RECIPES
Precaution • Innovation • Science

BRIEFING REPORT – INPUT FOR THE CO-CREATION PROCESS

Citizens' values and opinions in relation to Precaution and Innovation

Results from citizen' meetings in the Norway, Denmark, Italy, the Netherlands and Bulgaria

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1 Introduction

The precautionary principle has arisen as part of the discussions on how to protect public health and the environment in the face of uncertainty about the risks of a technology, innovation, or product. European policymaking on issues of considerable concern and scientific uncertainty has adopted precautionary approaches, to ensure high levels of public health, environmental protection and consumer safety without compromising science and innovation.

The precautionary principle both in EU and national contexts has become the subject of some debate. For proponents, its application is a way to encourage cautious decision-making when placing certain products on the market and, more generally, when making technological choices. In this view it is not opposed to innovation. For opponents, the precautionary principle can lead to an excess of caution that hinders scientific creativity and technological innovation, harming economic growth and the competitiveness of economic players on a world stage where not everyone is subject to the same rules.

RECIPES is an EU-funded initiative aiming to reconcile innovation and precaution by developing tools and guidelines to ensure the precautionary principle is applied while still encouraging innovation. The RECIPES project will work closely with different stakeholders through interviews, workshop and webinars.

The development of new products and technologies, such as genetically modified organisms, nanotechnology and neonicotinoid insecticides, presents opportunities for humans and the environment, but can also carry risks to human, animal and plant health as well as the environment and ecosystems. Decisions on their promotion or regulation are often taken in situations of uncertainty about these risks. But how do we take sound decisions in situations of scientific uncertainty? How do we decide on new and emerging technologies?

These questions were put forward in five European citizens meetings on citizens attitudes and opinions on precaution and innovation. The citizens meetings were conducted as the first step of the RECIPES co-creation process. The goal of the workshops was to incorporate citizens' views, concerns and messages into the project and to prepare the ground for the later involvement of stakeholders, during the next steps in the project: a stakeholder scenario workshop, online consultation of both stakeholders and policy makers and finally a stakeholder multicriteria workshop. This, so the future application of the precautionary principle (PP) can take into consideration the citizens' views.

2 Results from the five citizens meetings

Two of the major and crosscutting findings in and between the five citizens meetings was that participants did not see precaution and innovation as being in contradiction with each other and that the precautionary principle was almost universally recognised as an appropriate and effective tool to regulate uncertainties arising from development of technologies.

Furthermore, it was observed that participants seemed to look differently to technology or innovation in general as opposed to specific cases. Technology and innovation in general were characterized as an unstoppable force that was impossible to hold back by regulation. However, this conviction was much less present when people got into details about precaution in relation to specific cases, such as e.g. new medicine or GMO's. The complexity of the more general terms technology and innovation vs. concrete and specific cases

fostered arguments for assessing innovation and technology case-by-case and to differentiate precautionary measures according their societal and environmental value.

Even though considerable concerns towards innovation were articulated, the participants did not seem overly pessimistic. They were able to cite a variety of dilemmas, worst case scenarios and problems but did not seem angry or desperate about technology.

Ethical, moral and social consequences clearly mattered a great deal to the participants in the five citizens meetings and they predominantly argued that these matters should be included when assessing whether or not to invoke the precautionary principle.

A general view in all five interview meetings was that stakeholders and citizens should be widely involved and engaged in the process when applying the precautionary principle: "Everybody who has a stake should have a voice". At the same time, the complexity and time-consumption of the engagement process should be considered on a case-to-case basis in relation to the potential impacts, risks and uncertainties of that particular innovation.

The importance of involving institutions with scientific knowledge, independence from external interest, transparency and democratic responsibility often surfaced during the discussions. Distrust, or at least scepticism towards the neutrality of institutions not complying with the above (especially politicians and companies) were often expressed in relation to technology, power and economic interests.

Finally, the overall impression was that the participants seemed little informed about the governance towards technologies and uncertainties; how these risks have or have not been handled, by whom and how.

2.1 Testimonies from the 5 countries

In general, most people were open to share their opinion and the discussions went in a respectful manner, and a lot of different themes and subjects were discussed.

The participants seemed to be very well capable to make the concepts described in the information material their own and apply it on historical, contemporary or even personal issues and examples.

The Netherlands

"The Dutch participants overall were of the opinion that there is not necessarily a trade-off between precaution and innovation, but that transparency and involvement of a broad variety of stakeholders are important in precautionary decision-making."

Bulgaria

"The Bulgarian participants were motivated by their desire to learn more about precaution and innovation, as well as by their concerns about the potential risks posed by emerging technologies on environmental and human health."

Italy

"In the capital city, a small town and a country village, Italian citizens from the Lazio region declared that precaution and innovation go hand in hand."

Denmark

"The Danish debate was lively and friendly. In general, the view was that everybody who has a stake should have a voice and depending on the nature of the technology or innovation, it would be obvious to make constellations of actors who would be wise to involve and in some extreme cases it would be irresponsible not to involve everyone."

Norway

"In Bergen, 26 participants gathered at the Literature House, including both those who are fascinated by new technologies and those who are concerned about emerging risks.

3 Methodology

The interview meeting method is used to gain knowledge about, what a group of people think and feel about a complex issue. It is not a representative method, but it aims at including a diverse group of citizens who cover a broad spectrum of demographic criteria such as age, sex, religion, education, geographical zone and occupation.

In the five RECIPES interview meetings groups of about 20 - 40 people were asked about their perceptions and preferences in relation to precaution and innovation. As a rule, the participants did not pose any expert or professional knowledge about the issues. However, prior to and during the meeting, the participants were informed about the controversies and perspectives on the topic, so that they shared a balanced and factual starting point.

The interview meeting method employs a combination of a questionnaire and group interviews. These two methods complement one another well; the questionnaire ensures that all the participants are heard and that there is comparable data relating to the most important areas. The group interview took its point of departure in the questionnaire and ensured that the participants could include the underlying reasons of their answers.

Interview meetings are particularly suitable in cases where:

- There are complex issues (technically complex and/or ones posing a dilemma)
- Prior public knowledge is limited
- An ethical dimension is involved

(a more comprehensive explanation of the methodology is found under annex 5.6).

4 Discussion points

To achieve relevant results, a diversified sample of the population in all five countries was required. This requirement can be considered successful in all of the citizens meetings, but with small adjustments in Denmark and Italy. And in all the citizen meetings, participants were highly active and motivated, they were able to discuss precaution and innovation and come up with a number of wishes, concerns and messages.

The size of the groups and the quality of the data that was collected does not warrant us to make very firm conclusions about what citizens in general think about precaution and innovation in the five countries were the citizens meetings were held. But it provides an insight to the diversity of the answers in the questionnaire and arguments from the

discussions. Moreover, it gave us new insights into relevant topics, examples and some common thoughts among citizens that are useful to take into account for the rest of the project.

A notable element during the discussions was that people seemed to know a lot about the controversies and problems surrounding cases of innovation and precaution and not so much about the 'good examples'. Besides the topics mentioned in the information material, people also talked about the dangers of the impact of data-collection of tech-giants, pulse-fishing, medical prostheses, Wi-Fi, nuclear energy, plastics, electromagnetic fields, vaccination, cloning etc. People however seemed to be less informed about the governance towards these technologies; how these risks have or have not been handled, by whom and how. The cause of this discrepancy might be that the latter gets less attention in the news, is less interesting to remember and/or that less attention was paid to this aspect in the information material.

As mentioned in the results people seemed to look differently to technology or innovation in general as opposed to specific cases. Perhaps, but this is only a hypothesis, talking about innovation and technology in general terms makes the object so vague that people are more inclined to view it as unmanageable and uncontrollable, precisely because it feels conceptually ungraspable.

5 Annexes

5.1 Briefing report - Norway

RECIPES
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Citizen's view on Precaution and innovation in Norway

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5.1.1 Executive Summary

This report presents the outcomes of the citizen meeting in Bergen, Norway, where 26 participants with different demographics and backgrounds participated. The participants filled out a survey on precaution and innovation in the areas of GMOs, nanotechnology and pesticides, followed by group discussions of 10 of the questions in the survey.

Main findings and conclusions from the discussions:

- The participants generally agreed that both PP and innovation is important and should be balanced, although the majority of the participants tended to argue that precaution should have higher priority in many situations. However, some participants highlighted that the precautionary principle could hinder innovation, especially in development of new medicines or in the field of medical research in general.
- In the survey, everyone agreed that marked forces are insufficient to regulate uncertainty with new technologies, and that the PP should come into effect. In the discussions, most participants indicated that technologies should be strictly controlled, regulated or restricted, however, not necessarily banned. It was often highlighted that it would strongly depend on the case, and that the scale of risk should be balanced against the scale of gain.
- There were some disagreements about who should be involved in the assessments and regulation of risk. This often seemed to be based on different levels of trust in industry, researchers and public authorities, and different conceptions of the roles experts/researchers versus politicians/public authorities.
- Participants expressed more concerns about pesticides than about GMOs and nanotechnologies.
- While many participants expressed worries GMO's, some participants argued that regulations in some could hold back innovation.
- Participants disagreed about the possibilities to steer or regulate the development of technologies. Most agreed that it is particularly challenging at an international level, however, some argued that at a national scale, there are possibilities to at least direct innovations towards more sustainable directions.

5.1.1.1 Introduction

In May-June 2019, the RECIPES project hosted citizen meetings in Denmark, Norway, Netherlands, Italy and Bulgaria. RECIPES citizen meetings were set up to provide the public with an opportunity to reflect on issues related to precaution and innovation in relation to (new) technologies, and to provide their ideas and opinions directly to the researchers and managers of the RECIPES project. The present report is one of five country reports detailing the result of the national meetings. The results of all five citizen meetings will be collected in a main report and delivered to the researchers and managers of the RECIPES project.

The citizen meeting in Norway was held in Bergen on May 28. Participants were recruited using snowball sampling via emails and advertising on Facebook and posters in town. Eventually, 30 interested participants were selected and invited, and 26 people eventually showed up on the citizen meeting the 28th of May.

The report first gives a brief overview of the Norwegian context before proceeding to the results.

[Methodology will be explained in the main report]

5.1.1.2 Norway

The aim of this report is to analyze citizen's perceptions of precaution and innovation. The goal is to provide RECIPES researchers and management with input they can use to create a toolbox for the application of the precautionary principle. We will begin with providing some basic information about Norway in the table below:

Capital	Oslo
Number of inhabitants	5 334 762 (1.1.2018)[1]
GDP per capita	665 378 NOK = 69 449 Euro
Offcial languages	Norwegian, Sami
Form of government	The politics of Norway take place in the framework of a parliamentary representative democratic constitutional monarchy[2]. According to the Constitution, which was adopted in 1814, Norway is a monarchy in which the power is divided between three branches: a legislative branch which is also responsible for appropriations, the Storting (parliament); an executive branch, the Government; and a judicial branch, the courts[3].
Major economic sectors and industrial development	Business and industry in Norway are to a high degree '**raw-materials based industries**'. According to governmental webpages[4], natural resources have formed the basis for considerable value creation in Norway: • With oil and gas deposits in the North Sea, Norway is one of the **world's leading oil and gas exporters**. The petroleum industry has also given rise to a great deal of activity in the processing, supplier and service industries. • Rich fish resources have formed the basis of the **fish-processing industry**, and **fish farming** has made Norway one of the world's leading salmon exporters.

[1] Statistics Norway (SSB), https://www.ssb.no/en/

[2] https://en.wikipedia.org/wiki/Politics_of_Norway

[3] https://www.regjeringen.no/en/the-government/the-government-at-work1/id85844/

[4] The following information is copied from governmental webpages: https://www.regjeringen.no/no/dokumenter/Business-and-industry-in-Norway---1-Raw-materials-based-industries/id419338/

	• Rich supplies of **hydropower** laid the foundations of Norway's energy-intensive industry. • Norway has large forest resources that were first used as the foundation for the **wood-product industry** and later for the pulp and paper industry. The forestry industry was Norway's largest export industry up until the middle of the 20th century, and there is still a great deal of industrial activity in the wood-product and pulp and paper industries. • Norway's large **mineral deposits** form the basis of several types of industry, and there is a long tradition of extracting various ores from metalliferous rocks. Regarding **technology-based industry**, an increasing number of companies use advanced technology and specialist expertise to manufacture goods for niches in the market, including: **oil rigs, shipbuilding,** the **petrochemical industry**, and the **chemical industry** which has long traditions in Norway with the establishment of Norsk Hydro in 1905 who manufacture **chemical fertilisers**.[5] In the **service sector**, the **shipping industry** is worth mentioning, as *Norwegian interests control the world's third-largest fleet, making Norway a major maritime power. Norwegian ship owners are particularly active in the international tanker, bulk-carrier, chemical-carrier, gas-carrier, car-ferry and cruise markets*.[6] According to 'Innovation Norway', Norway has three world-leading industries: the oil and gas, maritime and the seafood sectors. *Renewable energy, the cleantech industry in general and the medical/biotechnology area, all represent interesting, emerging industries. Norway has also a strong tradition within metals and materials, very much based on clean energy. Finally, there are strong industry clusters and environments within finance, IT and knowledge-based services.* [7]
Research and development (R&D) intensity 2016[8]	Gross Domestic Expenditure on R&D (GERD) in national currency: 69 713 GERD as percentage of GDP: 2,03 Percentage of GERD financed by government: 46,65 Percentage of GERD financed by the business enterprise sector: 43,20 Percentage of GERD financed by other national sources: 1,68 Percentage of GERD financed by the rest of the world: 9,46 Percentage of GERD performed by the Business enterprise sector: 53,27 Percentage of GERD performed by the Higher Education Sector: 32,58 Percentage of GERD performed by the Gerovenment Sector: 14,15

[5] https://www.regjeringen.no/no/dokumenter/Business-and-industry-in-Norway---2-Technology-based-industries/id419354/

[6] https://www.regjeringen.no/no/dokumenter/Business-and-industry-in-Norway---Shipping/id419362/

[7] Innovation Norway is the Norwegian Government's most important instrument for innovation and development of Norwegian enterprises and industry. (https://www.innovasjonnorge.no/en/start-page/invest-in-norway/industries/)

[8] As found in OECD MSTI database, 2017 figures. https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB

5.1.2 Results from the questionnaire

5.1.2.1 Demographics

The interview meeting included 26 participants, with diverse backgrounds as the following three demographic variables indicate:

1. Gender: There was an almost equal representation of women and men: 14 were female and 12 male.
2. Age: Younger age groups had a slightly higher representation, with 7 participants in the ages 18-29, and 5 in the ages 30-39, compared to 4 in the ages 50-59 and 60-69 (Figure 1)
3. Sector of employment: A slight overweight of participants were employed in the public sector. There were also several employed in the private sector, while 5 were student (Figure 2)

Figure 1 - Age groups

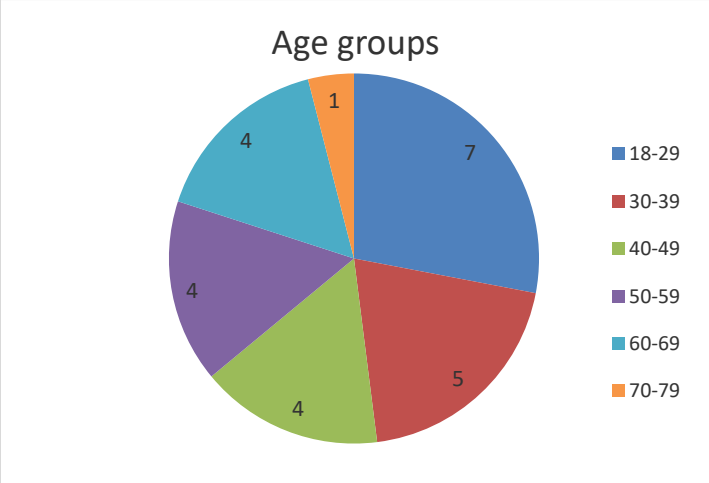
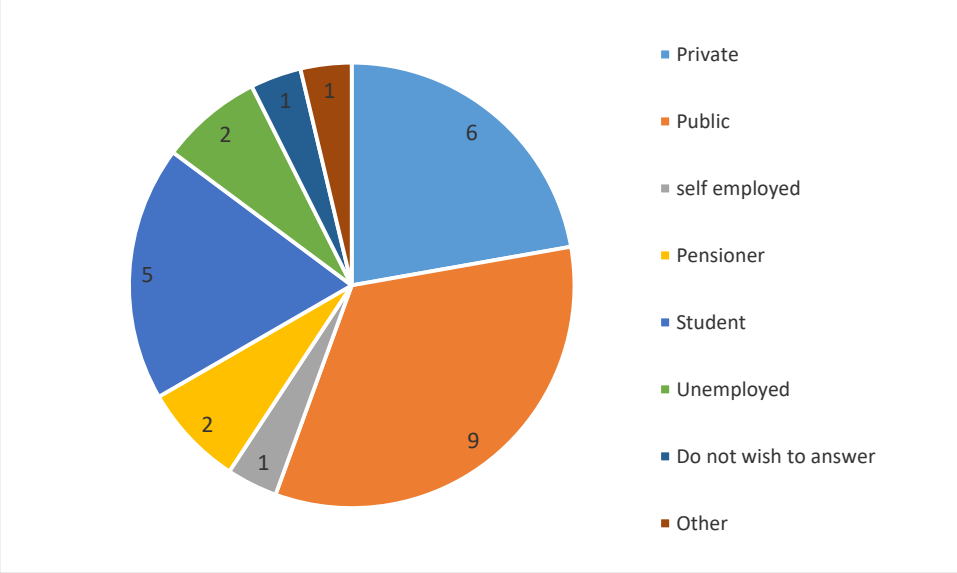


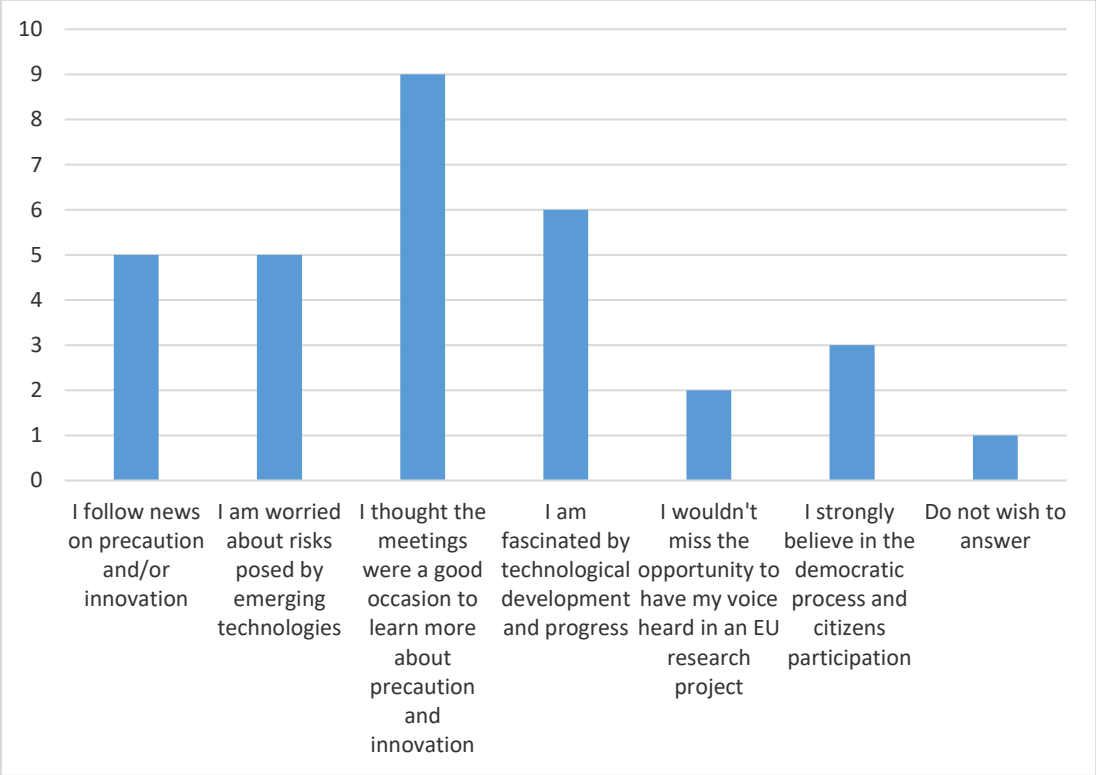
Figure 2 - Sector of employment



5.1.2.2 Reason for participation

Figure 3 shows that the respondents had varying reasons for participating. The most frequently mentioned reason – 9 of 26 – is that they thought the meeting was 'a good occasion to learn more about PP and innovation'. The second most frequent reply is 'I am fascinated by technological development' (6), while slightly less participants indicated they were worried about emerging technologies (5 respondents).

Figure 3 - What was your motivation to join the citizen meeting?

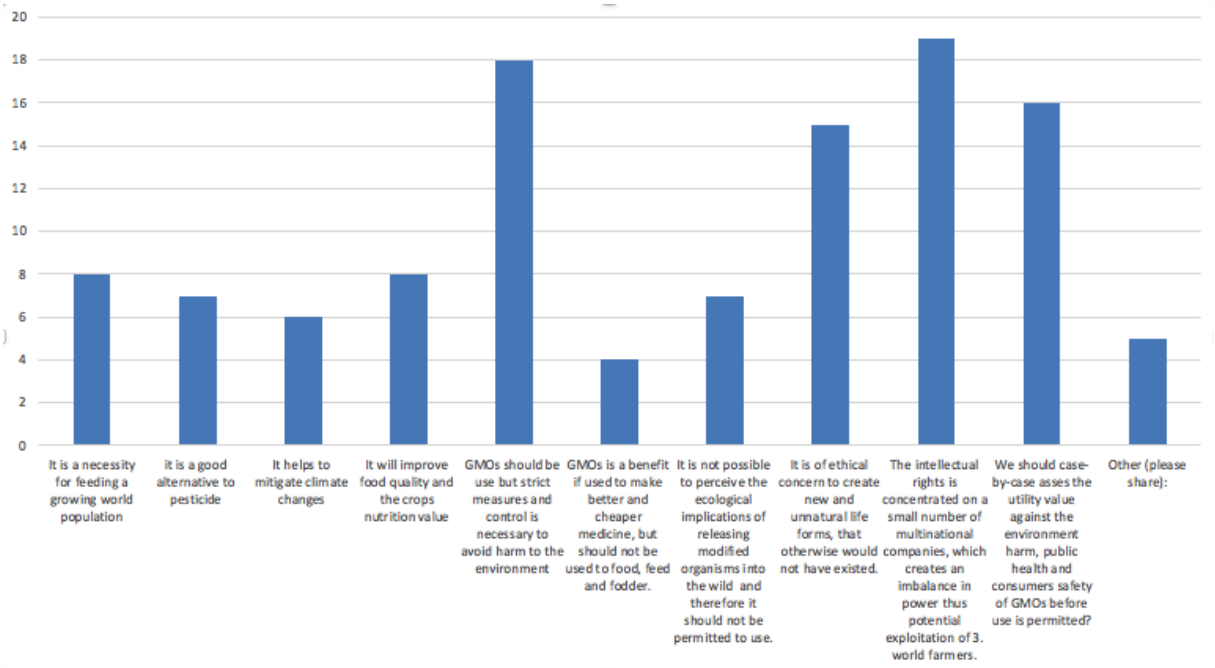


5.1.2.3 Genetically modified organisms

Figure 4 shows that opinions on GMO varied. However, concerns regarding ethical and international fairness seem to dominate – 15 of 26 respondents worried about the ethical concern to create new and unnatural life forms, and 19 of 26 respondents worried about the international imbalance in power and thus a potential exploitation of 3rd world farmers. Compared to this, only a few respondents marked the more optimistic statements: 8 persons marked 'It is a necessity for feeding a growing world population, 7 persons marked 'it is a good alternative to pesticide', 6 persons marked 'it helps to mitigate climate changes', and 8 persons marked 'It will improve food quality and the crops nutrition value'.

Further, statements suggesting some regulations were marked frequently, especially the statement that 'GMO's should be used under strict control' (18 of 26 respondents) and 'we should case-by-case asses the utility value against harm' (16 of 26 respondents). However, only 7 of 26 participants opted for the very strict regulation option stating that 'It is not possible to perceive the ecological implications of releasing modified organisms into the wild and therefore it should not be permitted to use'.

Figure 4 - What is your opinion on GMOs? (Mark every statement that you agree with)



A generally more cautious attitude towards GMO was visible in the replies to questions on labelling GMO products. Most of the respondents (21 of 26) agreed to that it is fair to require labelling of products containing GMOs, without evidence that GMOs are harmful to human health. Further, 19 of 26 respondents agreed to that the labelling of genetically modified foods also should cover products which are manufactured using genetically modified fodder or other genetically modified ingredients.

