact' is again added to the sheet.

*[Please see the template for session B to get an idea of how this might look]*

All subgroup members should have *the opportunity* to propose an impact on their own work. This means that the mind map (see template) may initially have several main branches (possibly with further branches for some ideas). At some point during the session however, participants should select one idea to work on in the next session (i.e. one main branch); they could consider things like popularity, originality, feasibility, and the available expertise within the group when deciding on the ideas they want to develop further. All subgroup members subsequently *have to*

include a suggestion how their specific expertise might strengthen that particular impact (i.e. they each add a sub-branches to the main branch that was ultimately chosen).

This session concludes with a brief plenary session, where the subgroups pitch their ideas in one minute to the whole group, explaining why they think it is worth developing further.

*Expected result for the next session:*

- one main idea from each subgroup that describes a possible impact of the citizens message on the work of the stakeholder (the main branch of the mind map), along with how the expertise of the other subgroup members contributes to this impact (subbranches in the mind map).

*Expected output for the report:*

- A selection of ideas, demonstrating the possible impacts of the citizen messages on the work of the stakeholders (take pictures of the sheets);
- A sense of the atmosphere during subgroup discussions (pictures of the subgroups, of drawings, telling quotes you overheard); note down quotes from the plenary pitches at the end)
    - *[Please note that these reporting tasks require skilled rapporteurs, who should be carefully instructed with respect to the expected outcomes!]*

## Session C: Prototyping

*(subgroup work followed by brief plenary session, 60 min or so)*

In this session, participants generate a storyboard that visualizes the possible impact defined in the previous session. It should express how the work of the stakeholder is modified in relation to the wishes, needs and values and messages expressed by the citizens. The storyboards should show three perspectives on the impact: impact from the perspective of the researcher; from the perspective of the citizen; from the perspective of one of the other stakeholders. The storyboard should also show concrete actions to be taken by these stakeholders to realize this vision.

*[Several copies of the first page of the template for session C can be printed out: subgroup members can work out specific elements of the storyboard, focusing on one of the perspectives, or perhaps one of the branches of the mindmap. Importantly however, the different pictures should combine to create a coherent storyboard (i.e. a single story, not 6 unconnected drawings); please see pages 2 of the template for some examples of how this might look)]*

*Expected result for the next session:*

- Storyboards with one main idea for each subgroup, describing a possible impact of the citizens message on the work of the stakeholder, along with how the expertise of the other subgroup members contributes to achieving this impact.

*Expected output for the report:*

- Storyboards [combining expected outcomes #2: Concrete design suggestions which relate to the research and innovation at hand; and #3: Responsiveness of the design suggestions to

societal needs and values]. Please note that these storyboards will play an essential role in further communication and dissemination in GoNano: in the ideal case, they immediately make it clear to all future viewers / readers that the workshops led to enhanced responsiveness of research and innovation trajectories to societal considerations, and explain how this is achieved (i.e. what concrete changes in practice will be / have been induced).
- To get as close to this ideal situation as possible, the storyboards should be visually attractive, intuitive, clear and compelling. This will require careful attention from both table facilitators and rapporteurs: is it clear what the storyboards intend to express? Are they concrete enough to inspire action? Is it clear what needs to happen? Is it clear how the original message is incorporated, and what effect it has had?

## Session D: Reflection

*(plenary session, 60 min or so)*

In this closing session, subgroups present their storyboards in plenary, highlighting both the idea and the actions to be taken by the stakeholders, followed by reactions from the audience. This session could be used by the subgroup to reframe their storyboard and or actions.

Presentations are followed by a discussion of steps to be taken in the run-up to the next workshop:

- What do we want to do at the second workshop? Ideas for the programme?
- Who will do what in preparation for that meeting?
- Do you have specific questions related to your storyboard to ask citizens and other stakeholders and experts in the upcoming online consultation?

Towards the end of this session, we should also reflect back on the initial hypothesis with participants: *did* the incorporation of the wishes, needs and values and messages expressed by citizens lead to new insights and ideas for your own work? Was it feasible? Was it realistic to expect this? Too optimistic? Any other suggestions on how to encourage reflection on societal perspectives in nanotechnologies?

This discussion can give us some insights for expected outcome #1: *do stakeholders see the relevance of citizen perspectives and multi-stakeholder engagement?* and expected outcome #4: *willingness of stakeholders to continue* before and after the workshop.

The question of inclusivity could be revisited here as well: how did the group composition affect outcomes?

To wrap-up this session and the workshop, moderators can discuss next steps: what's next in the GoNano project? How will we stay in touch in the coming months: can we call you? Email you? Facilitate interactions between you? Can we help you realise the plans in your storyboards in the meantime? Share the results of the citizen consultation with you?

*Expected output for the report:*

- Overview of final presentations by the subgroups and responses from the audience (picture / quotes)

- Overview of participants' responses to the aims of the workshop / hypothesis of GoNano. Insights in expected outcome #1: *Do stakeholders see the relevance of citizen perspectives and multi-stakeholder engagement?* before and after the workshop.
- Expected outcome #5: *Questions for the online consultation*
  Reflections on inclusivity considerations.