5.1.2.4 Nanotechnology

In figure 5, is it evident that the most frequently replied options are the two that suggest that nanotechnology could be used under some form of control: 15 of 26 replied it should be used under strict control, and 15 of 26 replied a case-by case assessment before use is permitted.

The figure also shows that slightly higher number of respondents have a positive perception of nanotechnologies, compared to the ones who have a strictly negative perception: While 11 of 26 answer that 'it poses endless opportunities', 7 of 26 answer that the risks are too high and it should not be permitted at all.

However, looking at figure 6, a majority of the respondents answer that 'we should ban the use of targeted medicine or nanomaterial if there are specific risks connected to them'. It also seems that respondents generally agree more to banning the use of nanoparticles in materials than in medicines.

Figure 5 - What is your opinion on nanotechnology?

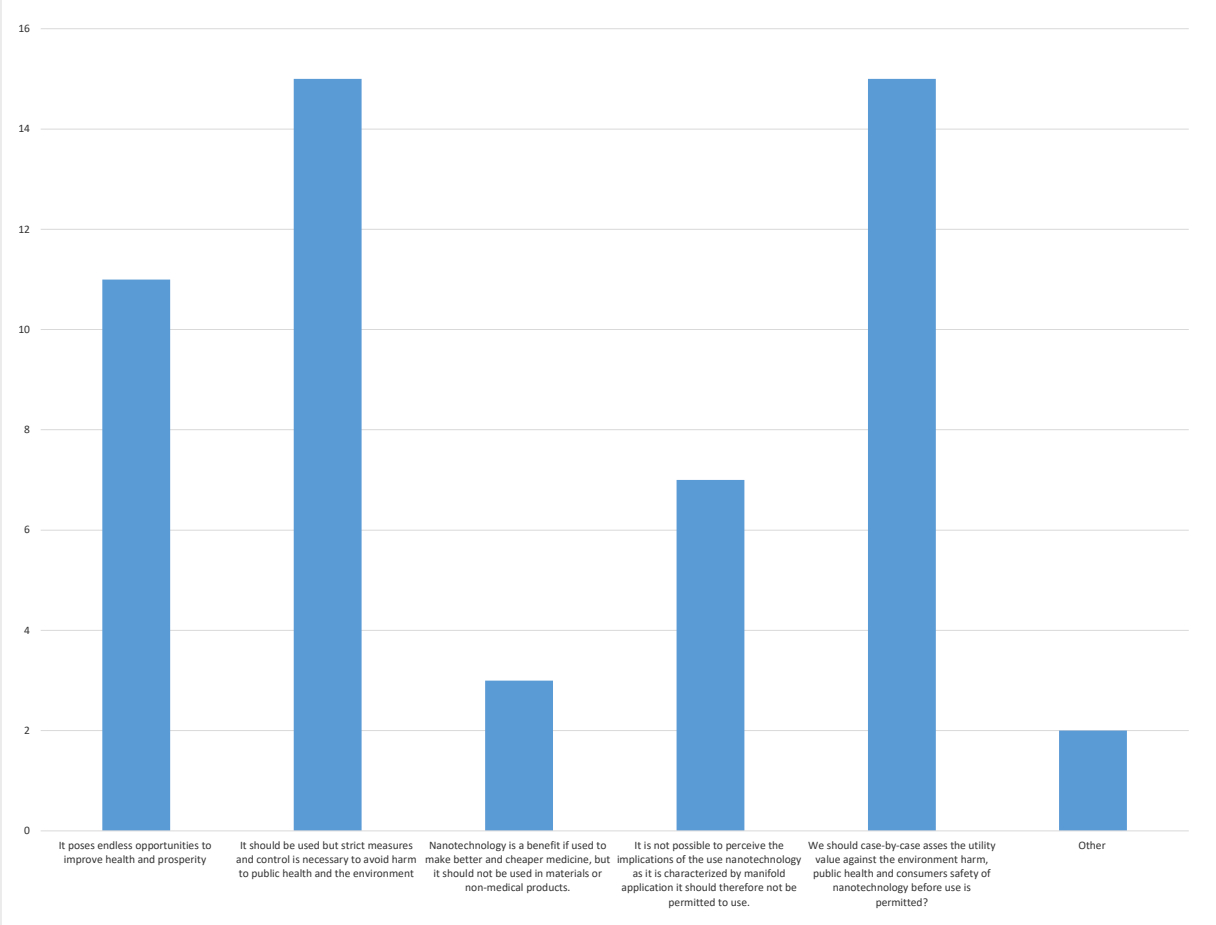
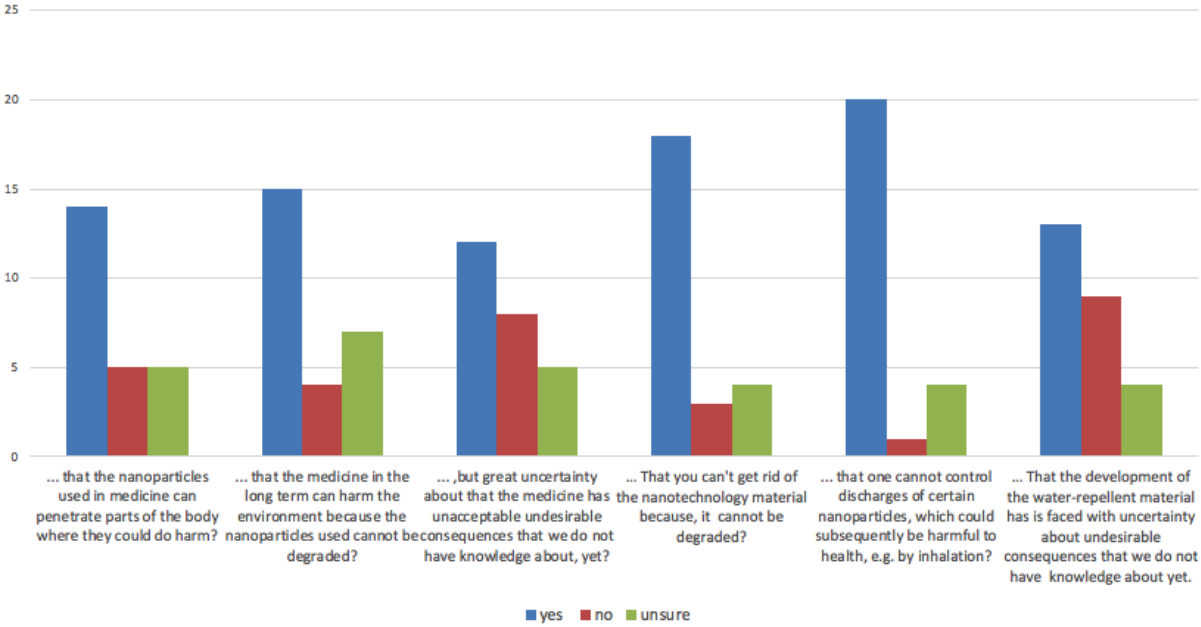


Figure 6 - Should we ban the use of targeted medicine or nanomaterial if there is a risk



5.1.2.5 Pesticides

The concerns regarding pesticides seem to be higher than those regarding GMO and nanotechnologies. Only one person answered that there are no problems with pesticides, and 3 persons answered that it is a necessity for food supply. The options that suggested that it could be used under strict restrictions / regulations / control received the most replies. On the other hand, only 4 persons replied that pesticides should not be used at all.

However, figure 8 shows that regarding applying the PP to ban neonicotinoids pesticides specifically, no one replied that it should not be banned, 10 answered a total ban, and another 10 answered it should not be banned but that there should be strict restricted and controlled use.

Figure 7 - What is your opinion on pesticides?

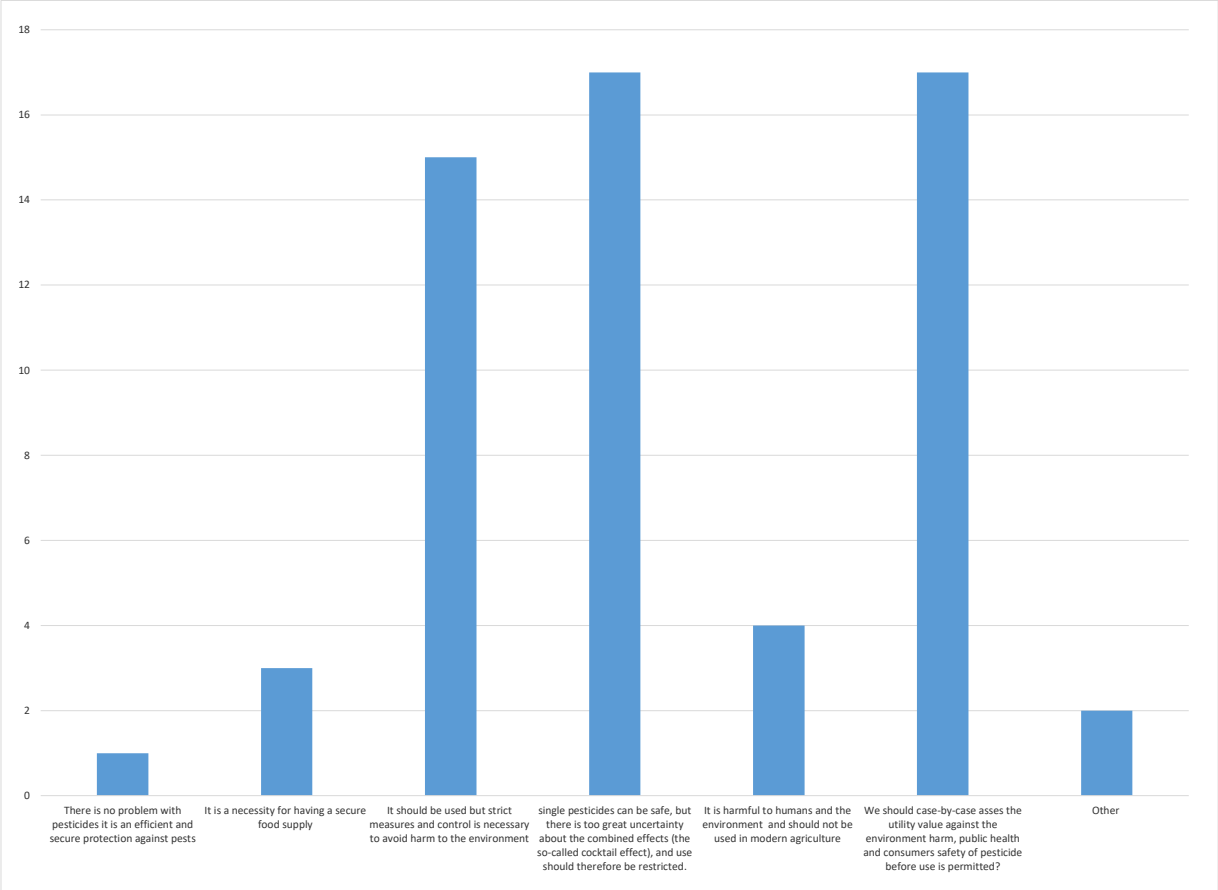
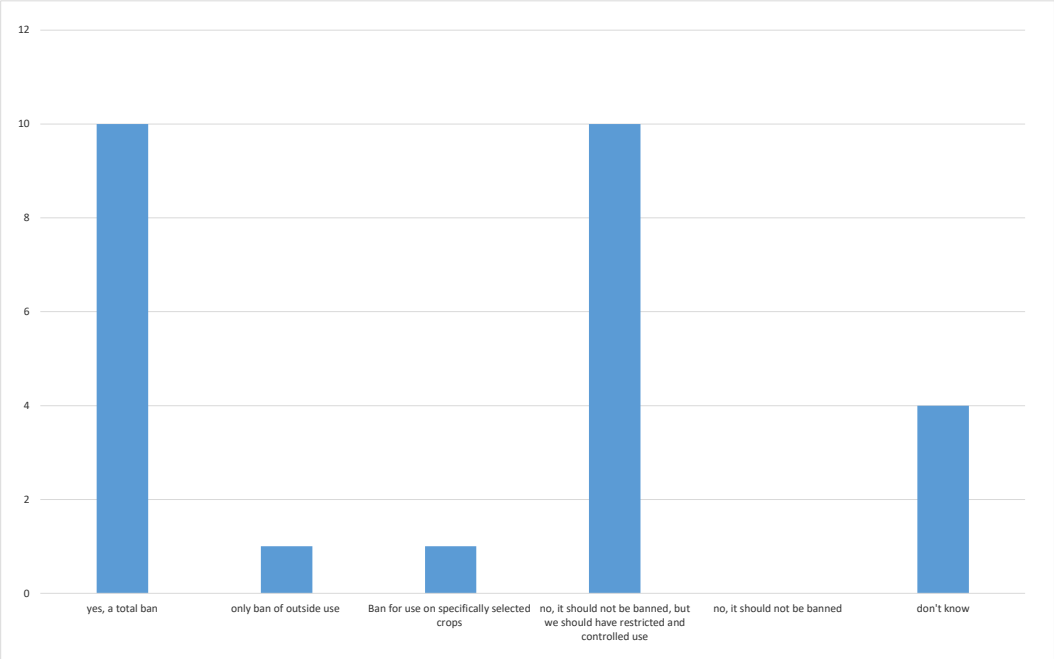


Figure 8 - Should EU apply the precautionary principle and ban the use of all neonics?



5.1.2.6 Precaution and innovation

5.1.2.6.1 Perceptions of precaution and innovation

Figure 9 and 10 show that respondents have positive associations to both concepts. Figure 9 shows that the majority of the respondents associated precaution to a logical way of protecting public health and environment (19 of 26). Compared to this, only one person replied the more negative associations (overprotection and a hindrance to innovation). Figure 10 shows that a majority of the respondents perceive innovation as something positive, logical and necessary, while only three respondents associated it with a way for developed countries to keep 3rd world countries down.

Figure 9 - What is precaution to you?

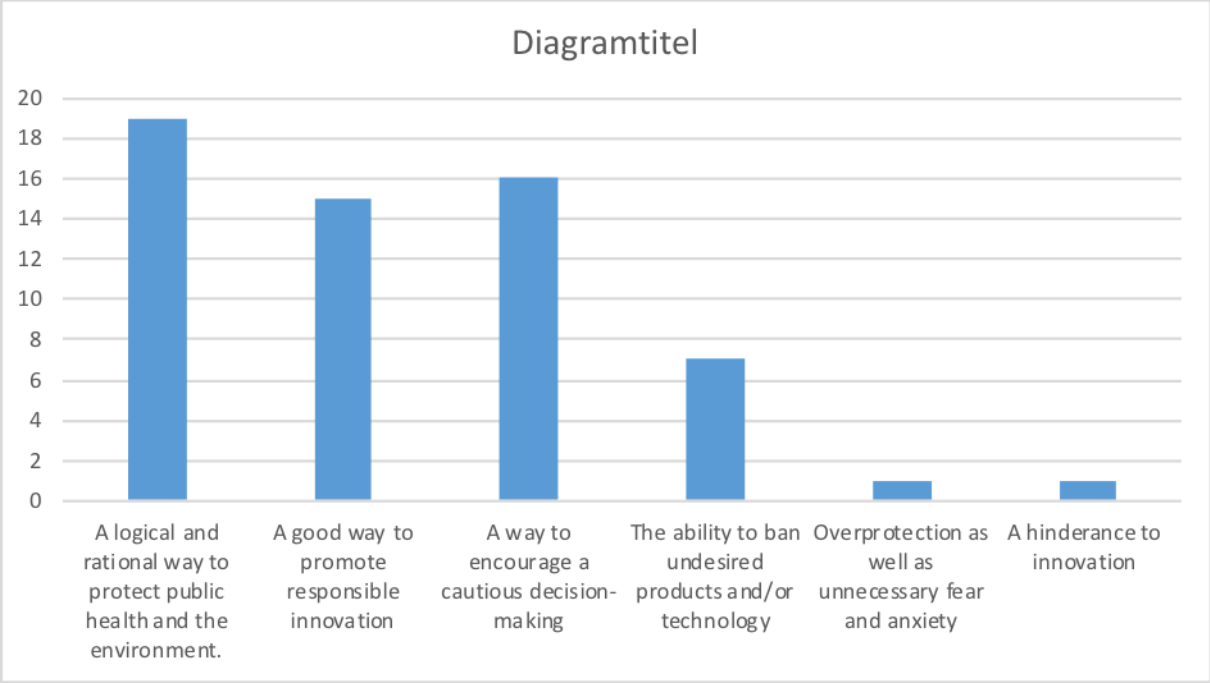
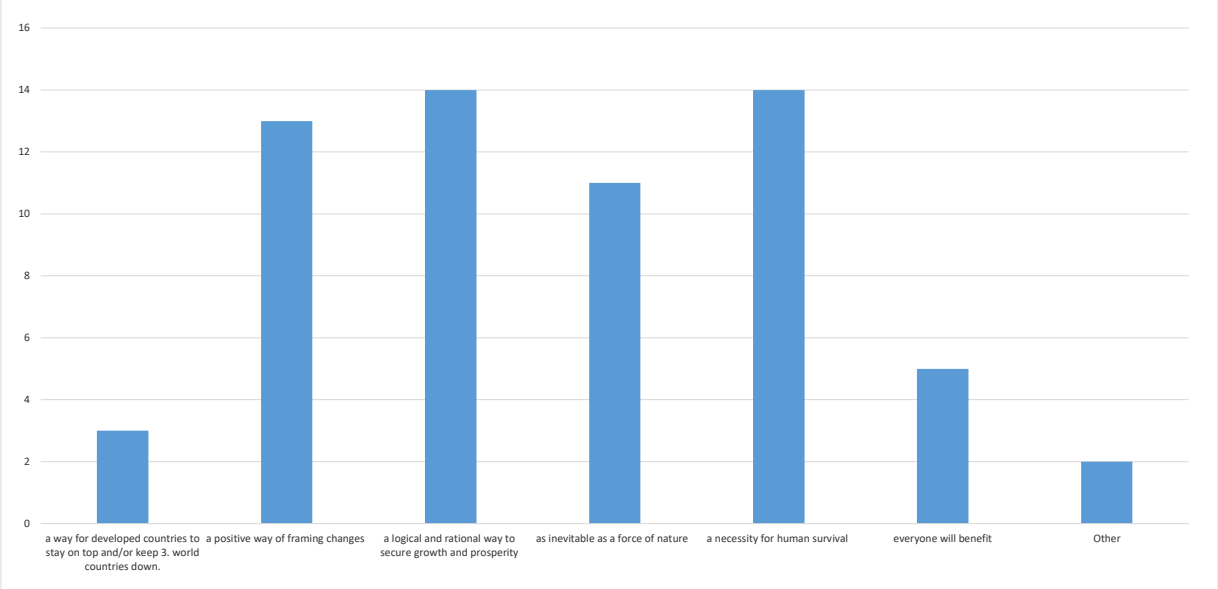


Figure 10 - What is innovation to you?



5.1.2.6.2 Balancing precaution and innovation

Of the 26 participants, the majority (16 of 26) answered that they do not think there is a trade-off between precaution and innovation. When asked which one would have a higher priority, 10 of 14 answered that precaution should have a higher priority, while only 1 respondent prioritised innovation. 3 respondents answered they should be weighed equally.

Figure 12 shows that the majority of the participants (23 of 26) agree that the precautionary approach also cover ethical and moral aspects and assessments of possible social consequences.

Figure 11 - Balancing precaution and innovation

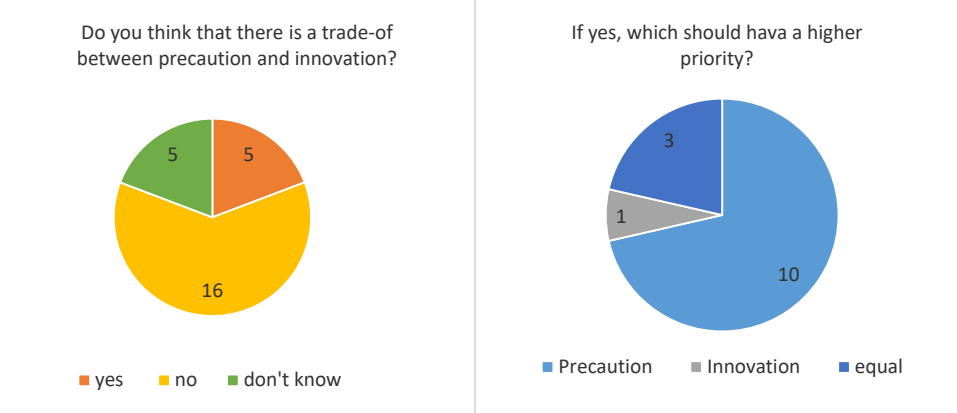


Figure 12 - Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?

5.1.2.6.3 Applying the PP

On the question of who should be involved when the PP has been invoked (figure 13), many respondents replied all or most of the alternatives. Academia, research, governmental legislators, governmental agencies, and advocacy groups where the most frequently chosen actors, while SME's got the least votes.

Figure 14 shows that the majority of the respondents answered that the industry should bear the burden of proving that a product is safe, rather than that the state should prove that it is dangerous.

Figure 15 indicate that respondents perceive the level of certainty needed for banning a product quite differently.

Figure 13 - Who should be involved when the precautionary principle has been invoked?

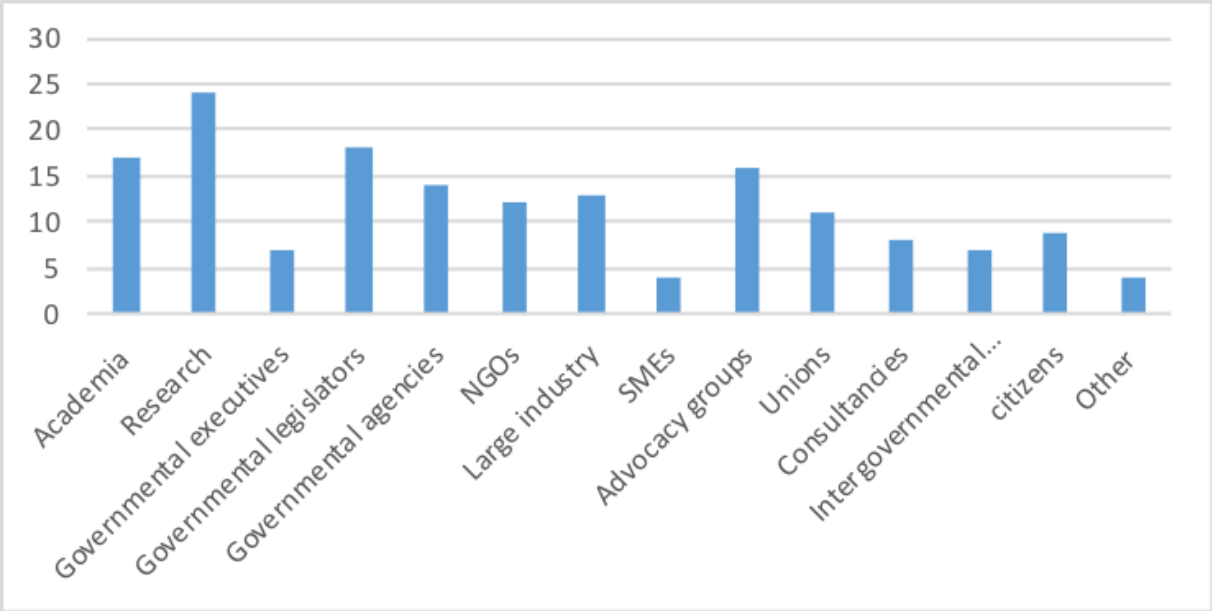


Figure 14 - Burden of proof: Should the state prove that a certain product or technology lead to unacceptable harm before they can be banned or should the provider or industry prove that the product or technology are safe before they can be brought on the market

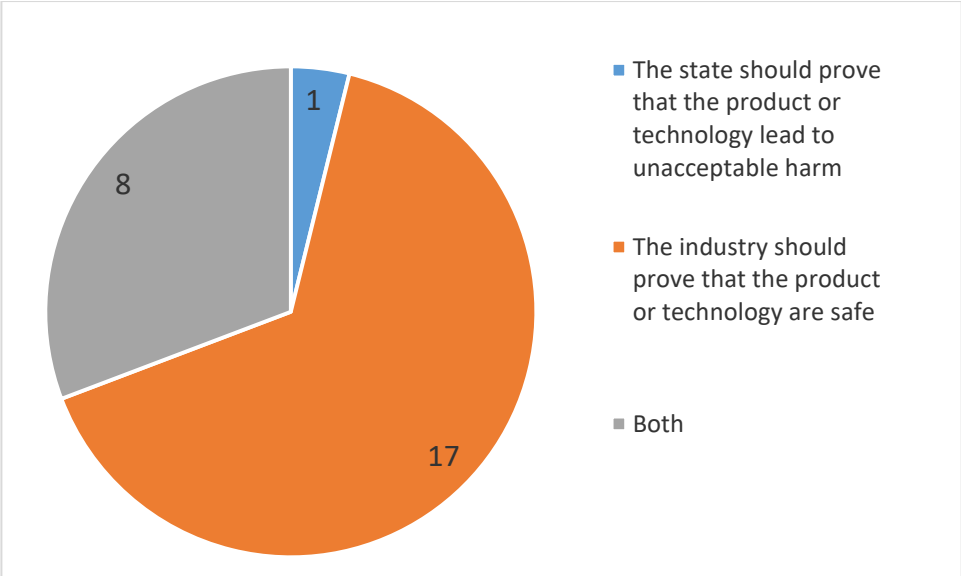
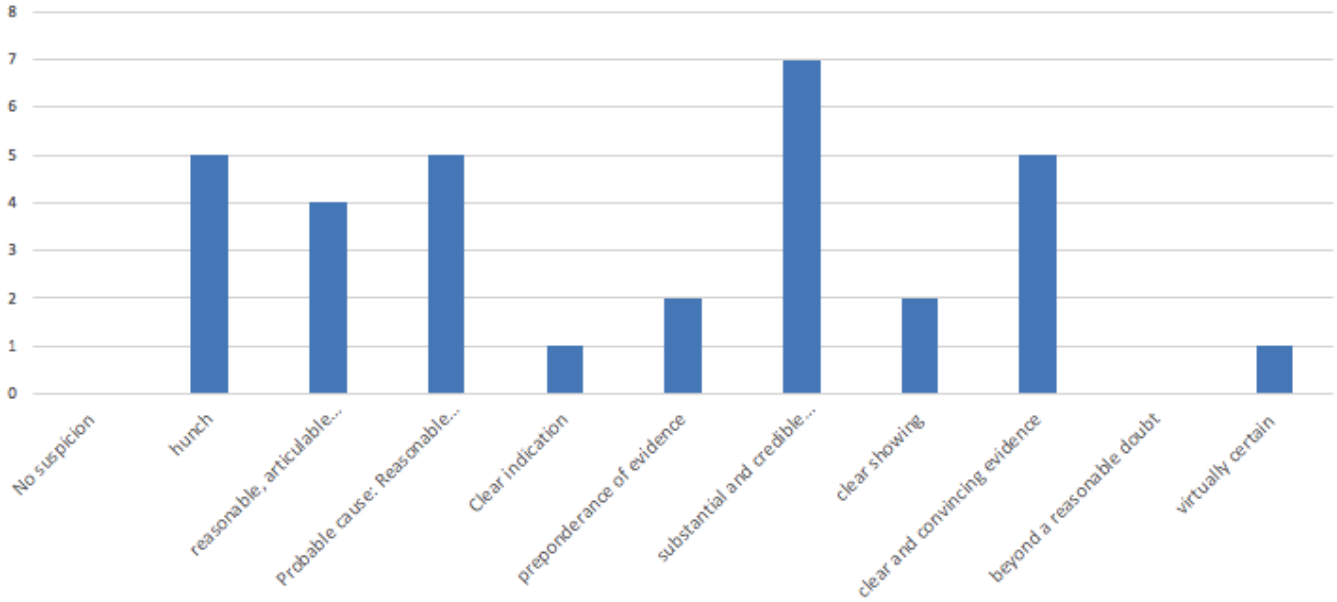


Figure 15 - How much certainty is needed / how strong does the evidence need to be before it is justified to ban a product or technology?



5.1.2.6.4 Developing the PP, and Regulation and control of technologies

Figure 16 shows that only 5 respondents trust politicians and authorities to regulate technology, compared to 12 who do not trust them. This may seem problematic when considering that none of the respondents answered 'no regulation, market forces will be sufficient' to the question on how they wish uncertainty with technology to be regulated. While the entire 26 participants answered that a precautionary principle should come into effect, figure 17 shows different opinions on how it should come into effect.

Lastly, figure 18 shows that most respondents believe that some regulations of technologies are possible.

Figure 16 – Trust in politicians

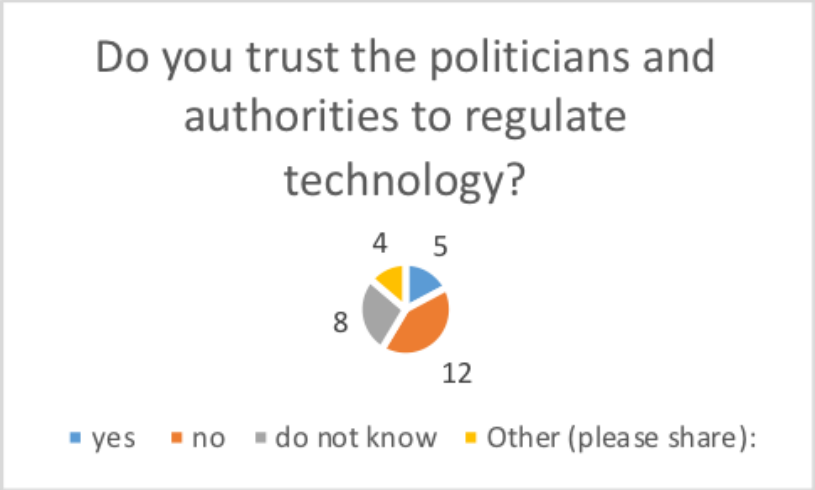


Figure 17 - How do you wish uncertainty with technology to be regulated? A precautionary principle that comes into effect when uncertainty about potential risks arise that requires

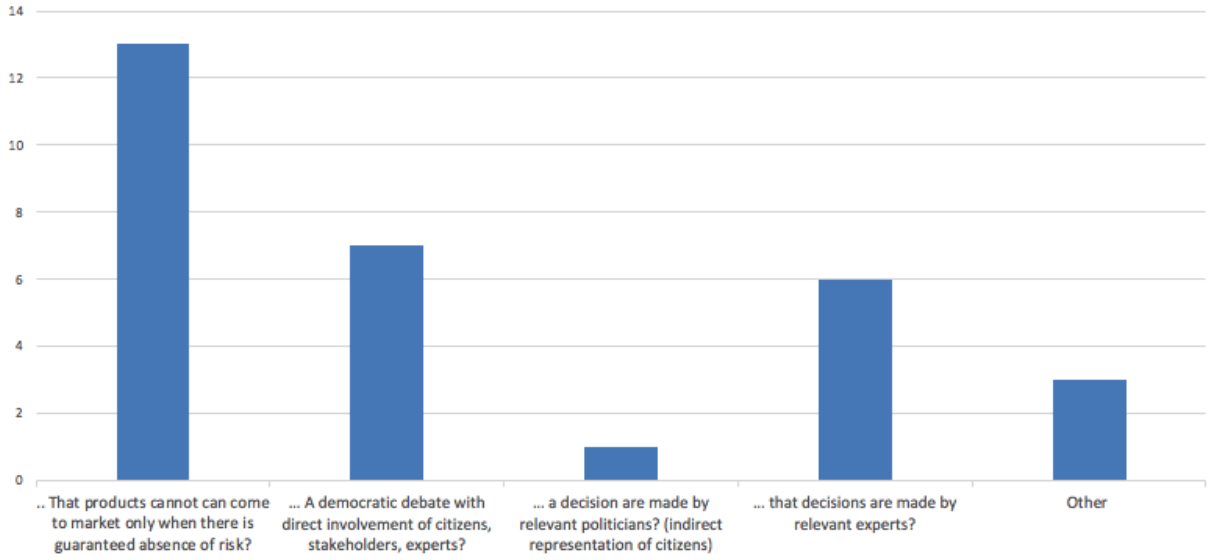
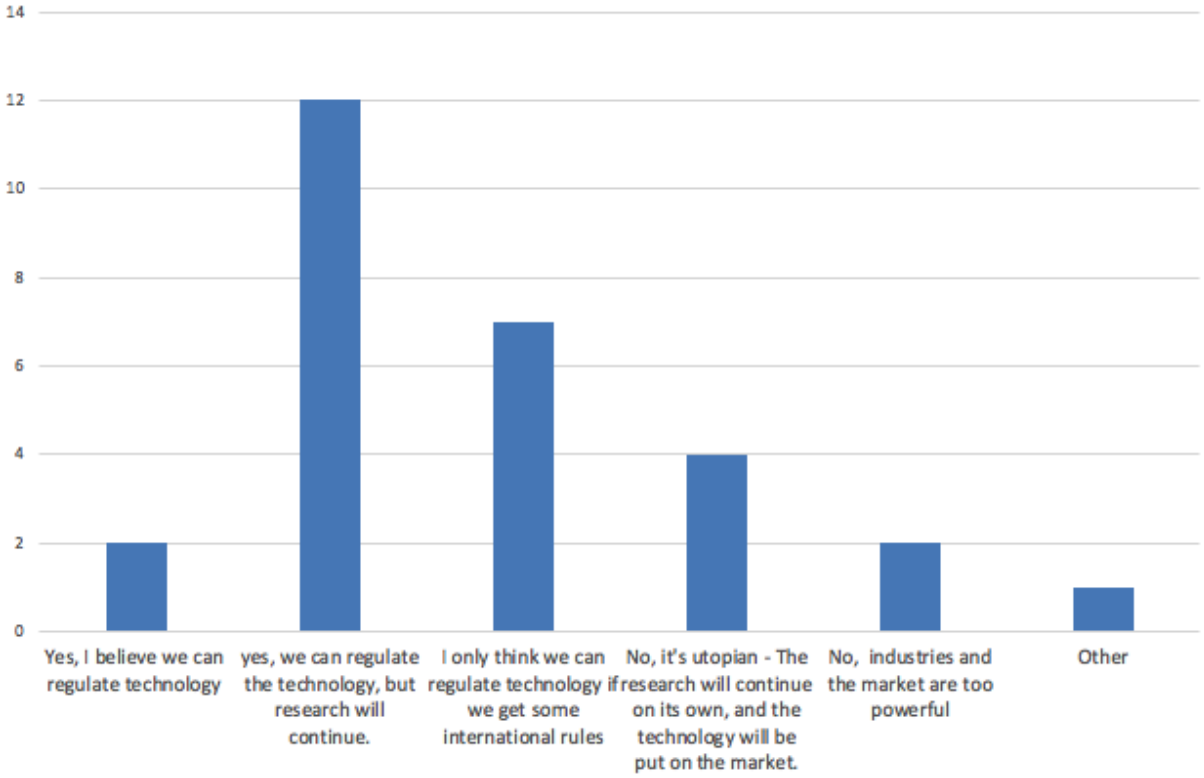


Figure 18 - Do you think the development of technology can be controlled?



5.1.2.7 Final remarks

The responses to the two last questions evaluating the meeting, shows that the majority felt that both the information material and the survey gave good overviews of issues and were easy to understand.

What did you think of the information material?

It gave a good overview of issues related to precaution and innovation	24
It gave a biased overview of issues related to precaution and innovation	2
It was easy to understand	16
It was hard to understand	1
Do not wish to answer	0
Other	2

What did you think of the questionnaire?

It gave a good overview of issues related to precaution and innovation	16
It gave a biased overview of issues related to precaution and innovation.	1
It was easy to understand	17
It was hard to understand	3
Do not wish to answer	2
Other	2

5.1.3 Themes from the group interviews

5.1.3.1 Precaution and innovation

5.1.3.1.1 Is there a trade-off between the two? And if so, which should be prioritized?

In all of the five groups, there was a general agreement that both precaution and innovation are important and should be balanced. However, there were some disagreements on how to strike a right balance between these. Many participants indicated that precaution was more important and should be a baseline for innovation, and examples such as pesticides were mentioned linked to worries about insect decline. Others argued that too much precaution could hinder development of e.g. food production. In one group, different perspectives emerged during the discussion. One participant argued that historically, it does not seem that the precautionary principle has hindered innovation. Another participant disagreed, stating that there is probably many restrictions hindering an increase in food production today. A third participant then argued that precautionary regulation can direct innovation in more sustainable directions, in other words not restrict innovation but rather steer it. A similar argument was mentioned in another group, where it was argued that innovations like nanotechnology could develop well under precautionary restrictions.

There were also some participants who indicated that innovation within large international industries/companies cannot be trusted in voluntary following precautionary approaches; they lack incentives for being truly precautionary, are too cynical, and therefore need to be regulated.

Regarding the prioritisation between precaution and innovation, many participants underlined that it would depend on the case. Some forms of innovation could imply none or little risks, while others could have serious consequences for environment and vulnerable groups, and insights into the possible harmful effects is therefore a precondition. One group discussed the importance of weighing benefits against risks of harm, underlining that some innovations that have large societal benefits should be able to take higher risks, than for example waterproof material in rain clothes that are not so important.

5.1.3.1.2 Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?

There was some confusion about this question and it was mostly not discussed much directly, besides wide agreement that a precautionary approach generally should cover ethical and moral aspects (because, as asked by one participant, what is it covering if it is not ethical and moral aspects?). Rather, discussions often focused on what social consequences imply. Different examples of social consequences and social inequalities were mentioned in the different groups. One group discussed ethical values in Norway such as democracy and gender equality, and one example mentioned was that innovation could have implications on gender equality. In another group, it was mentioned that ethical concerns must be included in for example cloning technology. One participant also mentioned that it probably could be useful to discuss possible ethical issues when developing any kind of innovations, because the discussions could also open up for new solutions.

In three of the groups, discussions centred on social consequences and social inequalities related to practises of industry/large multinational companies. Some participants expressed a worry that large multinational companies are immoral and do not consider ethical aspects and social consequences. Examples mentioned came from the big pharmaceutical industry, and companies such as Monsanto/Bayer in the case of GMO seeds.

One group also discussed how social consequences could be assessed in an objective manner.

5.1.3.1.3 Who should be involved when the precautionary principle has been invoked?

Some participants mentioned that as many actors as possible should be involved, in order to get a broad spectrum of opinions. It was suggested that as many as possible should be involved in the discussion, but perhaps only a few actors (some suggested public authorities while others suggested experts) should take the final decisions. Others disagreed and argued that including many groups was time-consuming - it would slow down the innovation process too much. Especially, it would be chaotic and time-consuming to include citizens with no real expertise. China was mentioned as an example, where innovations are fast because few are involved, but there are few ethical regulations, and this may also be problematic. A related argument was therefore that citizen's inputs are important in a democratic society. However, some indicated that it might be sufficient that citizens are indirectly included in a democratic system, or that researchers include citizen's perspectives.

Of the specific categories, research and academia were often mentioned. Some argued that experts should have the main say, but others argued that this is also problematic because researchers and experts can also be paid by industry, which in some cases can remain hidden. Independent research was therefore highlighted as a valued issue. In addition, some participants highlighted that politicians are important, but that they have to use different sources of (independent) research.

In one group it was argued that the list could be divided into two groups – public and private interests, and that it is important to include public interests to restrict market forces. Issues of democracy and power-imbalances were mentioned, and it was argued that less powerful actors should be included too.

5.1.3.1.4 Should the burden of proof be on the state or the service/technology provider?

Generally, the question was understood as who should pay for (bearing the burden) testing a product. Some participants underlined that the industry must bear this burden because it is costly and time-consuming. Other participants tended towards both, but highlighted that first; the industry should prove that a product is not harmful, and that thereafter the government should get involved.

In two of the groups, after mentioning that the industry has the main responsibility of explaining how a product is not harmful, counterarguments appeared. One argument was that researching possible harmful effects may be expensive, and small industries might not be able to afford it – an example was small industries innovating sustainable products with algae. Therefore, it was suggested government could fund the testing of the products if the industry has little funds and the gains for society are large. On the other hand, is it fair that taxpayers (indirectly through government controlling) pay for the development of a product, or should the companies pay for this themselves? Another argument was that it is dangerous to leave the responsibility to the industry, which cannot be trusted, and that government therefore must be involved. An example mentioned here was how industry had self-regulated the security of the Boeing airplanes, which later had crashed.

There were also discussions around the difficulties of assessing risks, especially long-term consequences. How to assess harm and how much harm is acceptable? The example from

nanotechnology was brought into de discussion in one group, where a participant underlined that this is particularly challenging for EU and 'weak' states to regulate because things are developing very rapidly.

In one group, they discussed how regulating does not need to be a burden, but can be useful for everyone, also for industry who can increase their income by becoming more environmental friendly. An example was mentioned where government regulated the emission allowance of factories, and consequently, the industry found innovative ways of adjusting by collecting the emissions and changing it to something they could sell. Thereby, both the environment and industry benefitted. It was suggested that perhaps something similar could happen in the pesticides industry to avoid insect decline?

5.1.3.1.5 How much certainty is needed before it is justified to ban a product or technology?

Two of the groups tended towards the high end of the scale (although questioning whether this really was a scale), arguing that one had to be quite certain, because banning a product is serious. However, it was highlighted that it depends on the case and the scale of the risks. E.g. Are the risks potentially a harm to the entire human population, or is the risks concerning a few unlucky individuals? One participant highlighted that the cases (GMO, nanotechnology) were difficult to discuss because they are about future uncertainties, while discussing historical innovations is easier – referring to an example of the innovation of electricity, which contained many risks but still was carried out, to the benefit of everyone. Another group discussed why GMO is banned in Norway, when is proven un-harmful. Another example mentioned was nuclear power.

Compared to this, two other groups tended towards the more precautious end of the scale. In one of these groups, some argued that a worst-case scenario should be used as a starting point. The example of neonics was mentioned – these chemicals should be banned, because the possible consequences are high. They considered GMO more complicated.

The last group started with discussing how much documentation should be given before something was allowed on the market. It was argued that the documentation required for allowing a product should be thorough and solid. DDT and cigarettes were drawn in as examples of products that were allowed without knowing the risks. Next, the difference between the scope of risks in different cases was discussed, and vaccinations and pesticides were compared. It was argued that pesticides differ from vaccinations, with regards to scope; while vaccinations have significant benefits to society as a whole but risks of side-effects to individuals, pesticides are not as essential for society but carries much broader risks to the earth as a whole. Therefore, thresholds for banning pesticides should be lower.

5.1.3.1.6 Do you trust the politicians and authorities to regulate technology?

There were different opinions between participants in all the groups. Some said they trusted Norwegian politicians, and things seem to work well here. Others explained they had lost trust after gaining insights into specific cases. One participant mentioned she lost trust after becoming a parent and discovering the lack of regulations on toxins in clothing for children. Another participant argued that local politicians do not consider the precautionary principle in cases of spatial planning, because they prioritise local industrial developments. In his perception, local politicians lack education and are not able to properly appraise risks. Windmill parks were mentioned as example where risks for protected environments has not been assessed properly.

Some argued that they had more trust in politicians and authorities in Norway than internationally. EU and US were often mentioned as being impacted by corporate lobbyism.

5.1.3.1.7 Who should be involved in the further development of the precautionary principle?

Some of the groups had few comments to this question, and some participants compared this to question 3 (section 3.1.3) and said they juts crossed off the same actors. Other participants argued that compared to the question of invoking the PP, more participants could be involved here in the development – everyone can contribute. Actors at the international level were also highlighted in one group.

In one group, researchers and academia was first underlined as the main actors to further develop the PP, but there was some discussion on what researcher's roles should be. One participant argued that politicians also are important, because different kinds or researchers would have different kinds of expertise and different opinions, and politicians should be the actors mediating between the different types of expert insights.

5.1.3.1.8 How do you want uncertainty with technology to be regulated?

Many participants were uncertain about this question (what is regulation? Uncertainty for who or at what scale?), and the discussions in the different groups took different directions.

One group focused on how the PP should be used as an important tool when uncertainty is high, including the step to be open for re-evaluation when new consequences of technologies are discovered. Paid or commissioned research was also discussed as problematic, and the importance of facilitating neutral research in order to get neutral regulation was highlighted.

In the second group, it was also mentioned that openness to uncertainties is important to enable a change of direction. Uncertainty could be reduced by more innovation and openness to regulation when new consequences are discovered. The oil industry was mentioned as an example of an industry that are trying to change direction towards cleaner production.

The third group debated whether experts or politicians should be the main regulators. In addition, this group questioned who experts are and reflected on the question which kind of expertise should be involved. There was some disagreement amongst the participants. One participant trusted experts more, while others argued that there may be many different experts and they may not agree. Therefore, politicians should have the final say. Eventually they seemed to agree that the regulation process should first involve a broad spectrum of experts, and thereafter politicians who have to make decisions weighing the different expert advice in addition to input from stakeholders or interest groups.

In the fourth group, there seemed to be an agreement that strict regulation is important. One participant argued that worst-case scenario thinking should steer regulation, because we are risking irreversible damage to our ecosystems. Two participants underlined that diverse groups of academic communities need to be involved in the regulation. This was because advanced technologies involve highly specialised experts who are trained to focus on very specific issues, and who may overlook broader or more varied aspects.

In the fifth group, one participant first mentioned that more information from different sources on products (uncertainty of the products ingredients and possible side-effects) was important to enable consumers to make informed choices. Then a discussion started on how uncertainty should be assessed. One participant highlighted that in local area planning (in Norway), the PP is often not properly addressed or applied. The participant thought the main reasons was that local authorities have too little knowledge to understand or initiate a risk- and vulnerability analysis, or that they chose to prioritize local economic growth and job opportunities. He therefore suggested that the government should give permission before innovations are allowed. Additionally, the importance of allowing re-regulation of a product if new consequences are discovered was mentioned in this group too.

5.1.3.1.9 Do you think development of technology can be controlled?

While some participants simply answered no, there were some discussions of possibilities. On the one hand, some participants in the various groups argued that some degree of control at the national scale (in Norway) was possible, regarding some technologies like GMO and nanotechnology. One participant argued that GMO could have developed further if there had been less control, and this shows that there has been some control, and that at least the speed of such developments can be slowed down. Another suggestion mentioned in two of the groups was that funding (or not funding) certain kinds of research or giving other kinds of economic incentives, is a way of steering technology development. It was underlined that this did not imply controlling directly, but rather steering technology development towards desirable directions. The possibilities of steering would however vary hugely between counties.

On the other hand, some participants said development of technology cannot be controlled because of economic interests, and that some actors will always want to push developments further. They often mentioned that some technologies, like AI, are impossible to control.

Further, many participants argued that this is much more challenging, but also more important, at the international level. One participant highlighted that the case of the CRISPR babies in China shows that even one of the world's most totalitarian states cannot control the development of technology. Another participant argued that coming to international agreements is challenging, pointing to the example that even agreements such as human rights have been difficult to control. However, a participant in a different group argued that it is possible sometimes, if the consequences are severe enough, pointing to the example of the one-child policy in China and the international regulations of nuclear power. And if no one believes it can work, it will not work.

5.1.3.1.10 Other comments

Some of the groups had time for an open round of comments after the 10 questions were discussed. Here are some points that were mentioned:

- There were some questions regarding what PP involves.
- Several participants questioned innovation:
    - What is growth / progress? Is progress always good or is there too much focus on progress?
    - Who will benefit from the innovation – the companies or consumers?
    - There is a hype about always developing 'something new', while many existing technologies and tools could be utilised better.
- Technological innovation can also have consequences for employment, people may loose jobs
- Suggestions that innovations can be more green / sustainable: One participant argued that many 'positive' and sustainable innovations are emerging in Norway.
- The PP is perhaps in the law, but it is often ignored in praxis because economy and job opportunities are prioritised.

5.1.3.2 Summary

Precaution and innovation (3.1.1)

- In all the groups there was a general agreement that precaution and innovation needs to be balanced and that one should not choose between the two. It was argued that precaution can steer innovation in a positive way, not necessarily restricting it.
- Regarding prioritizing between the two, most of the participants tended towards a more precautionary approach. It was however highlighted that it depends on the case. Some participants argued that too much precaution could hinder innovation. Cases from development of medicine was mentioned, in addition to that research on GMO could have developed further if there had been less precaution.

Assessments of social consequences in a precautionary approach (3.1.2)

- It seemed that few participants were familiar with the PP in itself, but many participants indicated that it should include ethical aspects.
- Some participants were concerned about social consequences of innovations promoted by multinational companies.

Actors involved in invoking PP (3.1.3) and in further developing PP (3.1.7)

- There was some disagreement regarding whether only experts or as many participants as possible should be involved, and whether this would be too time-consuming or not. Some disagreement on the role of researchers/experts also appeared; while some participants argued that experts should assess risks, others argued that public authorities should have the main say after consulting different expert advice and/or interest groups.
- In some discussions, expertise was questioned – who are experts / researchers, which experts should be involved, and how independent or objective is expert assessment?

Burden of proof (3.1.4)

- There was a general agreement that industry should pay for testing the product. However, there were also some scepticism towards industry and it was argued that the government has to be involved.
- It was also mentioned that assessing risks does not need to be a burden for industry but that it can also lead to other innovations.

Certainty required before banning a product (3.1.5)

- There was some disagreement on what level of certainty is required to justify a ban, depending on what cases were discussed.
- It was highlighted that it would depend on the scale of the potential consequences (risk for entire society/environment or individuals) compared to the scale of the potential benefits.

Trust in authorities regulating (3.1.6)

- Different opinions – some had trust, others had little trust
- Generally, there was more trust in the Norwegian system and its ability to regulate than in regulation at the international scale.

Regulation of uncertainty / Technology (3.1.8)

- Many participants were confused about this question (what is regulation? Uncertainty for who or at what scale?), and the discussions in the different groups took different directions. Two groups highlighted the importance of openness on uncertainties and

enabling re-evaluation of technologies when new consequences are discovered. In three of the groups, the difficulties of assessing uncertainty that eventually could lead to regulation was discussed, including the problem of different expert groups assessing uncertainty differently. One participant argued that the PP should have been applied in cases of local area planning, but is currently neglected because of a lack of knowledge about vulnerabilities/ and limited risk assessment, and because of giving priority to stimulating local economy.

Belief in controlling technology (3.1.9)

- Different opinions emerged, but there appeared to be some agreement that while there are possibilities to at least steer the direction of technological innovation in Norway (through e.g. funding of research or by creating economic incentives), it is especially important, but also challenging, to control and steer technology at the international scale.

Other / general issues and comments:

- Some participants mentioned it was challenging to discuss the cases we have chosen, because they are somewhat futuristic. Other examples were often drawn into the discussions, ranging from medicine, nuclear power, cars /self-driving cars, oil industry, fish-industry, windmills, and electricity.
- There seemed to be different underlying conceptions regarding what innovation is. While some linked innovation to academic research, others linked it to product development by industry. Many also questioned innovation – is it a hype, is progress always good, and who will benefit from innovation?
- Assessment of risks vs benefits were often discussed, with a focus on the scale of risks and benefits.
- It seemed that few participants were familiar with the PP and what it involves.

5.1.4 Conclusions

There seemed to be a general agreement that PP and innovation should be balanced, but some disagreement on how and how much. The majority of participants tended to argue for prioritizing precaution. However, some participants highlighted that a precautionary principle could hinder innovation, especially on medicine.

Much of the discussions evolved around regulations and restrictions of technologies. In the survey, everyone agreed to the statement 'marked forces are not sufficient to regulate uncertainty with technology, and the PP should come into effect'. In the discussions, many participants argued that technologies should be strictly controlled, regulated or restricted. However, some controversies emerged regarding how much certainty is needed before a product could be banned. While some regarded a hunch to be enough, others argued that banning a product is a serious matter and would need solid documentation. It was often highlighted that it would strongly depend on the nature of the case, and that the scale of risk should be balanced against the scale of gain (e.g., are the risk or the gains concerning the larger society or environment, or only individuals?). Further, there were different conceptions of the roles experts/researchers versus politicians/public authorities in the regulation of technology and assessment of risks.

Of the three cases, it seemed that participants expressed higher concerns about pesticides than about GMOs and nanotechnologies. Some controversies on GMOs emerged in the discussions. While many participants expressed worries about the developments of these technologies, some also highlighted the possibilities of these technologies and that the regulations in some cases may be too strict and hold back innovation.

Lastly, some controversies emerged around the questions on the possibilities of controlling technology. Participants disagreed about the possibilities to steer or regulate the development of technologies at an international level, but mainly agreed that there are possibilities to direct innovations towards more sustainable directions at a national scale.

5.2 Briefing report - Denmark

Citizen's view on Precaution and innovation - Denmark

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5.2.1 Executive Summary

This report presents the findings from the citizens' meetings organised by the Danish Board of Technology Foundation under the RECIPES project. Two meetings were held and both of them were situated in Capital area of Denmark, one in Copenhagen (4th of June) and one in Hvidovre (28th of June). The meetings were designed with the purpose to provide the participants with an occasion to reflect on technology, risks and safety, focusing on the precautionary principle and innovation. Three cases GMO, nanotechnology and pesticide were presented to the participant with the purpose to serve as examples of technology posing great opportunities, and at the same time containing uncertainties regarding potential health and environmental risks. During the meeting, participants expressed their opinions on precaution and innovation through a questionnaire and a group interview were the participants could elaborate further on their answers from the questionnaire.

During the Danish citizens meetings, we had a good and wide-ranging conversation about the issues surrounding precaution and innovation in a lively and friendly atmosphere. The overall impression from the meeting is that the participants in general recognized the importance of both innovation and precaution. Digging deeper into the questionnaire most participants (65%) did not see a trade-off between precaution and innovation and (over 90%) viewed precaution and innovation as having equal importance or that precaution should be prioritized in relation to innovation. This view was also represented in the interviews and the argument that precaution is a logical and fair respond to the protection of human health and the environment kept surfacing.

Another clear responds form the participants was the need of assessing innovation a technology case-by-case in relation to the utility value, social and ethical dilemmas and what risk the uncertainty entails, and a need to differentiate precautionary measures according to the societal and environmental value of an innovation.

100%, 20 out of 20 respondents was in favour of applying the precautionary principle in the case of regulating technology with scientific uncertainty about the associated risks. 16 out of 20 respondents found that the precautionary principle should also include ethical, moral and social aspects.

The voting in the questionnaire and the interview follow up leaves the impression of the participants preferring an extensive use of the precautionary principle, both with regard to the three individual cases as with regard to the suggestions and examples that were put forward during the discussions. In addition, the results from the Danish citizens meetings showed a positive attitude towards both innovation and the precautionary principle.

When addressing the question of whom should be involved in the implementation and development of the precautionary principle all listed actors in the questionnaire - Academia, Research, Governmental executives, Governmental legislators, Governmental agencies, NGOs, Large industry, SMEs, Advocacy groups, Unions, Consultancies, Intergovernmental organizations, and Citizens - should according to the participants, have a role. The actors that stand out as being most important to the respondents are; researchers, NGOs, citizens and academia.

In the interviews, arguments of actors with strong interests in a particular outcome, would be associated with a biased approach kept surfacing. This also underlines the respondents desire for a broad involvement of independent knowledge actors NGOs and citizens.

In this report you will find all answers to the questionnaire and a summary of the discussions during the interviews.

5.2.1.1 Introduction

In May-June 2019, the RECIPES project hosted citizen meetings in Denmark, Norway, Netherlands, Italy and Bulgaria. RECIPES citizen meetings were set up to provide the public with an opportunity to reflect on issues related to precaution and innovation in relation to research, and to provide their ideas and opinions directly to the researchers and managers of the RECIPES project. The present report is one of 5 country reports detailing the result of the national meetings. The results of all five citizen meetings will be collected in a main report and delivered to the researchers and managers of the RECIPES project.

The report first gives a brief overview of the context of Denmark, before proceeding to the results.

[Methodology will be explained in the main report]

5.2.1.2 Denmark

The aim of this report is to analyse citizen's perception on precaution and innovation. The goal is to provide RECIPES researchers and management with input they can use to create a toolbox with guidelines of how to use the precautionary principle in the future. We will begin with providing some basic information about Denmark.

Denmark is a Nordic country and the southernmost of the Scandinavian nations. Denmark proper consists of a peninsula, Jutland, and an archipelago of 443 named islands, with the largest being Zealand, Funen and the North Jutlandic Island. Denmark has a total area of 42,924 km2 with a land area of 42,394 km2 and a population of 5.8 million (as of 2018). The capital of Denmark is on the island of Zealand and is called Copenhagen.

The official language in Denmark is Danish and Denmark is a parliamentary democracy and has a constitutional monarchy wherein the prime minister is the leader of the state and the parliament determines the law.

The GDP of Denmark anno 2018 was 2.218 billion kroner (382.900 kroner per inhabitant). The Danish welfare comes primarily from the service sector, in which 80% of the employed work.

When it comes to research and innovation, the R&D expenditure as a percentage of GDP in Denmark is at 3.06%. R&D funding per capita is $ 1660.46. The percentage of R&D funding financed by industry is 58.31%, financed by government 28.56%, by other national sources 4.82% and financed by sources outside Denmark is 8.32%. The percentage of performed R&D activity is 64.44% by business enterprise sector, by higher education institutions 32.98%, by Government 2.22% or by private non-profit institutions 0.35%.

5.2.2 Results from the questionnaire

The meetings in Copenhagen was held on the 22rd of March between 17.00 and 20.00 at Vartov Grundvisk forum and on the 28th of June between 11.00 and 14.00 at the DBT domicile. Due to recruitment problems and an unexpected high level of 'no shows' reduced the number of participants to 20, which were smaller than we planned for 30-35.

The participant was prior to the citizens meeting given a leaflet with information that briefly described precaution and innovation, GMOs, nanotechnology and pesticides. Additionally, a presentation on the information material was given in the beginning of the citizens meeting to secure that all participant was informed before filling in the questionnaire. The

goal of the questionnaire were to get their opinion on the various issues and the results of the questionnaire are shown below.

5.2.2.1 Demographics

Twenty participants took part over the days, 10 of them female and 9 of them male plus one in the category others. (7) participants were under 29, (1) was between 29 and 39, (1) was between 40 and 49, (5) was between 50-59, (4) was between 60-69, (2) was between 70-79. We had no participants over 79. The participant group was therefore represented equally by men and woman and with a small overrepresentation of participants below 30 and above 50.

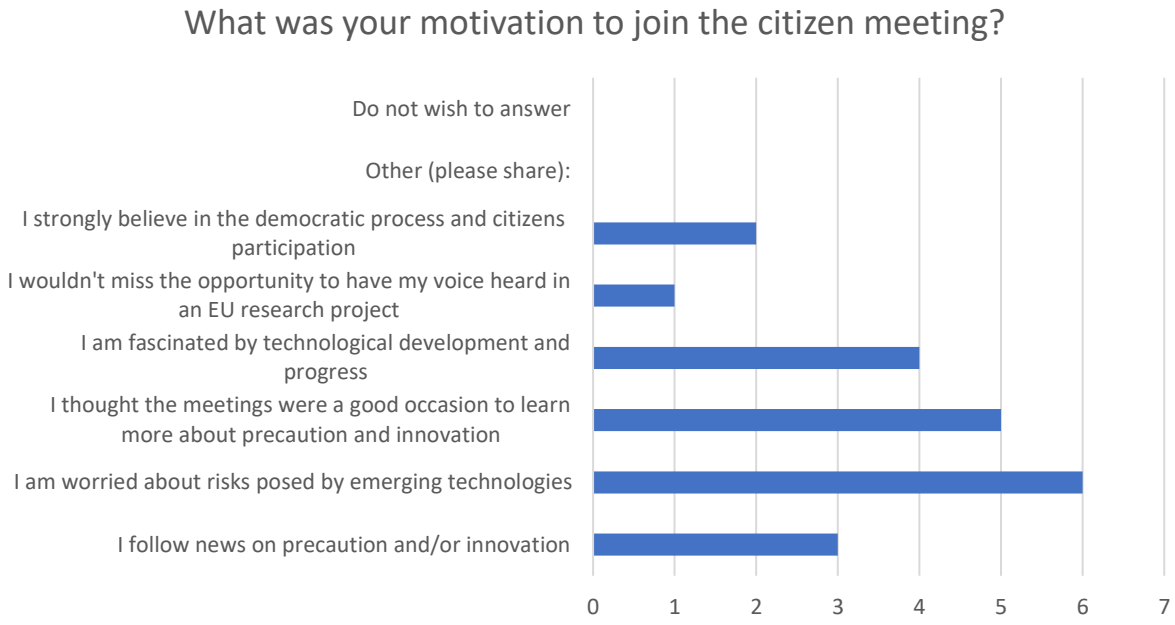
The group was mixed when it came to occupation with a slight overweight of students and self-employed. Most of the participants were self-employed (6) followed by the share of students (5). There were also a few retirees (3), unemployed (3) and a little less working in the public sector (2) and unemployed (2).

Figure 19 - Demographics

5.2.2.2 Reason for participation

The chief motivations mentioned by the participants for taking part in the citizens meeting were 'worries about the risks posed by emerging technologies' (6) and 'the possibility to learning more about the topic of precaution and innovation' (5). 'Fascination of technological development and progress' (4) and the participant 'following news of precaution and innovation' (3) also prompted a large part of the participants to take part in the meeting. Only few of the participants has indicated the options that the reason for their participation was the 'belief in the democratic process and citizens' participation' (2) and 'I wouldn't miss the opportunity to have my voice heard in an EU research project' (1).

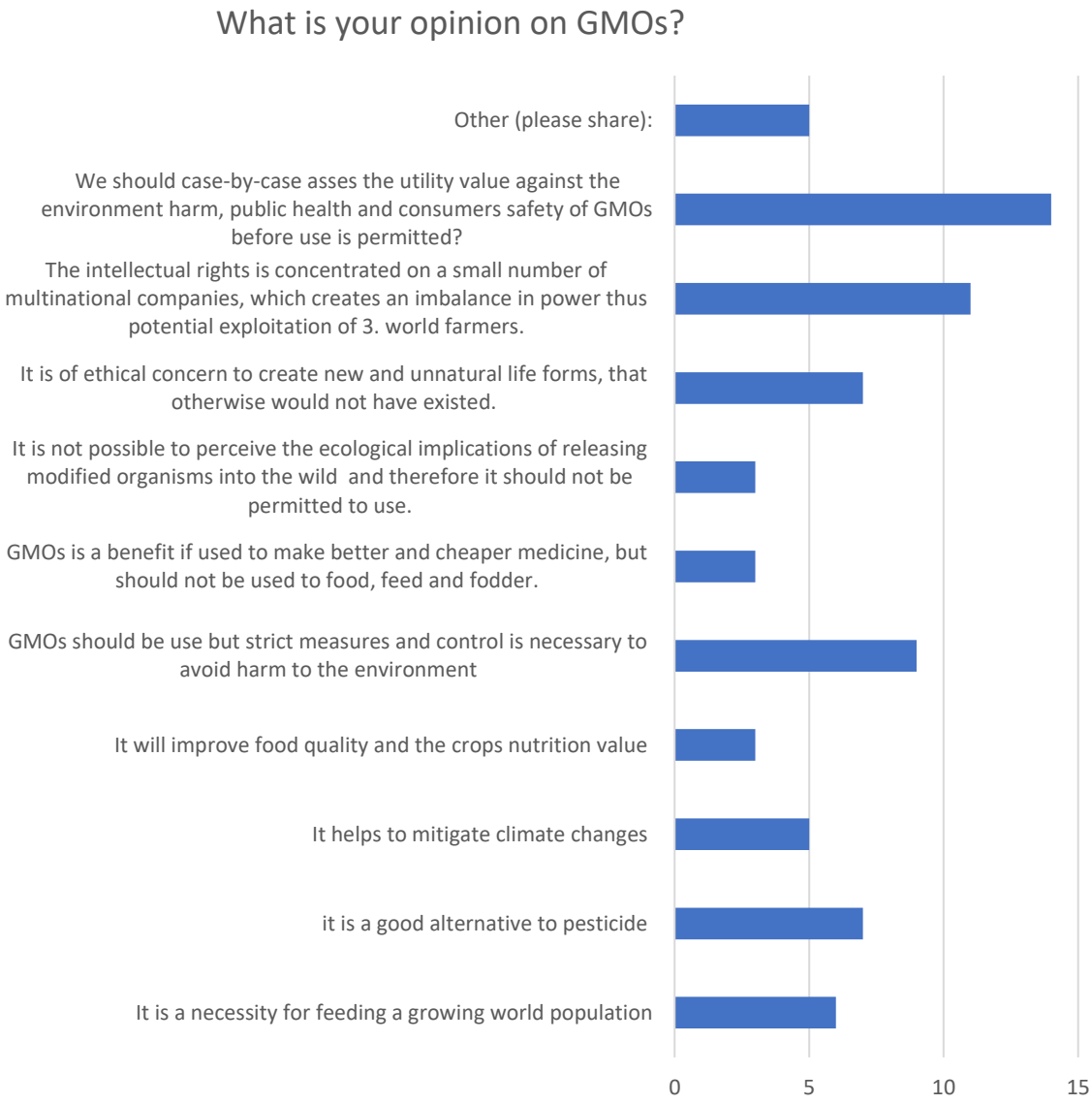
Figure 20 - Reason for participating



5.2.2.3 View on Genetically modified organisms

When asked about views on GMO's the two most common responses from the participants mentioned that *"We should case-by-case asses the utility value against the environment harm, public health and consumers safety of GMOs before use is permitted?"(14)* and that "*The intellectual rights is concentrated on a small number of multinational companies, which creates an imbalance in power thus potential exploitation of 3. world farmers" (11).* The rest of the answers are shown on the figure below.

Figure 21 - Opinion on GMOs

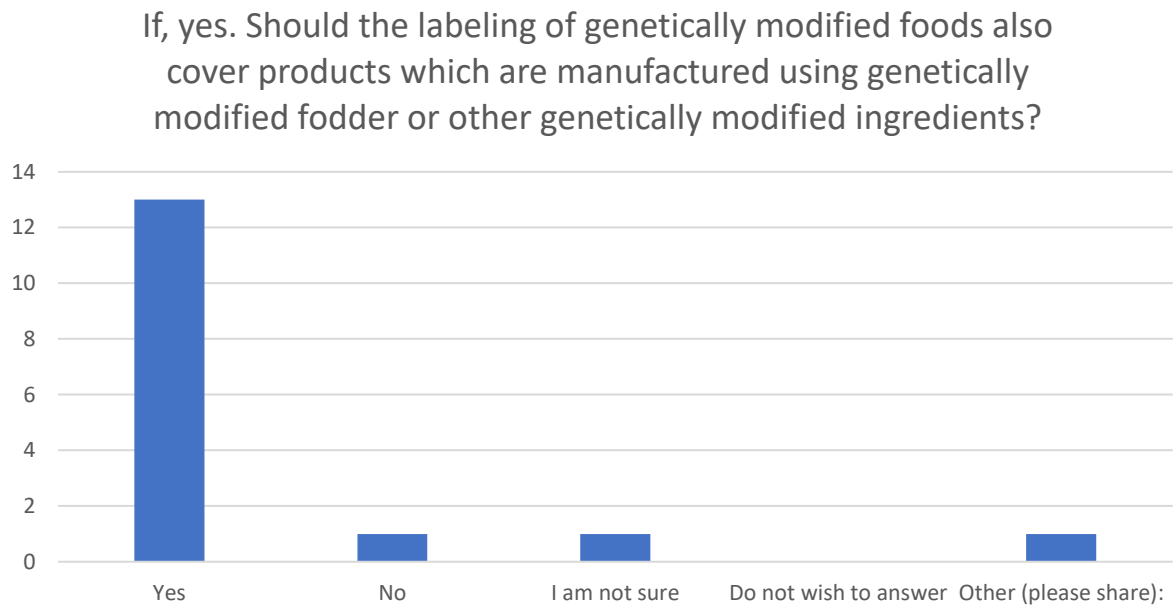


Most of the participants (13) voted that products containing GMOs should be labelled even when there if there is no evidence suggesting that GMOs are harmful to human health. Then presented with the question whether labelling of genetically modified foods should also include products which are manufactured using genetically modified fodder or other genetically modified ingredients (13) voted yes.

The participants thereby took a clear stand on the labelling of GMO products and had a cautious attitude towards GMOs.

Figure 22 – Labeling I

Figure 23 - Labeling II



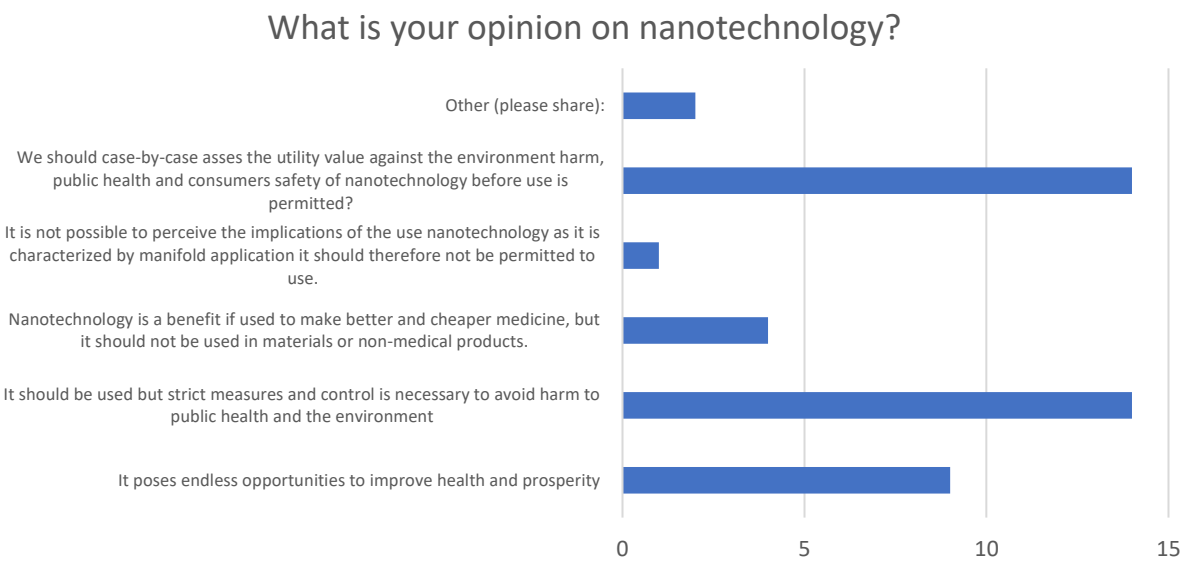
5.2.2.4 View on Nanotechnology

When asked about the views on Nanotechnology and products the participants' remarks were little less restricted than in the case of GMOs, but the vote was still toward restriction and control. The three most common responses from the participants was that *"We should case-by-case asses the utility value against the environment harm, public health and consumers safety of nanotechnology before use is permitted?" (14), "It should be used but strict measures and control is necessary to avoid harm to public health and the*

environment" (14) and that nanotechnology "*… poses endless opportunities to improve health and prosperity" (9).*

The rest of the remark can be seen in the table below.

Figure 24 - Opinion on nanotechnology



Further, the participants were asked to take a stand on whether or not to ban products utilizing nanotechnology in the cases of medicine and materials: *"In your opinion should we ban the use of targeted medicine or nanomaterial if there is risk of…?"* The participants were given the options 'yes', 'no' or 'don't know' to six scenarios three for medicine and three for material.

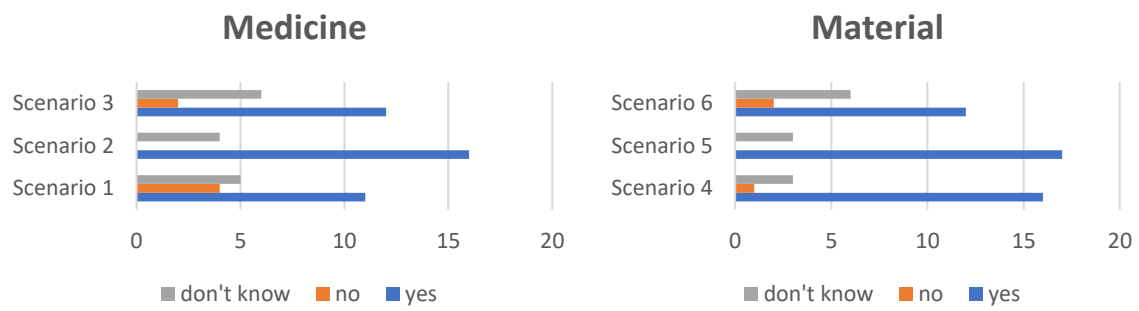
Scenarios

Medicine

1. ... that the nanoparticles used in medicine can penetrate parts of the body where they could do harm?
   Yes (11) no (4) don't know (5)
2. ... that the medicine in the long term can harm the environment because the nanoparticles used cannot be degraded?
   Yes (16) no (0) don't know (4)
3. ... , that the medicine has unacceptable undesirable consequences that we do not have knowledge about, yet?
   Yes (12) no (2) don't know (6)

Material

4. … That you can't get rid of the nanotechnology material because, it cannot be degraded?
   Yes (16) no (1) don't know (3)
5. … that the development of the water-repellent material has is faced with uncertainty about undesirable consequences that we do not have knowledge about yet.
   Yes (17) no (0) don't know (3)
6. … that the development of the water-repellent material has is faced with uncertainty about undesirable consequences that we do not have knowledge about yet.
   Yes (12) no (2) don't know (6)

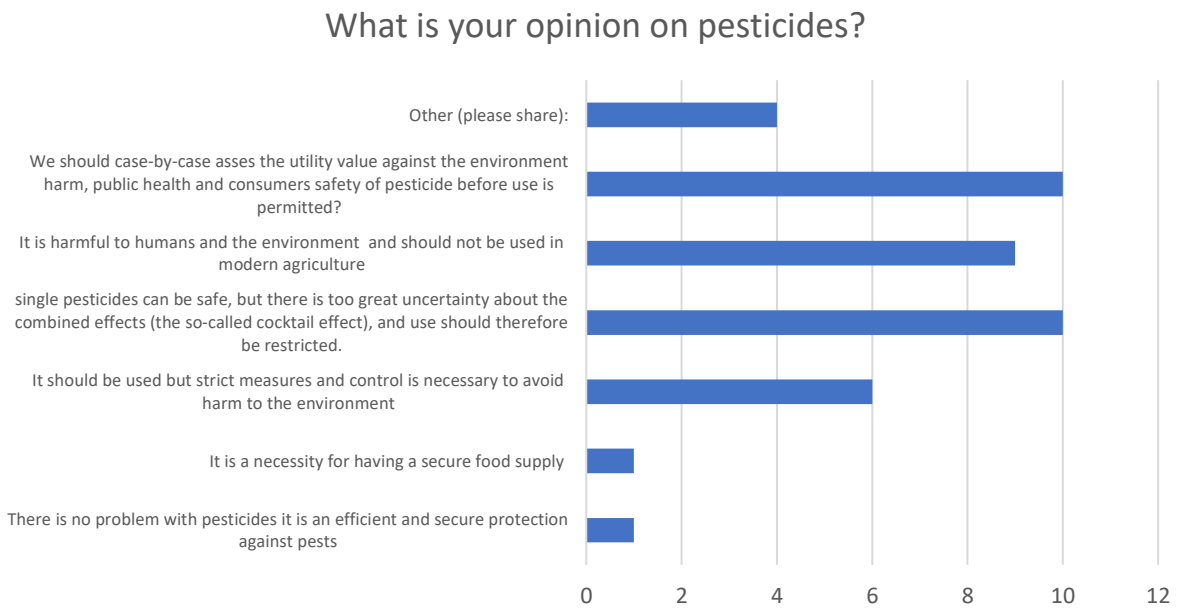


The opinion, yes, in favour of the ban were most voted in all cases. In scenario 2, 4 and 5 more than 75% voted for a ban and in scenario 1, 3 and 6 more than 50 % voted for a ban. This points to that the participants believe that the use of targeted medicine or nanomaterial should be banned whenever risks or uncertainty are articulated.

5.2.2.5 Pesticides

When asked about the views on Pesticides the three most common responses from the participants was that *"We should case-by-case asses the utility value against the environment harm, public health and consumers safety of pesticide before use is permitted?" (10), "It is harmful to humans and the environment and should not be used in modern agriculture"(9)* and *"single pesticides can be safe, but there is too great uncertainty about the combined effects (the so-called cocktail effect), and use should therefore be restricted"* (10). The rest of the remark can be seen in the table below.

Figure 25 - Opinion on pesticides

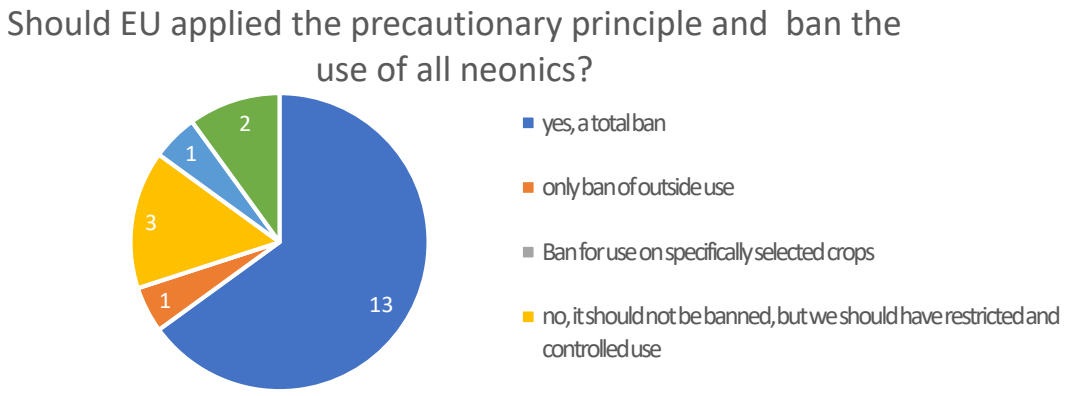


Further, the participants were asked: *"Should EU applied the precautionary principle and ban the use of all neonics?"* The topic of neonicotinoids and its effect on environment and

human health was briefly presented in the information material that participants received before the meeting. When asked if the EU should apply the precautionary principle and ban the use of neonics, (13) of the respondents answered that a total ban of neonics should be introduced. Another group of participants (3) voted that the use of neonics should not be banned but the use of these pesticides should be restricted and under stringent control. The rest of the votes were distributed among the following answers: i) "Don't know" (2); ii) "Only ban of outside use" (2); iii) "no, it should not be banned" (1).

To this question the voting was clear: 13 voted "yes, a total ban" and only one voted "no, it should not be banned".

Figure 26 - Neoneonics

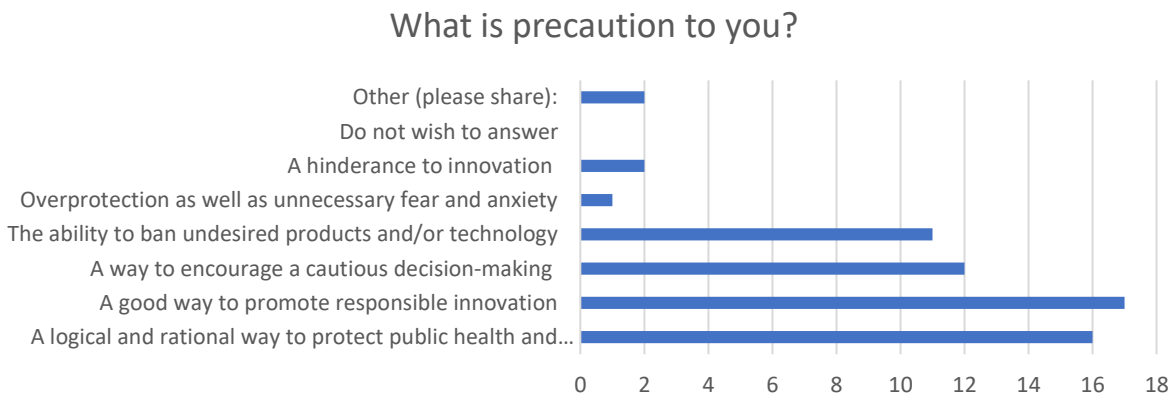


5.2.2.6 Precaution and innovation

The participants found the topics of precaution and innovation more complex than the question on the specific technologies GOMs, Nanotechnology and Pesticides, but the information provided in the introductory presentation and the information material gave them a good overview of both the scope and the importance of these topics.

When asked about the views on precaution the four most common responses from the participants were A good way to promote responsible innovation (17), A logical and rational way to protect public health and the environment (16), A way to encourage a cautious decision-making (12) and that precaution provided the ability to ban undesired products and/or technology (9).

Figure 27 - Precaution



After giving their view on precaution the participants were asked to share their view on innovation. More than 50 % of the participant voted that innovation is a positive way of framing changes (13). The second most voted were a logical and rational way to secure growth and prosperity (9) and as inevitable as a force of nature (9). Further, a necessity for human survival was given (8) votes and everyone will benefit (6) votes. A substantial number of the participants marked the box other (7) and in the following their comments will be shared:

4 Innovation provides the opportunity to develop welfare, democracy and freedom

5 A path to breakthroughs in the medical field and in the green transition

6 Innovation for achieving growth is not always good in itself, growth is bad if there is not another purpose as well.

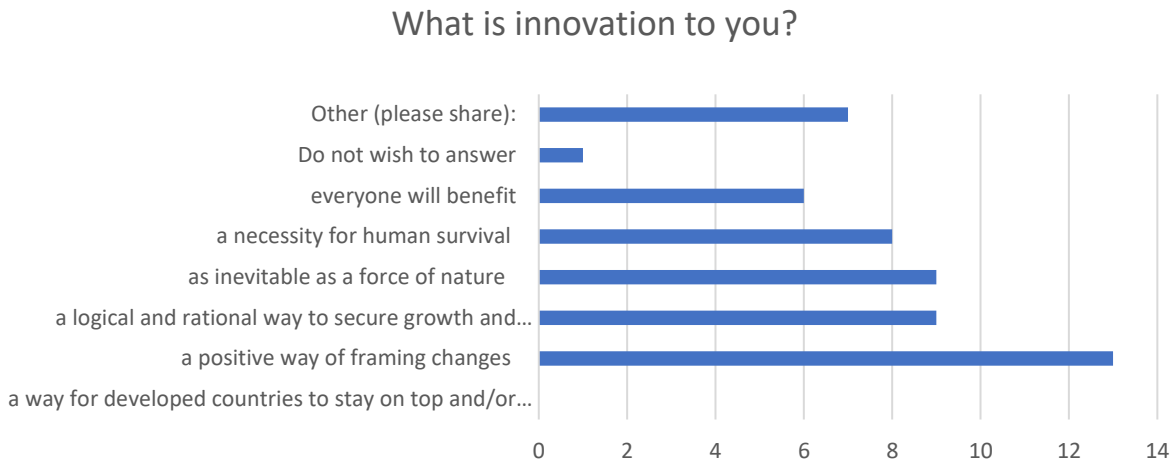
7 Innovation is often seen as something positive. We must, however, say that some forms of innovation can have negative consequences, which is why it is important to be critical.

8 Innovation is the process that happens when an invention lives its life as a product in a free or regulated market. One example is the Danish wind turbine development from wind mill built in wood and up to the new large wind turbines we know today.

9 None of the above

10 Innovation is a key word that is completely uncritical about any new technology, whether we need it or not and innovation is for me a very politically charged word.

Figure 28 - Innovation



After giving their opinion on precaution and innovation the participant was asked if there is a trade-off between them and whether precaution or innovation were of higher priority. (7) of the participants voted that, there is a trade-off between precaution and innovation, while (13) do not think that there is a trade-off.

The 7 participants who voted that there is a trade-off between precaution and innovation was given the opportunity to answer an additional question to indicate whether precaution or innovation should have a higher priority. We had 13 responses which means that some of the participants answered this question even though they did not think that there is a trade-off between precaution and innovation. (6) out of 13 participants voted that precaution should have a higher priority, and 6 voted that precaution and innovation are of equal priority. Only (1) participant has voted that innovation should have a higher priority. (4) participants have chosen to make further comments by voting others. (including 2 that made another answer as well) The 4 comments are displayed below the figures:

Figure 29 - Tradeoff

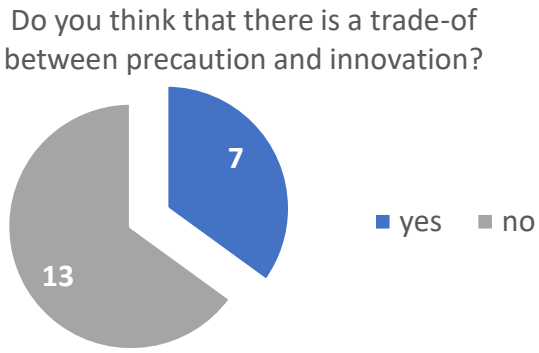
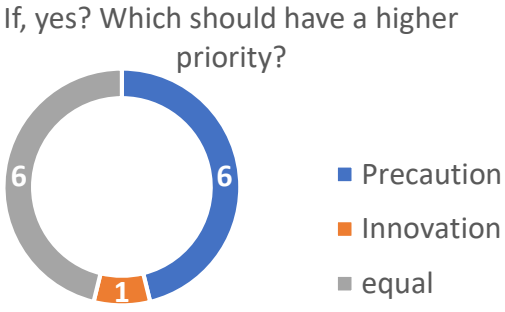


Figure 30 - Priority



Additional comments

11 The precautionary principle must push innovation towards the best possible solution.

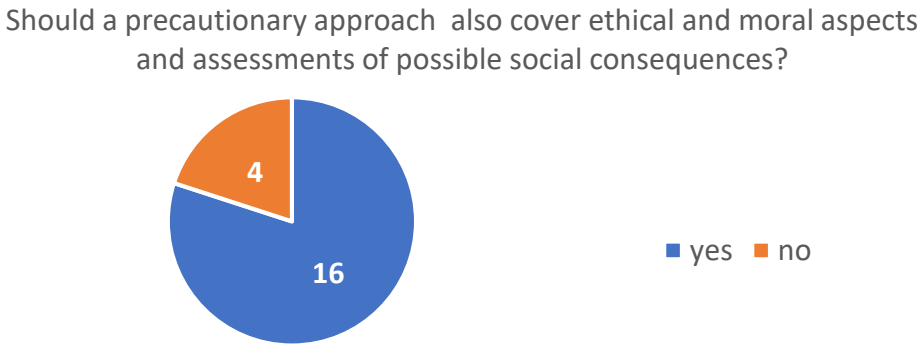
12 Innovation without precaution is not innovation, it is just the beginning of the innovation process.

13 Most of all, it must be given equal priority. I also think an important factor should be the danger of doing nothing. eg. one should be more risk-taking in relation to GMOs because they can reduce the use of something more risky already in use (Pesticides).

14 I don't think we need an innovation that doesn't relate to precaution

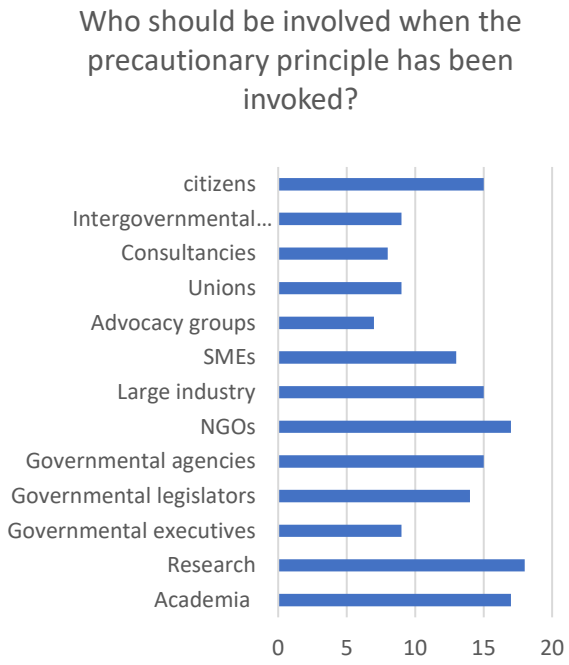
Nearly all the participants 16 out of 20 responded that ethical and moral aspects and assessments of possible negative consequences should be considered as well when the precautionary principle is applied.

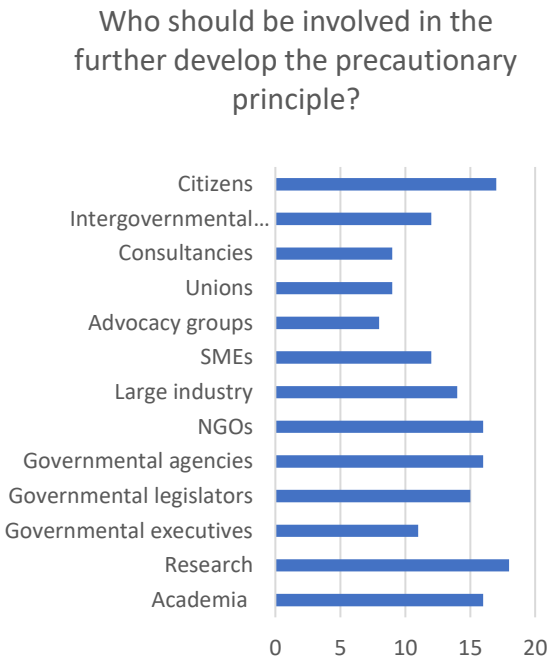
Figure 31 - Ethical and moral aspects



Two of the questions addressed the actors that should be involved in the implementation and in the further development of the precautionary principle. According to the respondents all listed actors - Academia, Research, Governmental executives, Governmental legislators, Governmental agencies, NGOs, Large industry, SMEs, Advocacy groups, Unions, Consultancies, Intergovernmental organizations, and Citizens - should play a role in implementing and further developing the principle. The groups that stand out and have collected the most votes for both questions are researchers, NGOs, citizens and academia.

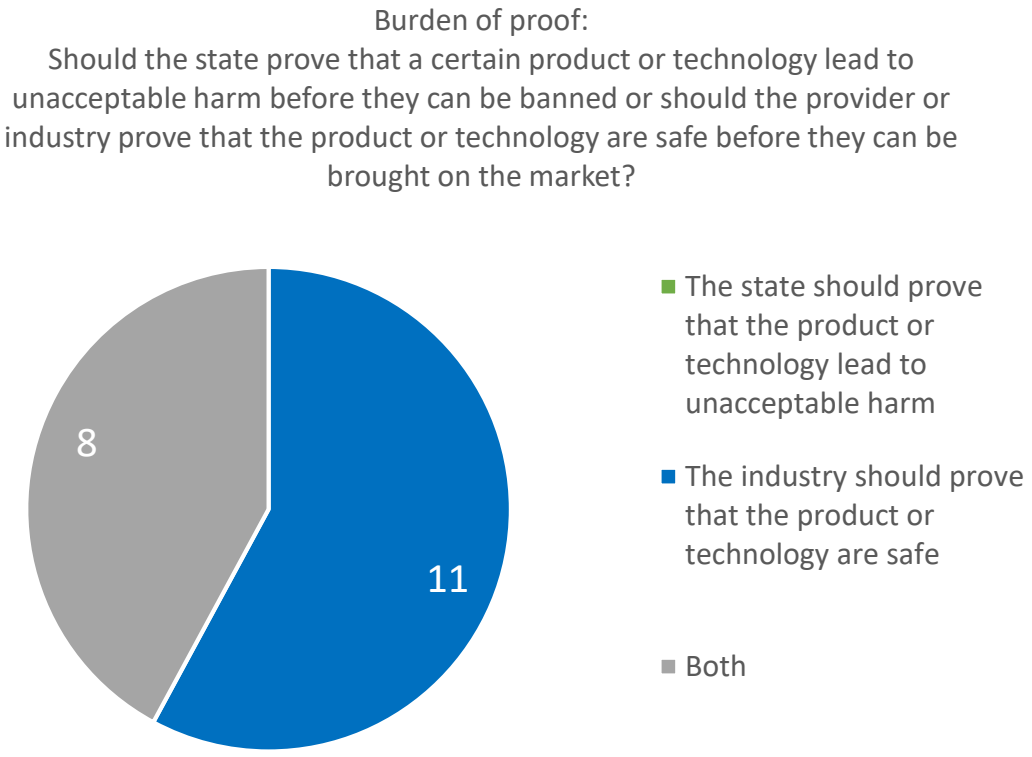
Figure 32 - Involvement of other actors





In relation to whom has the burden of proof, should the state then prove that a certain product or technology do not lead to unacceptable harm or should the provider or industry prove that the product or technology are safe before it can be brought on the market. (11) of the participant voted that it is the industry that has the burden of proof when having to prove that a product or technology is safe enough to be put on the market. (8) of the respondents claimed that both industry and state should prove that a product/technology is safe. None of the participants answered that the state alone is responsible for proving that a product or technology leads to unacceptable harm in order to ban it. The vote was clear and the majority think that the burden of proof foremost lies with the industry.

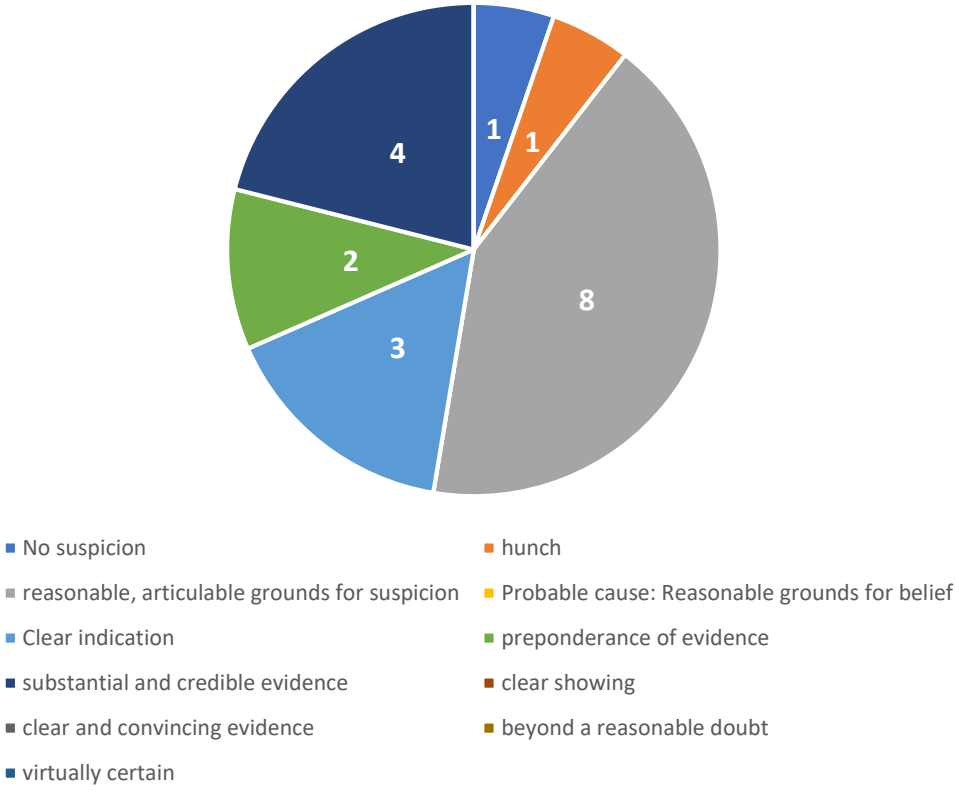
Figure 33 - Burden of proof



How much certainty is needed / how strong does the evidence need to be before it is justified to ban a product or technology? This question was difficult for the participants answer and some of them asked for further clarification to be able to make their choice And according to the participants it was in particular challenging to distinguish between the proposed options to the levels of certainty that is needed to ban a certain product or technology. In the end, the most popular answers were "reasonable, articulable grounds for suspicion" (8) and "clear and convincing evidence" (4), followed by "clear indication (3). See the rest of the votes in the diagram below.

Figure 34 - Evidence and certainty

How much certainty is needed / how strong does the evidence need to be before it is justified to ban a product or technology?



Based on the voting the conclusion that the participants have low levels of trust in politicians and authorities to regulate technology is easy to make. (16) out of 20 voted no to the question "Do you trust the politicians and authorities to regulate technology?" and 4 voted don't know.

Figure 35 - Trust in politicians

Do you trust the politicians and authorities to regulate technology?

The questionnaire also inquired whether uncertainty with technology should be regulated through the application of the precautionary principle or regulated through the market forces. 100% of the participants voted for utilizing the precautionary principle. The participants were then asked how the precautionary principle should apply:

15 .. That products cannot can come to market only when there is guaranteed absence of risk? (11)

16 … A democratic debate with direct involvement of citizens, stakeholders, experts? (4)

17 … a decision is made by relevant politicians? (indirect representation of citizens) (0)

18 … that decisions are made by relevant experts? (6)

Most participants agreed that development of technology can be controlled, but the largest share (11) stated that this could be done only if some international rules are developed. (7) voted that we can regulate the technology, but research will continue and only (1) voted that we can regulate technology and (1) voted No, it's utopian - The research will continue on its own, and the technology will be put on the market.

5.2.2.7 Final remarks

During the event and in particular during the answering of the questionnaire the participants commented on the complexity of the topic and found some of the questions difficult to understand and answer. Even though, the participants in general, were positive about the information material and the questionnaire. (14) out of 20 voted that the information material gave a good overview of issues related to precaution and innovation, and that it was easy to understand. (4) voted that it gave a biased overview and only (1) that it was hard to understand. Most of them thought that the questionnaire gave a good overview of issues related to precaution and innovation (15), and (10) that it was easy to understand. (6) out of the 20 participants thought that the questionnaire gave a biased overview. And only (1) that it was hard to understand.

5.2.3 Themes from the group interviews

5.2.3.1 Precaution and innovation

5.2.3.1.1 Is there a trade-off between the two? And if so, which should be prioritized?

The participants were asked to share their opinions in relation to the balance between precaution and innovation, to discuss whether there is a trade-of between precaution and innovation and whether innovation or precaution should be prioritised.

It is important to state that throughout the discussion all participants, argued for the importance of both innovation and precaution. However, the arguments can be divided into three groups.

One group of arguments that can be classified into the category; there is a trade-off and for logical reasons the balance is tipping towards favouring precaution. A second group of arguments classified as; there is a trade-off and it is unfavourable towards innovation without reasonable grounds, and the third group of arguments classified as; there is no trad-off between precaution and innovation, precaution is promoting innovation and all innovation benefits form a precautionary approach.

When asked to choose which of the two – precaution or innovation – should have a priority, the following arguments were shared:

Everyone agrees that there must be balance between the two, but with a overweight of arguments that is inclined towards the precaution being weighted slightly more. Particular attention is paid to the fact that we must be more precautionary when it comes to products such as sunscreen and water repellent clothing than in the case e.g. medicine. All in all, the general view is that there must be a case by case assessment in relation to the utility value, social and ethical dilemmas and what risk the uncertainty entails.

5.2.3.1.2 Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?

Ethical, moral and social consequences clearly mattered a great deal to the participants of the Danish event and the answers to this question was predominantly, yes.

- Certainly, ethics and morals should be taken into account when applying the precautionary principle ... further we should consider whether to use the precautionary principle to create more equality in the world?
- One could start by screening on the basis of the UN's sustainable development goals. In this way ethics and morals must be included to some extent.

But some concerns were also articulated:

- It was a difficult question. At first, I thought it was a good idea. But then I thought it was very extensive. It could mean that it would be difficult to make decisions because it (red. Precautionary principle) becomes too complicated and difficult to enforce.
- Morality should not interfere with the precautionary principle, otherwise it will be a religious discussion. The use of the precautionary principle must be launched on reasonable and documented grounds.

5.2.3.1.3 Who should be involved when the precautionary principle has been invoked?

When asked about; Who should be involved when the precautionary principle has been invoked? The participants general view is that everybody who has a stake should have a voice. Going deeper into the discussion it was clear that the involvement also should be proportional with the topic and that the diversity of opinions should be a priority. Mostly all agreed that citizens, large industry, NGO’s, governmental agencies and research/academia should be involved when invoking the precautionary principle, but some concern was expressed when involving intergovernmental organisations, consultancies, unions, advocacy groups, and governmental executives. Further, a mistrust in lobby organisations was articulated.

- Everyone should not be involved every time - but depending on the nature of the technology or innovation, it would be obvious to make constellations of actors who would be wise to involve and in some extreme cases it would be irresponsible not to involve everyone.
- If everyone is to be involved, we will never get anything approved. We need to rely on experts and the experts need to be documented independent. If we do not trust the experts, the use of the precautionary principle becomes completely unmanageable.

5.2.3.1.4 Should the burden of proof be on the state or the service/technology provider?

There was some consensus, that it is the industry that has the burden of proof. But when dealing with the issue of uncertainty, it is complex and the responsibility for public safety should be placed on both industry and state.

- The industries must demonstrate that it (e.g. a product) is not harmful…. But it does not remove the responsibility of the state to investigate whether it is harmful.
- I think the industry should be required to clarify possible risks and uncertainties. It is never possible to determine anything with certainty, but risks and uncertainties can be justified. Then, the decisions must be revise when new knowledge arises.
- I believe that there must be a dialogue between industry and state and that the burden of proof is a shared responsibility between what the state can detect and what companies can prove in terms of product safety.

5.2.3.1.5 How much certainty is needed before it is justified to ban a product or technology?

The participants tended to answer in the lower end of the scale arguing that "reasonable, articulable grounds for suspicion" is a reasonable and justified reason for the banning of a product. However, it was also highlighted that a large part of the participant was tending to respond in the middle of the scale arguing that only clear indication, preponderance of evidence or substantial and credible evidence could justify a ban of a product.

In the discussion the complexity of the question was unfolded and many of the participants expressed that:

- I was difficult to answer. It (red. the question of certainty) depends on the context. For example, medicine is a special issue. There are side effects for almost al medicin, but if it is the last resort for a patient with a deadly liness, then we must be more willing to take risks and be less pricautionary. On the other hand there is a long way from life safeing medicin to everyday product bought at supermarkets, and in this case we would benefit more form a stricht application of pricautionary principle.

The question of non-scientific knowledge and the role it plays in the assessment of precaution was also of great debate, some argued that:

- Is there uncertainty if a product is not safe, it should not be approve for sales. Sometimes, we do not have the research and science needed to prove that it is harmful, but only a 'hunch'. In this case it is important to listen to non-scientific proof as well.

5.2.3.1.6 Do you trust the politicians and authorities to regulate technology?

The discussions in this area were, in its essence, very much about trust in politicians and not so much about the thrust in authorities. In the discussions a considerable amount of distrust towards politicians was noticeable. Politicians were not trusted, first of all, because they would lack the necessary knowledge and secondly because they would serve other interests.

- I do not know if I trust in politicians to regulate technology, probably not - When one hear about the precautionary principle, one thinks that is sounds to do a lot of good, but there are so many lobbyists who threatens this belief – in my experience, politicians do not have sufficient konwlegde about the technologies we are facing and that their attitudes are influenced a lot by the large stakeholders"
- Can one trust that politicians act on the basis of uncertainties or do the large and powerful industrial and political lobbies have such a great influence on politicians that we cannot rely on their judgment".

5.2.3.1.7 Who should be involved in the further development of the precautionary principle?

When asked about; Who should be involved in the further development of the precautionary principle? The participants general view was a lot like in the question of; Who should be involved when the precautionary principle has been invoked? It was difficult for the participants to distinguish between the two question. The diversity of view varied a lot, from:

- 'everybody who has a stake should have a voice' to 'Primarily political institutions not so much stakeholders'.

Digging deeper into the discussion it was clear that the involvement of citizens was also of debate; with arguments such as.

- As a citizen you do not have the insight needed to evaluate the precautionary principle.

And

- I think citizens are important. And I think that we today a proving that citizens can easily familiarize themselves with complex problems such as precaution and innovation.

5.2.3.1.8 How do you want uncertainty with technology to be regulated?

There was consensus amongst the participants that uncertainty with technology should be regulated with the precautionary principle and the discussion was more about who and how we should regulate with the precautionary principle.

Most of the participants argued that a product should not be marketed if the absence of risk cannot be guaranteed and others viewed that it should be based on expert decisions.

5.2.3.1.9 Do you think development of technology can be controlled?

Most of the participants argued that international agreements are the best solution and most fair place to implement the precautionary principle while others were afraid that a strong precautionary principle could result in less curiosity and diminish innovation.

- If we do not have international agreements, then it has no effect that we are cautious in DK. E.g. If they regulate in a completely different way in Germany.
- I really agree with all statements - I think we can regulate technology and innovation, but we are up against such strong forces

5.2.3.2 Summary

During the Danish citizens meetings, we had a wide-ranging conversation about the issues surrounding precaution and innovation.

Precaution and innovation and how they should be prioritized (3.1.1)

- It is important to state that throughout the discussion all participants, argued for the importance of both innovation and precaution. However, with a overweight of arguments that is inclined towards the precaution being weighted slightly more.
- In general, the view amongst the participants is that there must be a case by case assessment in relation to the utility value, social and ethical dilemmas and what risk the uncertainty entails. And that we must differentiate between products like sunscreen and water repellent clothing and more vital products like e.g. medicine.

Assessment of ethical and moral aspects and social consequences(3.1.2)

- Ethical, moral and social consequences clearly mattered a great deal to the participants and certainly, ethics and morals should be considered when applying the precautionary principle. The participants further argued that a precautionary approach could be bound to the UN's sustainable development goals.
- Also, consideration whether we could use the precautionary principle to create more equality in the world was discussed.

Engagement when invoking and developing the precautionary principle (3.1.3) (3.1.7)

- In general, the view was that everybody who has a stake should have a voice. But should everyone be involved every time? Depending on the nature of the technology or innovation, it would be obvious to make constellations of actors who would be wise to involve and in some extreme cases it would be irresponsible not to involve everyone.
- Some participants also argued that if everyone is to be involved, it would be very time consuming to get anything approved. And that we need to rely more on experts to make the use and development of the precautionary principle more manageable.
- Further, some of the participant argued that citizens could and should play a bigger part in developing the precautionary principle. And that citizens could be assigned such a task, even with complex problems such as caution and innovation.

The burden of proof (3.1.4)

- There was some consensus, that it is the industry that has the burden of proof. But when dealing with the issue of uncertainty, it is complex and the responsibility for public safety should be placed on both industry and state.

Certainty and justification to ban a product or technology (3.1.5)

- The participant found it difficult to assess and answer this question and argued that the need of certainty is circumstantial.
- However, the voting and the discussion tended to be in the lower scale and even modest evidence could justify the ban of a product.

Trust in authorities regulating (3.1.6)

- The discussions in this area were, in its essence, very much about trust in politicians and not so much about the thrust in authorities. In the discussions a considerable amount of distrust towards politicians was noticeable. Politicians were not trusted, first of all, because they would lack the necessary knowledge and secondly because they would serve other interests.

Regulating with uncertainties (3.1.8)

- There was consensus amongst the participants that uncertainty with technology should be regulated with the precautionary principle.
- Most of the participants also argued that a product should not be marketed if the absence of risk cannot be guaranteed.

Belief in controlling technology (3.1.9)

- Most of the participants argued that international agreements are the best solution and most fair place to implement the precautionary principle
- Others were afraid that a strong precautionary principle could result in less curiosity and diminish innovation.

5.2.4 Conclusions

From the survey and the interviews, it is clear that the participants do not find the market forces sufficient to regulate technology, and that the precautionary principle has a very important role in dealing with regulation in situations with uncertainties related technology and innovation. Moreover, it was also a strongly argued that the precautionary principle should take moral, ethical and social dilemmas into account.

According to the survey, a desire for technology to be strictly controlled could be concluded, but in the subsequent interviews, this hard liner approach is slightly softened, and a more balanced view was expressed. The overall impression from the meetings is that the participants in general recognized the importance of both innovation and precaution and that the regulation of technology and innovation should strongly depend on the case, and that the scale of risks should be balanced to the scale of gains.

When addressing the question of whom should be involved in the implementation and development of the precautionary principle a wide range of a opinions came to the surface. Most felt that there should be a wide involvement of stakeholders in all cases, others that a wide involvement process of course would be nice to have in all cases, but that the time perspective should be considered in terms of potential impacts and uncertainty. Arguments that only expert should be involved in the implementation and development of the precautionary principle all surfaced to some degree. The overall impression from the meeting is that researchers, NGOs, citizens and academia stand out as being most important to involve according to the respondents.

5.3 Briefing report – Italy

Citizen's view on Precaution and innovation - Italy

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5.3.1 Executive Summary

This report illustrates the findings from the citizens' meetings organised by K&I held in Italy in June 2019 under the RECIPES project. The meetings took place in Capranica – VT (June 1), Latina (June 5) and Rome (June 3 and 10). The meetings were designed to provide the participants with an occasion to reflect on technology, risks and safety, focusing on the precautionary principle in the framework of technological innovation, and starting from the example of three cases: GMOs, nanotechnologies and neonicotinoid pesticides. During the meetings, participants expressed their opinions on precaution and innovation through a questionnaire and group interviews. They first answered a structured questionnaire, and some of the questions were then discussed in depth during group interviews (as a whole, five groups of participants were formed). Here below, the main results of the questionnaires and the group discussions.

- The main push to attend the meetings (7 people out of 10) was the wish to learn more about precaution and innovation.
- About **GMOs**, the prevailing opinion is that their use and utility should be assessed case by case, and their labelling is necessary both for food and other products (more than 4 people out of 5).
- Concerning **nanotechnologies**, while recognising their potential for industry and for healthcare, uncertainty prevails: most people were not able to express an opinion (around one half). A case-by-case assessment resulted to be the most popular answer.
- As for **pesticides**, there is an orientation towards the controlled use of these substances. The most widespread opinions, in fact, are those that highlight: the need to carefully assess the risks before allowing their use, again on a case-by-case basis (around 3 out 5 people).
- The majority of participants showed a strong orientation to precaution (more than 7 out of 10 consider it a way to promote responsible innovation), and a positive attitude towards innovation (a way so secure growth and prosperity according more than half participants). Precaution and innovation have been considered for the most part of participants as two sides of the same coin (there is no trade-off between the two for 70% of the respondents). The burden of proof lays on both the industry and the state, with different timing. The contribution of research is fundamental.
- Different opinions have been expressed about the degree of certainty needed to ban a product or a technology, but without extreme positions.
- An extended idea of precaution, covering also a consideration of social consequences of technologies, is widely shared.
- Two main positions have been registered about the involvement of stakeholders in decisions related to the precautionary principle. On one hand, an inclusive point of view states that all the stakeholders affected by a decision should take part in it, while the supporters of the other consider competences as the main requirement to participate in the decisions. Many participants stressed the need to improve education, information, and social dialogue to improve decisions and involve citizen and further stakeholders in decisions.

5.3.1.1 Introduction

In May-June 2019, the RECIPES project hosted citizen meetings in Denmark, Norway, Netherlands, Italy and Bulgaria. RECIPES citizen meetings were set up to provide the public with an opportunity to reflect on issues related to precaution and innovation in relation to research, and to provide their ideas and opinions directly to the researchers and managers of the RECIPES project. The present report is one of 5 country reports detailing the result of the national meetings. The results of all five citizen meetings will be collected in a main report and delivered to the researchers and managers of the RECIPES project.

The report first gives a brief overview of the context of Italy, before proceeding to the results.

5.3.1.2 Italy

The aim of this report is to analyze citizen's perception of precaution and innovation. The goal is to provide RECIPES researchers and management with input thay can use to create a toolbox for the application of the precautionary principle. We will begin with providing some basic information about Italy.

Here below, we illustrate some basic country information and basic information about R&D (as found on Wikipedia or other sources):

Capital: Rome

GDP: 2,442 trillion (in $)

Number of inhabitants: 60,484,000

Official languages: Italian

Form of government: Parliamentary Republic

Major economic sectors and industrial development: Italy has a major advanced capitalist mixed economy, ranking as the third-largest in the Eurozone and the eighth-largest in the world. A founding member of the G7, the Eurozone and the OECD, it is regarded as one of the world's most industrialised nations and a leading country in world trade and exports. The country is well known for its creative and innovative business, a large and competitive agricultural sector (with the world's largest wine production), and for its influential and high-quality automobile, machinery, food, design and fashion industry.

Italy is strongly oriented towards the services sector, which in 2017 scored three quarters of the added value; the share is long, compared with other large European countries, equal to about 23% of GDP. Productive work is based in small and medium-sized enterprises: those of larger dimensions are mostly managed by the founding families and, in some cases, by foreign groups. The prevailing sector is the manufacturing sector for which Italy is the sixth country in the world.

R&D intensity[9] (R&D expenditure as a percentage of GDP): 1.35%

Percentage of R&D expenditure financed by government: 35.23% (*)

Percentage of R&D expenditure financed by industry: 52.08% (*)

[9] All the data presented hereinafter are available on the source: OECD MSTI database, 2017 figures. The percentages of R&D expenditure (see *) refer to 2016 figures, the latest available for Italy.

Percentage of R&D expenditure financed by other domestic sources: 2.94% (*)

Percentage of R&D expenditure financed by sources abroad: 9.75% (*)

Percentage of R&D funding performed by the business enterprise sector: 61.44

Percentage of R&D funding performed by the higher education sector: 24.18

Percentage of R&D funding performed by the government sector: 12.69

Percentage of R&D funding performed by the private non-profit sector: 1.69

5.3.2 Results from the questionnaire

5.3.2.1 Demographics

The collective questionnaire was achieved through 4 sessions (2 in Rome, 1 in Latina and 1 in Capranica – Viterbo province). In the second session, held in Rome, the respondents were organised in two different groups. Overall, there were five interview groups, which involved a total of 30 respondents.

Specifically, of the 30 people involved:

- 18 (60%) were residents of a large city, Rome;
- 6 (20%) were residents of a small city, Latina;
- 6 (20%) were residents in a rural centre, Capranica

All locations are located in the Lazio region, in central Italy.

The gender balance was perfectly equal (50% male and 50% female), while the age distribution was slightly unbalanced on the group 50-59 (see Figure 1).

Figure 36 - Age distribution of respondents (in absolute values)

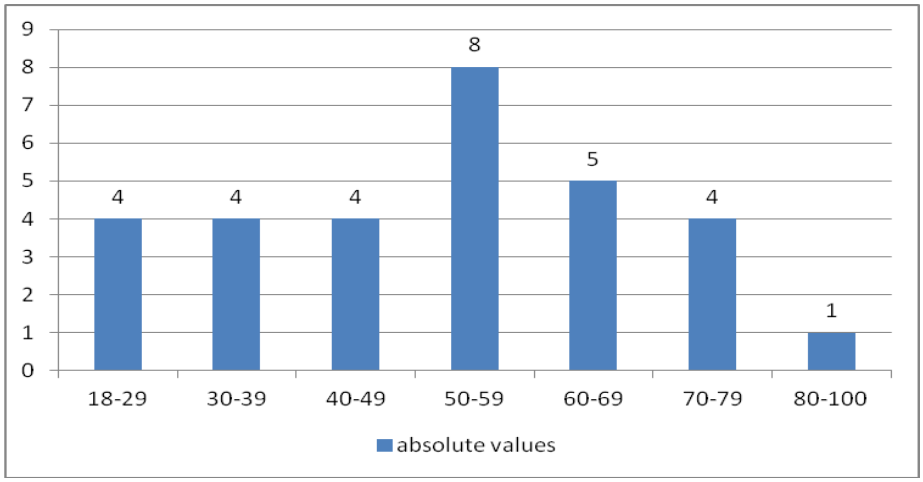
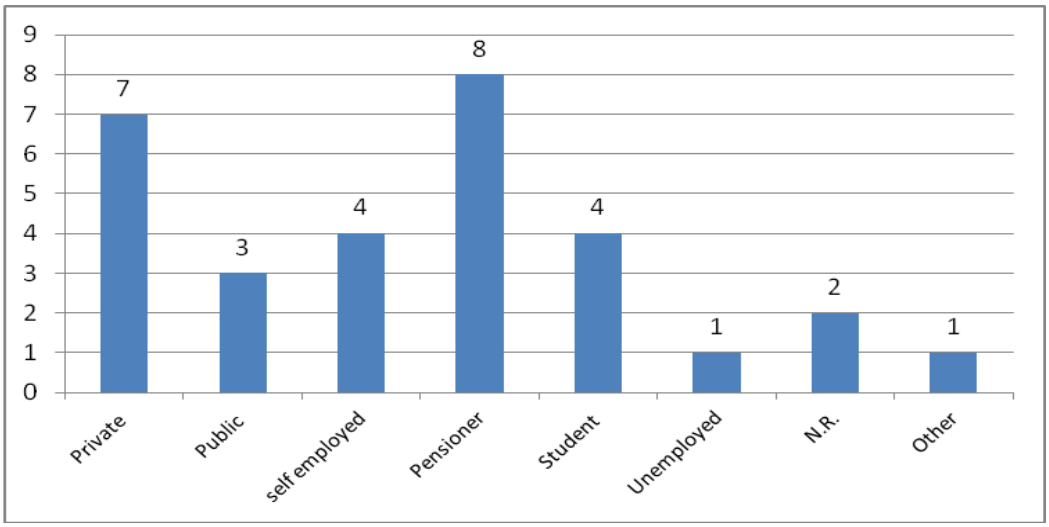


Figure 2 shows the distribution of respondents by employment sector. The majority group, probably in consideration of the presence of numerous elderly people (age groups over 60), is that of pensioners (8 respondents out of 30, equal to 27% of the total), followed by

those working in the private sector (7 respondents equal to 24%). The only interviewee who answered "other" is an artist. Finally, two people preferred not to respond.

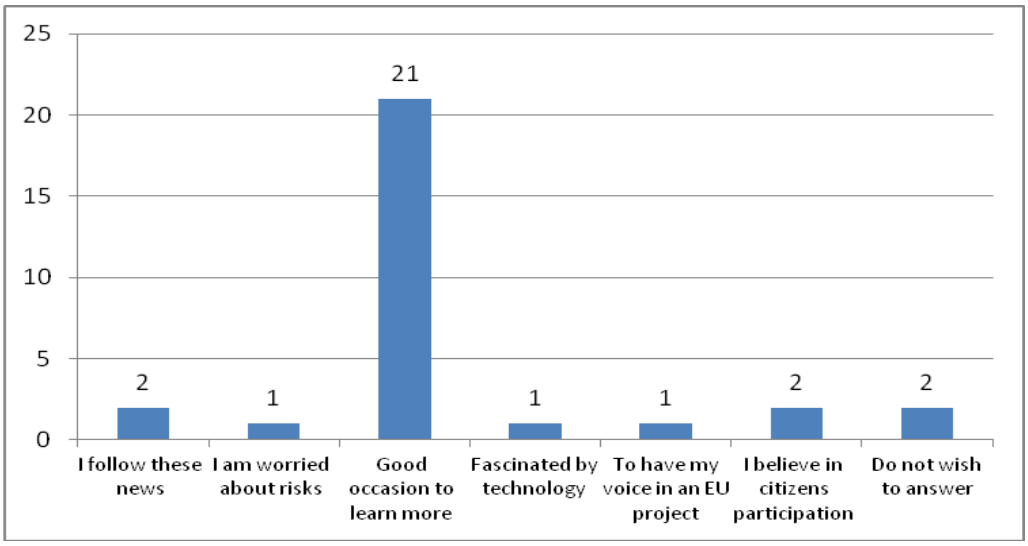
Figure 37 - Employment sector distribution of respondents (in absolute values)



5.3.2.2 Reason for participation

As can be seen in Fig. 3, the vast majority of respondents (21 equal to 70%) decided to participate in the meeting as they considered it a good opportunity to get more information about the topics of precaution and innovation. Two respondents (7%) declared that they follow the news in this area and that they participated in the meeting precisely because they were interested in these topics.

Figure 38 - Reason for participation of respondents



5.3.2.3 Genetically modified organisms

Respondents' opinions about Genetically Modified Organisms (GMO) are quite varied, but very numerous are those who have expressed scepticism about such products. As can be

seen in Table 1, most of the interviewees consider them substantially useful, but accept them only on the basis of careful checks.

In particular, more than half of the participants believe that their usefulness should be verified through a specific assessment of the individual cases and of the possible damages they can cause (17 respondents equal to about 57%).

The same is true of those who believe that GMOs should be used, but under strict control to avoid damage to the environment (14 respondents, 47%).

Table 1 - Opinions about the Genetically Modified Organisms

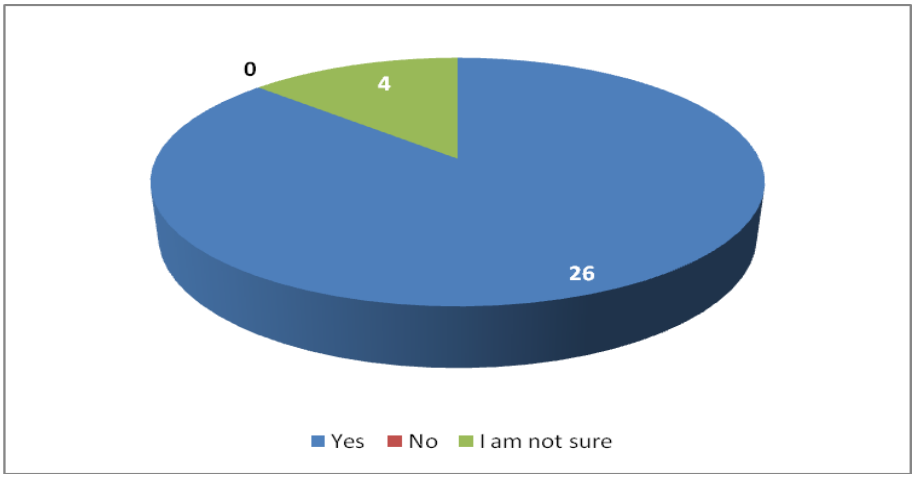
Opinion	v.a.	%
We should case-by-case asses the utility value against the environment harm, public health and consumers safety of GMOs before use is permitted?	17	57%
GMOs should be used but strict measures and control is necessary to avoid harm to the environment	14	47%
The intellectual rights are concentrated on a small number of multinational companies, which creates an imbalance in power thus potential exploitation of third world farmers.	13	43%
It is not possible to perceive the ecological implications of releasing modified organisms into the wild and therefore it should not be permitted to use.	7	23%
It is of ethical concern to create new and unnatural life forms, that otherwise would not have existed.	7	23%
It is a necessity for feeding a growing world population	6	20%
it is a good alternative to pesticide	6	20%
It will improve food quality and the crops nutrition value	3	10%
It helps to mitigate climate changes	2	7%
GMOs is a benefit if used to make better and cheaper medicine, but should not be used to food, feed and fodder.	1	3%
Other (please share):	2	7%

Another emerging point of view (13 respondents, 43%) is the one emphasising, not so much the usefulness or danger of such products, as the imbalance of power between third world farmers and large multinationals.

Less numerous, but still present, are those who attribute some positivity to GMOs.

To confirm this, as can be seen in the figure below, almost all consider it necessary to label GMO products. 26 participants in the meetings indeed answered "yes" to the question, while the remaining 4 "I am not sure".

Figure 39 - Opinions about the necessity of the labelling on genetically modified foods



Almost all those who have stated that they believe it is right to ask for labelling (25 out of 26 respondents) also believe that this same label should also cover industrial products that include feed or other genetically modified ingredients.

5.3.2.4 Nanotechnology

Also with regard to the use of nanotechnologies, most of the interviewees lean towards the need for a careful evaluation of their dangerousness on a case-by-case basis (18 people, equal to about 60%). However, it should be noted that in general the interviewees seem inclined to use these technologies. In fact, one in three respondents believe that nanotechnologies provide unlimited opportunities to improve health and almost one in two respondents think they can be used, even if under strict control.

Table 2 - Opinions about the nanotechnology

Opinion	v.a.	%
It poses endless opportunities to improve health and prosperity	10	33%
It should be used but strict measures and control is necessary to avoid harm to public health and the environment	14	47%
Nanotechnology is a benefit if used to make better and cheaper medicine, but it should not be used in materials or non-medical products.	3	10%

Opinion	v.a.	%
It is not possible to perceive the implications of the use nanotechnology as it is characterized by manifold application it should therefore not be permitted to use.	1	3%
We should case-by-case asses the utility value against the environment harm, public health and consumers safety of nanotechnology before use is permitted?	18	60%
Other (please share):	0	0%

In the table below, opinions are given about the conditions for banning nanomaterials in use for targeted medical therapies.

Table 3 - Conditions for the banning of targeted therapies (with nanomaterials)

Ban conditions for nanomaterial	Yes	No	Do not Know
... that the nanoparticles used in medicine can penetrate parts of the body where they could do harm	16	3	11
... that the medicine in the long term can harm the environment because the nanoparticles used cannot be degraded	8	3	19
..., that the medicine has unacceptable undesirable consequences that we do not have knowledge about, yet	5	7	18

What seems to prevail in this regard is a feeling of uncertainty linked to the lack of knowledge on the subject (on average, about one person out of two answers "I don't know"). The risk that the nanoparticles can cause damage in other parts of the body is the one that most frightens the interviewees (over half of them would be favourable to the ban of nanoparticles in this case).

Finally, in table 4 the opinions on the conditions for the ban of nanomaterials are reported.

Table 4 - Conditions for the ban of nanomaterials

Ban conditions for nanomaterial	Yes	No	Do not Know
… That you can't get rid of the nanotechnology material because, it cannot be degraded?	11	4	15
… that one cannot control discharges of certain nanoparticles, which could subsequently be harmful to health, e.g., by inhalation	14	3	13

Ban conditions for nanomaterial	Yes	No	Do not Know
… that the development of the water-repellent material has is faced with uncertainty about undesirable consequences that we do not have knowledge about yet.	6	7	17

The prevalent reason, among those proposed to the interviewees, for the ban of nanomaterials, appears to be the danger that the "waste" of these nanoparticles (about one interviewee out of two) cannot be controlled. This is followed by the risk of persistence of nanomaterials and the impossibility of getting rid of them (more than one in three respondents). It should be noted, also in this case, that overall about one interviewee out of two cannot express an opinion on the matter.

5.3.2.5 Pesticides

Finally, as regards the use of pesticides, there is an orientation towards the controlled use of these substances. The most widespread opinions, in fact, are those that highlight: the need to carefully assess the risks before allowing their use (17 respondents, equal to about 57%); to limit their use only under strict control measures to avoid environmental risks (16 people, 53%); the need to make a restricted use of it, especially due to the risk of the so-called "cocktail effects" (15 people, 50%).

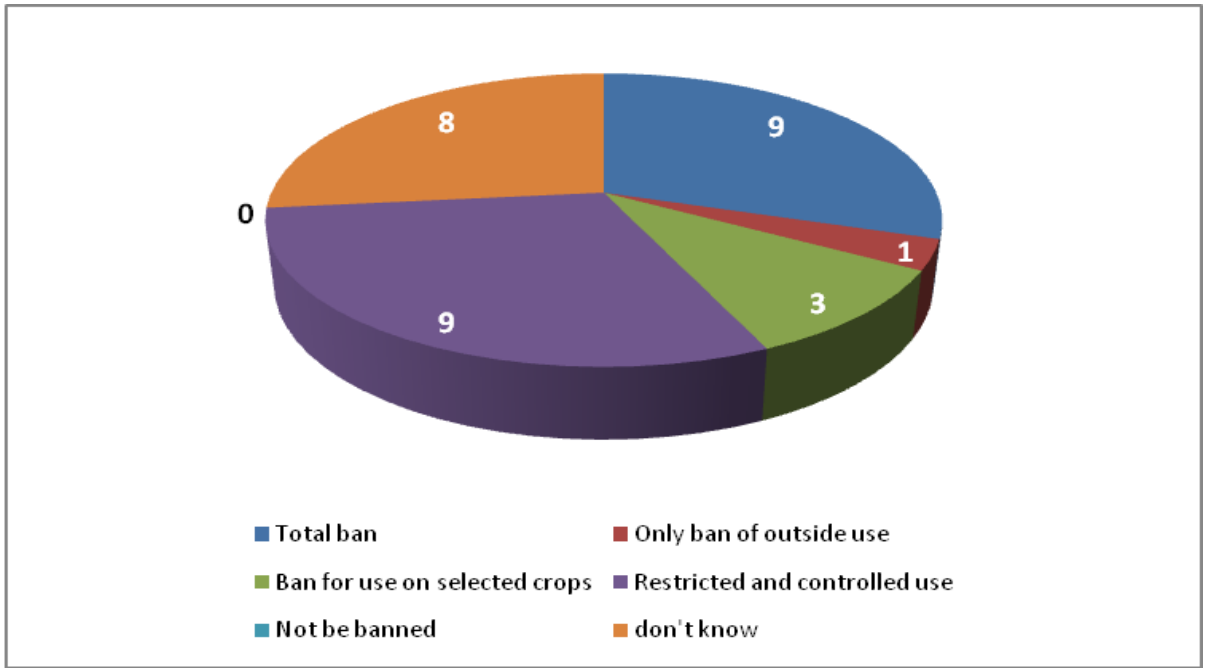
Table 5 - Opinion on the use of Neonics

Opinion	v.a.	%
There is no problem with pesticides it is an efficient and secure protection against pests	0	0%
It is a necessity for having a secure food supply	0	0%
It should be used but strict measures and control is necessary to avoid harm to the environment	16	53%
Single pesticides can be safe, but there is too great uncertainty about the combined effects (the so-called cocktail effect), and use should therefore be restricted.	15	50%
It is harmful to humans and the environment and should not be used in modern agriculture	6	20%
We should case-by-case asses the utility value against the environment harm, public health and consumers safety of pesticide before use is permitted?	17	57%
Other (please share):	1	3%

None of the interviewees, on the other hand, highlights only the positive aspects, while 6 participants in the meetings (20%) are inclined towards a generic "ban" on use in modern agriculture because it is harmful to the environment and to human beings.

This aversion to direct demand is even higher: "the EU should ban all neonicotinoids, applying the precautionary principle". As can be seen in the figure below, 13 respondents appear to be oriented to banish, in some way, these substances even if with different grades (9 are for a total ban, 3 for the ban only for use on specific selected crops and 1 only for outdoor use of neonicotinoids.

Figure 40 -Opinions on application of the precautionary principle and the ban of all Neonics

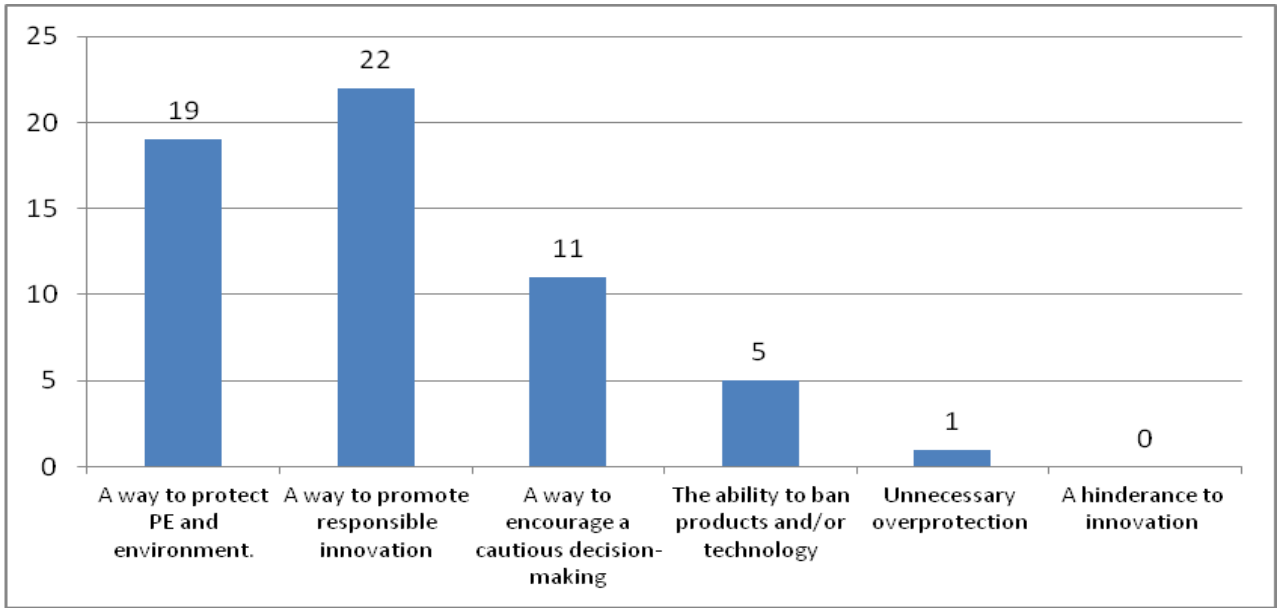


Regarding this subject, however, it must be said that the number of those who do not believe they are able to express an opinion is relevant (8 out of the 30 respondents).

5.3.2.6 Precaution and innovation

Figure 6 shows the main points of view regarding the subject of precaution. Most of the statements seem to indicate a high sensitivity of the interviewees to the precautionary principle. In fact, about two people out of three believe that this is a logical and rational way to protect public health and the environment. An even higher proportion of respondents (22 people, or about 73%) believe it is a good way to promote responsible innovation.

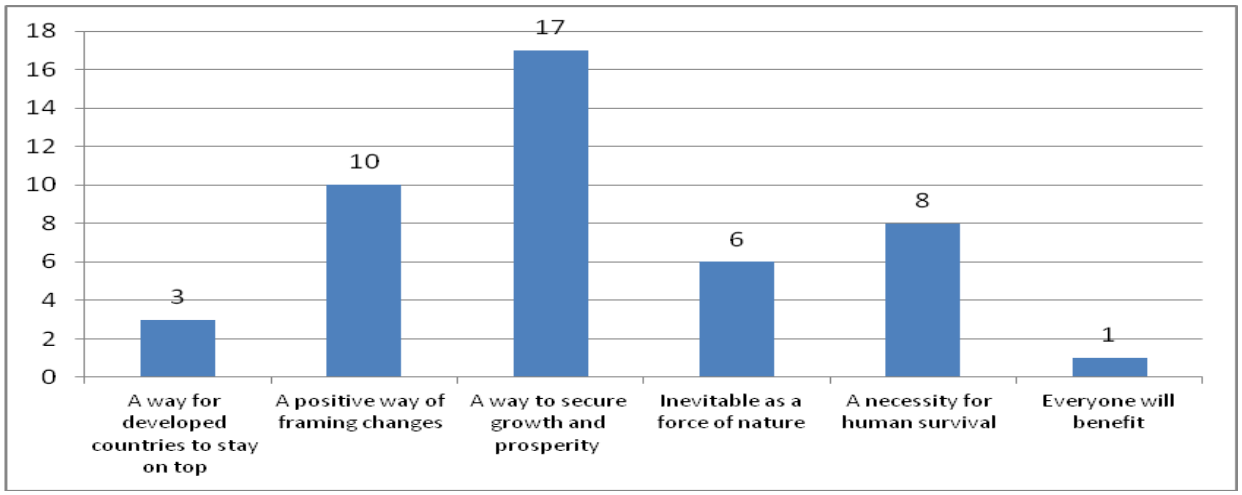
Figure 41 - Opinions related to what is "precaution"



Only one respondent believes that the precaution is excessive protection, while no participant believes that it is a brake on innovation.

As far as innovation is concerned, the opinions are very different from each other and cover the whole range of proposed options. As can be seen in Figure 7, just over half of the respondents (57%) believe that innovation is a logical and rational way to guarantee development and prosperity, while 1 participant in meetings out of 3 (33%) believes that it is a positive way to shape changes. Others underline the necessity and the inevitability of innovation: 8 respondents (27%) believe that this is a necessity for survival and 6 (20%) that this is an inevitable thing like forces from nature.

Figure 42 - Opinions related to what is "innovation"



Furthermore, one participant added that innovation can also be seen as the "tendency of societies that always tend towards improvement and higher quality".

5.3.2.7 Final remarks

In principle, the material provided by the project in preparation for the collective meetings was very much appreciated by the participants. 2 out of 3 considered it an excellent general picture of the issues connected with the themes of precaution and innovation. Only 2 people, on the other hand, considered the material incorrect and misleading.

Table 6 - Opinion on the information material

Opinion	v.a.	%
It gave a good overview of issues related to precaution and innovation.	21	70%
It gave a biased overview of issues related to precaution and innovation.	2	7%
It was easy to understand	18	60%
It was hard to understand	0	0%
Do not wish to answer	2	7%
Other (please share):	1	3%

The clarity of this material was also emphasized by the majority of respondents (18 people out of 30, around 60%).

Finally, two people did not want to make judgments about the material available to them.

A similar trend, as can be seen in Table 7, was recorded in the answers to the questionnaire and its clarity with 23 people who considered it a good general picture and 16 who considered it easy to understand. Only a very limited number of participants, on the contrary, considered it to provide a distorted image of the issues (1 interviewee) or difficult to compile (2 people, plus one that considered only the first part complicated).

Table 7 - Opinion on the questionnaire

Opinion	v.a.	%
It gave a good overview of issues related to precaution and innovation.	23	77%
It gave a biased overview of issues related to precaution and innovation.	1	3%
It was easy to understand	16	53%
It was hard to understand	2	7%
Do not wish to answer	0	0%
Other (please share):	1	3%

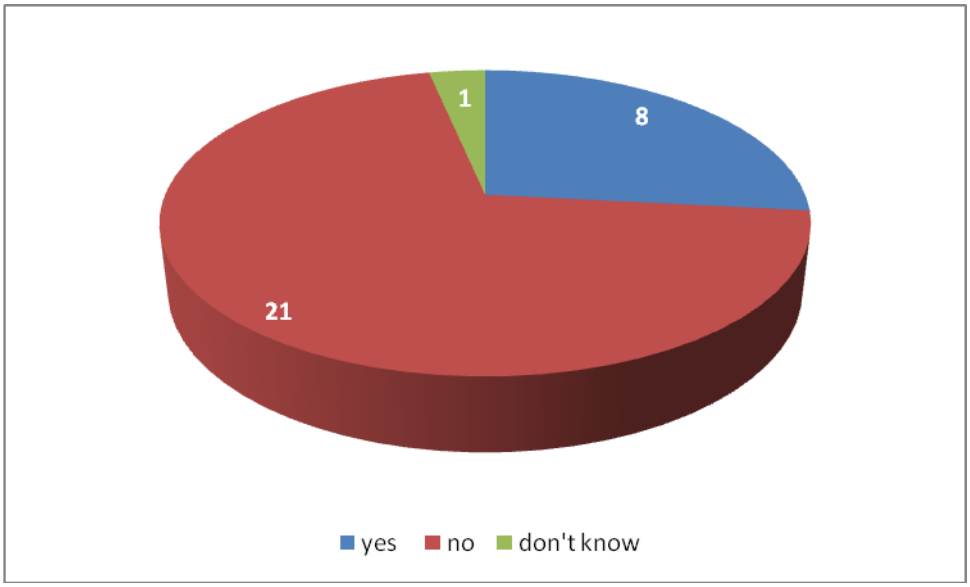
5.3.3 Themes from the group interviews

5.3.3.1 Precaution and innovation

5.3.3.1.1 Is there a trade-off between the two? And if so, which should be prioritized?

As can be seen in the figure below, over 2 people out of 3 believe that there is no trade-off between precaution and innovation. Furthermore, among the other 8 respondents who believe this relationship to be in place, 3 argue that the trade-off should not exist and that the two processes should go hand in hand. Still among those who show an inverse relationship between the two principles, there are 4 others that believe that priority should be given to the precautionary principle and only 1 to innovation.

Figure 43 - Opinions related to the existence of a trade-off between precaution and innovation



The arguments against the existence of the trade-off are many and can be briefly expressed through the positions of some participants in the meetings:

- there can be no trade-offs because innovation is such only if it is prudent, otherwise we cannot talk about innovation;
- only if there is precaution we can talk about innovation;
- in the European scientific system the approach does not provide for opposition and the two tend to go hand in hand, contrary to what happens in other systems like China (example of the complete disappearance of bees following the excessive use of pesticides);
- there is no trade-off as we, the beneficiaries of the innovations, must exercise the precaution.

One of the interviewees specifies that innovation always and in any case passes for a minimum risk and that perfect balancing is not possible, while another specifies that science itself must go on, control and precaution must intervene only at the time of

application of technologies. For this reason, as another interviewee argues, the so-called innovation cycle must be kept in mind when it comes to precaution.

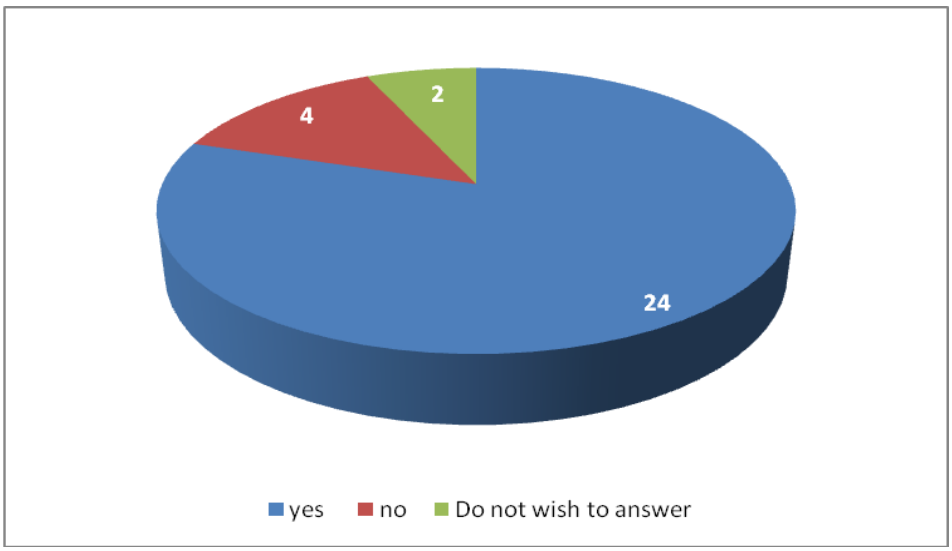
Among those who find the existence of a trade-off, there are those who warn against the risk that the interests of the "private" may go beyond precautions and those who, with an opposite point of view, fear that excessive precaution could push towards a risk of "obscurantism".

5.3.3.1.2 Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?

As can be seen in Figure 9, the vast majority of the participants in the meetings (24 of which about 83%) believe that ethical and moral aspects, as well as an evaluation of the social consequences, should be considered in the framework of the precautionary approach.

Among these interviewees there are those who believe that this is a political and moral choice proper to democracy, which would require a wide participation. With respect to this, however, the problem of adequate knowledge is underlined, which must make it possible to have all the terms of reference for a decision. In particular, there are also those who underline the difference between precaution and prevention with the latter which must be based on precise and verifiable information.

Figure 44 - Opinions on the inclusion of ethical, moral and social aspects in the precautionary



Moreover, among those who answered "yes" to the question, there are those who, however, distinguish between ethical and moral aspects and the social consequences. In particular, according to some interviewees, it is precisely these last aspects that should be considered because they can impact on everyday reality, such as the labour market. For example, we report the situation that has arisen at the Taranto ILVA[10] where on the

[10] The ILVA steelworks in Taranto is the largest steel processing plant in Europe. The case, which has not yet been concluded, dates back to 2012, when the prosecutor of Taranto established the closure of the steelworks and the arrest of its managers, due to the very serious environmental violations that led to the death of hundreds of people. Since then a long and complicated process has begun in which the state has tried to save the company

weighing plate there is on the one hand the health of workers and the population and on the other the risk of loss of jobs and impoverishment of the area.

The motivations of those who believe that these aspects should not be considered in the precautionary principle were very articulated. Specifically, we emphasize the priority of health and the environment with respect to other aspects (moral and ethical aspects) and to the fact that the precautionary principle should not be extended too much, in order to avoid the difficulty of actually having innovation. Others point out that inserting too many aspects, above all moral and ethical, risks bringing about a philosophical reflection with few outlets. Finally, there are those who believe that the moral aspect is a discourse that pertains to the individual sphere and that it cannot be taken into consideration in the precautionary principle.

5.3.3.1.3 Who should be involved when the precautionary principle has been invoked?

Table 8 -Stakeholders to be involved when the precautionary principle has been involved

Opinion	v.a.	%
Academia	17	
Research	27	
Governmental executives	8	
Governmental legislators	26	
Governmental agencies	13	
NGOs	9	
Large industry	9	
SMEs	7	
Advocacy groups	5	
Unions	9	
Consultancies	4	
Intergovernmental organizations	11	
Citizens	17	
Other (please share):	2	

from closure, both to avoid the loss of the work of thousands of people, and for the fundamental importance of the company for the Italian economy.

Opinion	v.a.	%
(1) agencies and other actors at the international level; (2) the gender point of view		

A polarization has been observed between those who believe that a small number of subjects must be involved when the precautionary principle is invoked and those who think that this type of decision should be taken with the help of a vast group of actors.

The main reason given by those who are inclined to restrict the number and type of subjects involved is that of skills. Primarily, the respondents of this notice argued that only highly informed views on the issues addressed should participate in this type of decision. Not surprisingly, the area of research is that which almost all the interviewees believe should always be present (the consideration of the academy was very minor, which is considered relevant for this type of decision by just over half of the participants, number however quite substantial).

The opposite opinion (the more inclusive one) was based mainly on the fact that the decisions must involve, in addition to all the competent subjects, even those on which the measures adopted will fall, to keep in mind all the points of view (in one case the need to consider in this sense also gender differences has been reported).

There has been much debate about whether or not citizens should take an active part in the decision. More than half of those present were of this opinion, citing arguments related to democracy and the need to control the interests at stake. Against the active involvement of citizens, the reasons given concerned the actual competence and degree of information needed to intervene in such complex matters. However, the conviction that citizens should receive correct and adequate information to form their own opinion on the subject, to be expressed also on the occasion of the elections, is very much shared. Some have emphasized the time factor, which would not allow citizens or other non-insider points of view to take mindful positions, others have pointed out that in Italy it has sometimes happened that popular consultations were held without afterward taking into account their results (for example, on the public management of drinking water).

The role of trade unions is also debated, which according to some interviewee should be present to protect the interests of the workers involved.

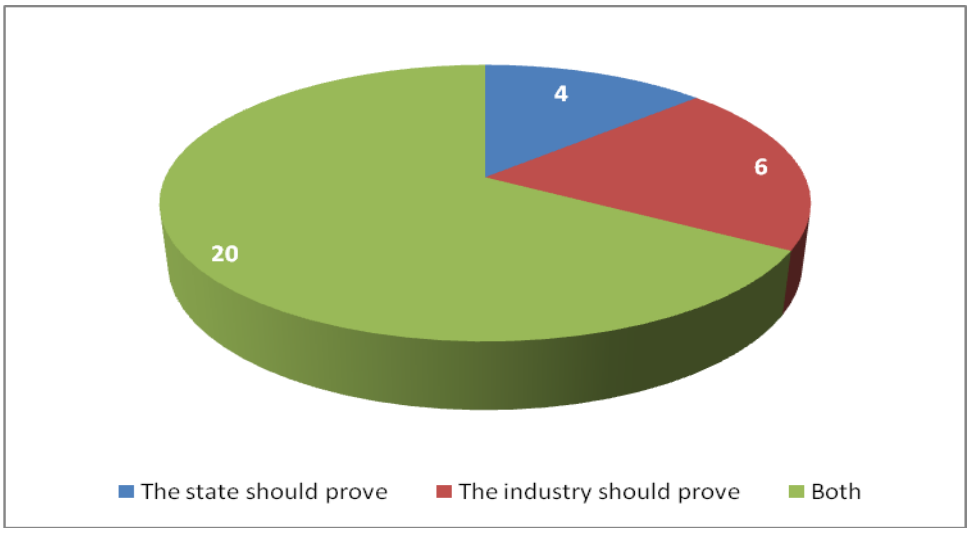
Doubts have been expressed about the opportunity to involve companies, given the profit-making objective that would conflict with the primary collective interest, which is to say the protection of health and the environment. Several participants expressed great distrust, especially with regard to large companies.

Some participants stressed the role of the public sector in controlling private interests. Others have challenged the ability and ownership of the public administration to deal with these matters. In one case, the external and regulatory authority of specialized international agencies has been invoked, which should dictate standards and supervise the subject, being also able to provide the views of other countries on how certain environmental and health issues are regulated (as has been done, for example, by delegating to the World Health Organisation the coordination of the fight against AIDS).

Lastly, almost a third of the participants considered the role of NGOs to be useful.

5.3.3.1.4 Should the burden of proof be on the state or the service/technology provider?

Figure 45 - Opinions about the burden of proof



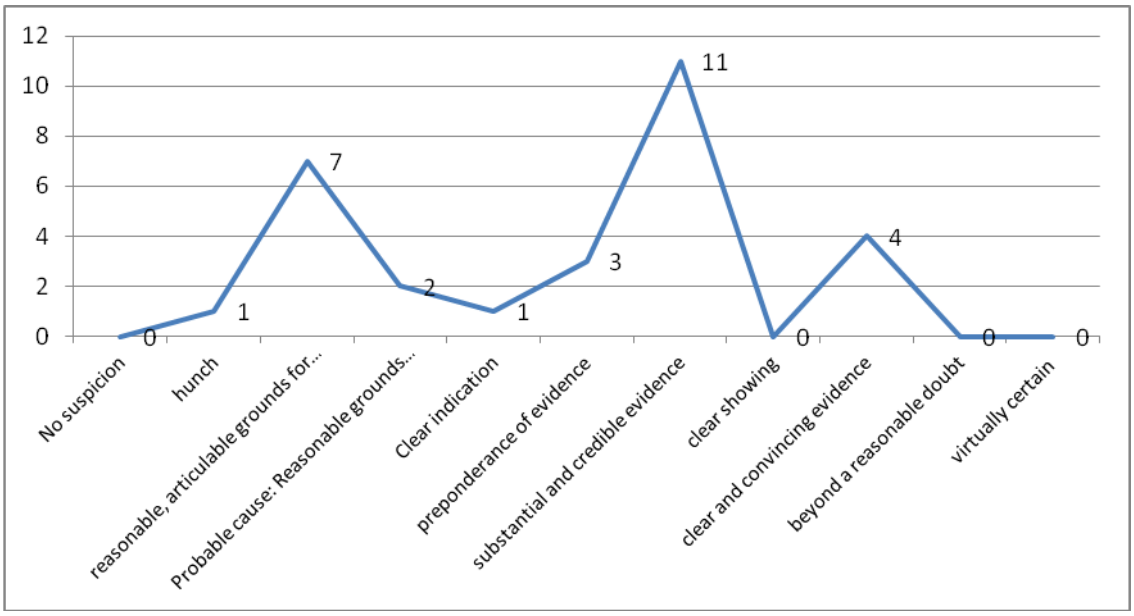
The most widespread opinion among the interviewees about the burden of proof is that it is to be shared between the state and the promoters of potential risk products or technologies. Among the remaining, more numerous those who attribute the burden of proof to the industry concerned.

Several respondents noted that there is an issue of different times and roles: first the producer must prove the absence of risks, then the authorities must check what the interested parties have claimed (one interviewee stated that the state is super partes). Several interventions have highlighted the fundamental role of science and scientists, some highlighting the function of providing key information at the beginning of the decision process, others highlighting its impartiality (which could almost configure an arbitration function).

Some participants talked about the damage caused by failed state control of technologies and products that later proved to be harmful.

5.3.3.1.5 How much certainty is needed before it is justified to ban a product or technology?

Figure 46 - Opinions on the degree of certainty to ban a product or technology



About one third of the participants stood at low levels (3 out of 11) of certainty to be able to banish a product or technology. The remaining ones expressed themselves mainly on the "substantial and credible evidence" option (7 out of 11).

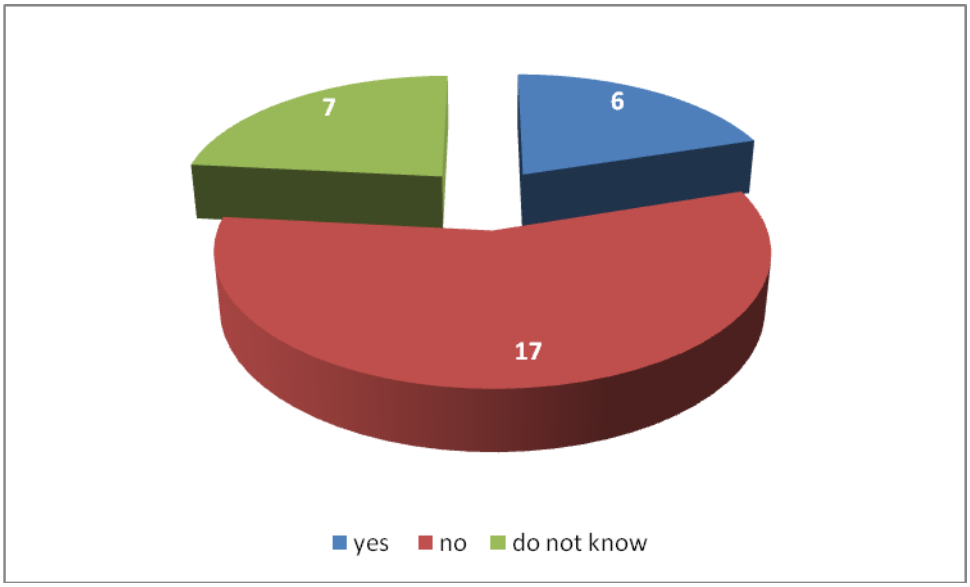
For the choice of high levels of certainty before banning, a participant invoked the role of scientists, and spoke of the risk of blocking all innovations, when it comes to asserting that "everything harms".

A person has alleged the impossibility of expressing himself on the subject of scientific certainty, if not on a case by case basis, noting that the decision differs according to the stages of the innovation/release process in the environment and/or on the market that are considered, and he also noted that in Italy the authorities took different decisions when they found different situations. Another participant stated that, in the case of the ILVA of Taranto, for example, where in the name of employment and work it was decided to continue steel production even in the presence of health and environmental risks, it would have been better to lower the thresholds necessary to ban the technology in question.

Another person has motivated his choice to position himself at an intermediate certainty level specifying that today not everything can be controlled, as was the case in past centuries, given the rapidity of innovation.

5.3.3.1.6 Do you trust the politicians and authorities to regulate technology?

Figure 47 - Trust in politicians and authorities to regulate technology



As it happens often in Italy concerning many fields of public interest, and it is confirmed from the graph above, Italian politicians and authorities do not benefit of the trust from the interviewees (only a fifth of these latter claimed to trust them).

Some interviewees distinguished between politicians and authorities (with them referring to administrators and technicians) in arguing their choice. It would be precisely the authorities that enjoy the least trust among the interviewees (even less than is the case with politicians), who have given various examples of regulation and / or ineffective control of the technologies in circulation (from the failure to detect diesel emissions before the Volkswagen case[11] up to the use of medical devices such as non-functioning cardiac stents).

One of the few optimistic participants about the regulatory abilities of the governors has highlighted the differences between the protection of health and the environment assured in Europe and what happens in other areas of the world (even more so in developing ones, such as different Asian countries), which makes citizens trust the authorities in this area.

5.3.3.1.7 Who should be involved in the further development of the precautionary principle?

Table 9 - Stakeholders to be involved in the further development of the precautionary principle

Opinion	v.a.	%
Academia	18	

[11] The so-called Dieselgate or emission scandal concerned the discovery of the falsification of emissions from cars equipped with diesel engines sold in the United States of America and Europe.

Opinion	v.a.	%
Research	26	
Governmental executives	10	
Governmental legislators	21	
Governmental agencies	12	
NGOs	10	
Large industry	12	
SMEs	6	
Advocacy groups	4	
Unions	8	
Consultancies	4	
Intergovernmental organizations	14	
Citizens	16	

The discussion on the actors to be involved for the revision of the precautionary principle has resumed the terms of the one that had preceded it about who to involve when the precautionary principle is invoked.

In the two questions, the numbers of supporters of each actor, in fact, are largely overlapping, at least for the actors who have been most cited: Academia; Research; citizens; legislators.

However, there are some differences in the numbers and, in some cases, even when numbers are equal or similar, in the arguments provided to support or not the involvement of certain types of stakeholders.

More interviewees considered the role attributed to intergovernmental agencies to be relevant (about half of the interviewees mentioned them, while about one third referred to them in the previous question).

Not a few (40%) even those who nominated the large industry (30% in the previous question), although more people in the discussion suggested instead that it was better to leave companies out of this decision.

As regards citizens, some have stressed that the opportunity to involve them depends on what the precautionary principle is to be applied to. When it comes to products that are already known to harm (e.g., pesticides), they should certainly be involved, obviously after being enabled to evaluate. Others recalled cases in which, although there were public meetings on similar problems (for example, the use of a herbicide in an area with an agricultural vocation), very few of the interested parties (citizens and farmers) actually presented themselves to discuss it.

One person (slightly bucking) has argued for the need to restrict the circle of decision makers when making more difficult decisions. Another stressed the importance of consultancies when discussing future developments.

5.3.3.1.8How do you want uncertainty with technology to be regulated?

Table 10 - Opinions on how to regulate technology

Opinion	v.a.	%
• No regulation, market forces will be sufficient	0	0
• A precautionary principle that comes into effect when uncertainty about potential risks arise that requires = 29	29	97%
... That products cannot come to market only when there is guaranteed absence of risk? 20	*20*	*67%*
… A democratic debate with direct involvement of citizens, stakeholders, experts? 5	*5*	*17%*
… a decision are made by relevant politicians? (indirect representation of citizens) 1	*1*	*3%*
… that decisions are made by relevant experts? 3	*3*	*10%*
• Other = 1 Decisions taken by the authorities on the basis of indications from competent experts	1	3%

No respondent said he was in favour of regulating uncertainty about technology on the part of market forces.

Almost all (29 out of 30) have chosen one of the other available options, referring to different ways of interpreting the application of the precautionary principle. The most shared (two thirds of the interviewees) concerns the authorization to put products on the market only in the absence of risks.

Finally, only one interviewee proposed a combination of two possible answers stating that the decision should be taken by the competent authorities based on indications from the experts. In this regard the Italian example of Stamina[12] is brought, which, without a decision taken and effectively controlled by experts, has deluded many people "playing on their pain".

The discussion generally focused on the actors to be involved to ensure the absence of risk. In particular, some participants have highlighted the need to involve competent subjects in the regulation who are not motivated by specific political and economic

[12] Stamina was an Italian company tried and convicted for the promotion and sale of non-certified treatments based on the use of stem cells for very serious diseases.

interests. In this regard, some point out, however, that the state must be able to certify and control, even considering the time needed, given that industry times are very fast.

Also the involvement of citizens has been highlighted as relevant, but connected to the need to have adequate methods of involvement that allow citizens to have their say and not to intervene only after the decision has been taken. Another participant similarly highlights the need to support citizens for their effective involvement. In this regard, one respondent noted a difference between Italy and the United Kingdom, a country in which, in his opinion, citizens are facilitated to involvement and provided with sufficient information to express a reasoned opinion on decisions that concern them.

5.3.3.1.9 Do you think development of technology can be controlled?

Table 11 - Opinions on the actual possibility to control technology

Opinion	v.a.	%
Yes, I believe we can regulate technology	2	7%
Yes, we can regulate the technology, but research will continue.	13	43%
I only think we can regulate technology if we get some international rules	6	20%
No, it's utopian - The research will continue on its own, and the technology will be put on the market.	6	20%
No, industries and the market are too powerful	3	10%
Other	0	0%

The prevailing opinion among the participants is a moderate optimist about the possibilities to regulate technology. In particular, the majority of the people consulted stated that technology can be controlled even if scientific research will continue.

Almost one third, on the contrary, think that technological development cannot actually be controlled, because of reasons connected either to the technological research system, or to the strength of industry and market mechanisms.

In the debate concerning the possibility to regulate and control technology, the request of some participants emerged of an enhanced regulation, but also of adequate and shared explanations of new technologies and their use, because these arguments concern everyone.

5.3.3.1.10 Further issues emerged during the debate

Some topics not present in the questionnaire were raised by some participants at the end of the debate. They included:

- The concern for global warming, which pushes us to think carefully about the precaution against risks and the necessary control over technologies

- The study of sustainable alternatives (for example to pesticides)
- The importance of individual responsibilities (which everyone must assume) regarding the sustainability of environmental and health technologies in relation, for example, to issues such as waste disposal and recycling
- The centrality of the issue of state control over technologies
- The importance of education, training and awareness-raising among citizens and other stakeholders
- The need to find effective forms of social dialogue on topics crucial to the health and well-being of citizens and the protection of the environment (in this regard, some participants expressed appreciation for the debate during the collective interview and others for quality preparatory materials), for which social media represent a false solution
- The risks linked to functional illiteracy in a world in constant change, especially thanks to the evolution of technologies
- The usefulness, in some cases, of taking personal risks in view of possible beneficial discoveries (e.g., experimental treatments for diseases)
- A cautious optimism with respect to the European situation regarding what is happening in the rest of the world.

5.3.3.2 Summary

- Is there a trade-off between precaution and innovation? And if so, which should be prioritized?

Most of the participants (over 2 people out of 3) believe that there is no trade-off between precaution and innovation and that the two aspects go hand in hand. In principle, the most widespread opinion is that precaution is an appropriate way to control innovation. About a quarter of the participants noted the existence of a trade-off, and in any case believed that it should be resolved in favour of precaution.

- Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?

Almost all participants (83%) share a broad concept of precaution, which also includes other aspects in addition to the protection of health and the environment, mainly those of a social nature (there is no consensus, however, when we speak of ethics).

- Who should be involved when the precautionary principle has been invoked?

On this topic, the various tables have seen a polarization between those who believe that a small number of subjects must be involved when the precautionary principle is invoked and those who think that a vast team of actors must come into play. About half of those present argued in favour of the presence of citizens. The main argument was related to the topic of skills needed for an informed decision. Almost all participants have expressed their concerns about the possibility that private interests prevail in matters related to public health.

- Should the burden of proof be on the state or the service/technology provider?

The widely prevailing opinion (2/3 of those present) is that the burden of proof must be shared. The arguments referred mainly to the different phases in which information / arguments must be provided (scientists and technicians in the initial phases, state and other regulators at the end of the process, through the controls).

- How much certainty is needed before it is justified to ban a product or technology?

Also in this case, summarising the progress of the discussions in the different tables, we can speak of two main positions (with many nuances). The first, expressed by about a quarter of those present, required a low level of certainty (3 out of 11) for banning, the other, with just over a third, on a medium-high level (7 out of 11) . There were no extreme positions, but various concerns were expressed (from the risk of stopping technological development to that of making very risky health decisions).

- Do you trust the politicians and authorities to regulate technology?

Only a fifth of the participants expressed confidence in Italian politicians and administrators. Over half did the opposite, mainly based on examples taken from the policies of recent years.

- Who should be involved in the further development of the precautionary principle?

The discussion that has already taken place about the involvement of the various stakeholders in the cases in which the precautionary principle is invoked has been re-proposed and the key role of information has been reiterated to ensure that all interested parties take part in the decisions. The role of intergovernmental agencies and, surprisingly, of large companies has been emphasized, even if among those present there prevails the distrust of those who hold private interests and profit in these decisions.

- How do you want uncertainty with technology to be regulated?

None of the participants considered the market forces sufficient to self-regulate the uncertainty connected with the technology, while most of them (2/3) argued that only healthy and safe products should be put on the market. The timing of the decisions and the roles of the main players involved were discussed (above all on the need for regulators to follow the pace of technological innovations) regulating.

- Do you think development of technology can be controlled?

About half of the participants were confident in the possibility of regulating technology. The discussion concerned the space-time aspects of regulation. Some expressed doubts about the effectiveness of a regulation that does not start from international agreements and others, on the contrary, referred to the local territorial dimension as an appropriate framework. According to some, control can only be exercised in the short term. Others have asserted that only in the future will we be able to control technological development more adequately.

- **Further issues**

Several participants raised other issues related to their experiences with regards to environment and health. Among these, in addition to a general concern related to environmental issues such as global warming, which pushes towards individual empowerment for a sustainable future, the importance of education and training to allow greater participation of citizens in decisions on health and the environment and the need to find forms of social dialogue capable of mobilizing all stakeholders on these issues.

5.3.4 Conclusions

In general, we can talk about a high level of "precaution" of the participants in the Italian meetings with citizens. Everyone calls for an active role of the state in regulating and controlling the risks deriving from the use of potentially harmful technologies and products.

The aspects on which maximum convergence was found were:

The lack of trust in politicians and administrators (due to the inability to control and to take decisions that are not always consistent)

The distrust of private interests at stake in the spread and use of technologies and products such as GMOs and pesticides.

Perhaps the most controversial aspect was that of the role of citizens in relation to complex issues such as the precautions to be taken in case of risk and how to understand participation in decisions in this area.

Two other aspects on which there was no convergence are the level of certainty needed before banning a product or technology and the possibility of controlling technological development.

5.4 Briefing report - The Netherlands

Citizen's view on Precaution and Innovation

The Netherlands

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Date of submission/publication

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5.4.1 Executive Summary

Introduction

This report describes the results of a citizens meeting that was held in the Netherlands for WP1 (task 1.3) of the RECIPES-project. The aim of the meeting was to get insight into the rationalities, values and presumptions of Dutch citizens with regard to the precautionary principle and innovation.

Methods

This information was gathered through a combination of a questionnaire and group interviews. With the help of a market research organization ('Markteffect') forty people with backgrounds that were more or less representative of the Netherlands[13] with regard to gender, age, followed education and employment were assembled on the 19th of June 2019. A week before the meeting the selected participants had been send a document that informed them about the project and the topic of the precautionary principle and innovation. Three cases (GMO's, nanotechnology and pesticides) were included to make the topics more tangible.

After a brief summary of the background material, the participants filled in – silent and separated from each other – the questionnaire. Next, the group was split up into five groups of eight people that were guided to five different rooms. It was made sure that these groups were of a diverse composition with regard to gender, educational background and age. In each room a moderator from the Rathenau Institute led a discussion on the basis of questions that followed the themes that were put forward in the questionnaire. While the questionnaire had served to track down some general tendencies among the participants with regard to the precautionary principle and innovation, the discussion was meant to identify the rationalities, values and presumptions behind these answers and gave people the room to bring new issues, examples and ideas to the table.

This report is the outcome of an analysis of the results of the questionnaires (see paragraph 1) combined with the input (transcripts, recordings and general notes) from the group discussions (paragraph 2). The conclusion (paragraph 3) contains the main findings as a result of a synthesis of the previous parts.

Results:

First of all, participants generally recognized the importance of both innovation and precaution. A slight preference was noticeable towards letting precaution prevail over progress of innovation, which was seen as a rational and logical way of protecting health and the environment, while innovation was more often associated with (private) individual and economic interests. An overwhelming majority (93%) was in favour of applying the precautionary principle in the case of regulating technology with scientific uncertainty about assessed risk. A general agreement (83%) existed about the need to also include ethical, moral and social aspects in assessments that are applied in a precautionary approach.

Both the results from the questionnaire and the discussions pointed to a preference towards a thorough and extensive precautionary approaches, both with regard to the three individual cases as with regard to the suggestions and examples that were put forward during the discussions. A majority argued that both companies and the government should have a responsibility with regard to the burden of proof, and a variety of other stakeholders were suggested as possible candidates to be involved during the application of the principle. During the discussions, themes like transparency, informing the general public,

[13] See pages 7-8 for the details.

international agreements, the need of independency of supervisory bodies and democratic practices often surfaced as being important.

Another recurring sentiment towards precaution and innovation – especially when people talked about it in general terms – was that 'technological development would continue anyway' and that not much could be done with regard to regulating it. This feeling seemed often to be strengthened by the presuppositions that companies/politicians/researchers would do whatever they wanted to do for progression of innovation activity. Some participants furthermore expressed a general frustration that 'the guy in the street' could not keep up with innovation or they pointed to examples of innovation, such as mobile phones and the internet, that had suddenly transformed society and against which not much could have been done.

In addition, there seemed to be a discrepancy between what people knew about scandals or disasterssurrounding technologies with uncertain implications and what they knew about how such problems had been mitigated and by whom. The origin of this could lie in the fact that this gets less attention in the news, is less interesting to remember and that less attention was paid to this aspect in the information material.

Discussion

The results in this report do not warrant very firm extrapolations about what 'people in the Netherlands think about innovation and precaution', since the size of the group was only forty. Also, the multiple choice approach of the questionnaire, the phrasing of certain questions and answers, and the specific cases chosen, might have directed answers in certain directions. Some participants moreover marked multiple options when only one option was required. Finally, little attention was given to governance or risk management in the information material, which possibly made pessimism about actability for precaution surface in the group discussions.

Conclusion

In conclusion, the results from the questionnaire and the discussions indicated a positive stance towards precaution and innovation, the opinion that there does not necessarily exists a trade-off between the two and that transparency, and the importance of involving a broad variety of stakeholders with different responsibilities, having knowledge and independency from external interests are important for applying the precautionary principle.

5.4.1.1 Introduction

In May-June 2019, the RECIPES project hosted citizen meetings in Denmark, Norway, Netherlands, Italy and Bulgaria. RECIPES citizen meetings were set up to provide the public with an opportunity to reflect on issues related to precaution and innovation in relation to research, and to provide their ideas and opinions directly to the researchers and managers of the RECIPES project. The present report is one of five country reports detailing the result of the national meetings. The results of all five citizen meetings will be collected in a main report and delivered to the researchers and managers of the RECIPES project.

The report first gives a brief overview of the context of the Netherlands, before proceeding to the results.

5.4.1.2 The Netherlands

The aim of this report is to analyze citizen's perception of precaution and innovation. The goal is to provide RECIPES researchers and management with input they can use to create

a toolbox for the application of the precautionary principle. We will begin with providing some basic information about the Netherlands.

The Netherlands is located in the northwestern part of Europe and borders the North Sea. The capital of the country is Amsterdam. It is a parliamentary constitutional monarchy with a unitary structure. The official and most spoken language is Dutch.

The country has a population of approximately seventeen million people and a Gross Domestic Product of around 725 billion euro's. Trade, banking, transport, agriculture and technological devolopment (especially ICT) are some of it's major economic sectors.

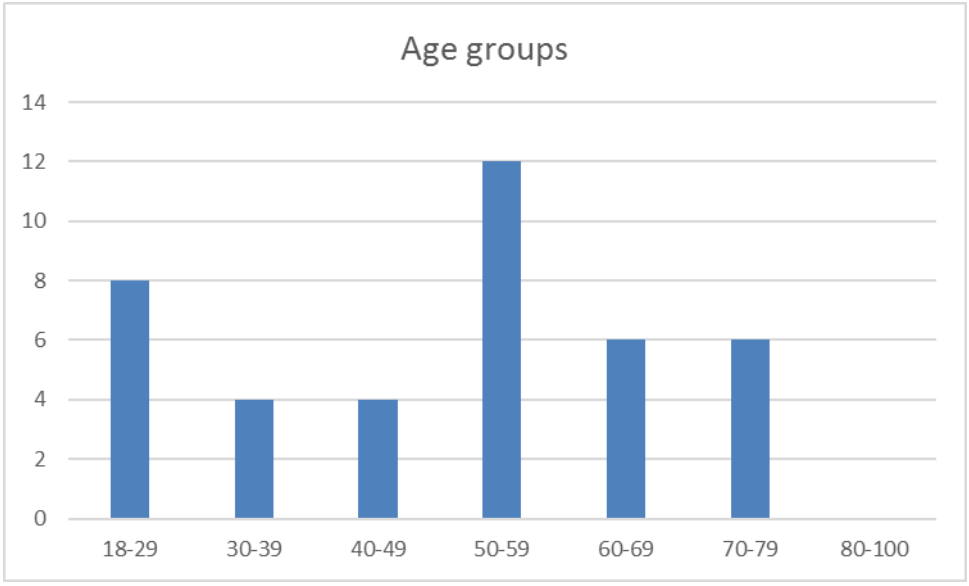
The R&D intensity of the Netherlands (R&D expenditure as a percentage of GDP) was 1.99% in 2017.14 In 2016 (the latest data available) 52.2% of the Gross Domestic Expenditure on Research and Development (GERD)15 was financed by the business enterprise sector, 31.33% by government, 2,71% by other national sources and 13.92% by the rest of the world. Of the GERD that was performed in 2017 58,78% can be attributed to the business enterprise sector, 29.81% to the Higher Education sector and 11.41% to the Government sector. The percentage performed by the Private Non-Profit sector in this year is not given on the site of the OECD, but would probably amount to around 0,5%.

5.4.2 Results from the questionnaire

5.4.2.1 Demographics

The number of people that participated in the group discussions was 40. Of this group 53% were male and 47% were female. The age was distributed among them as follows:

Figure 48 – Age groups

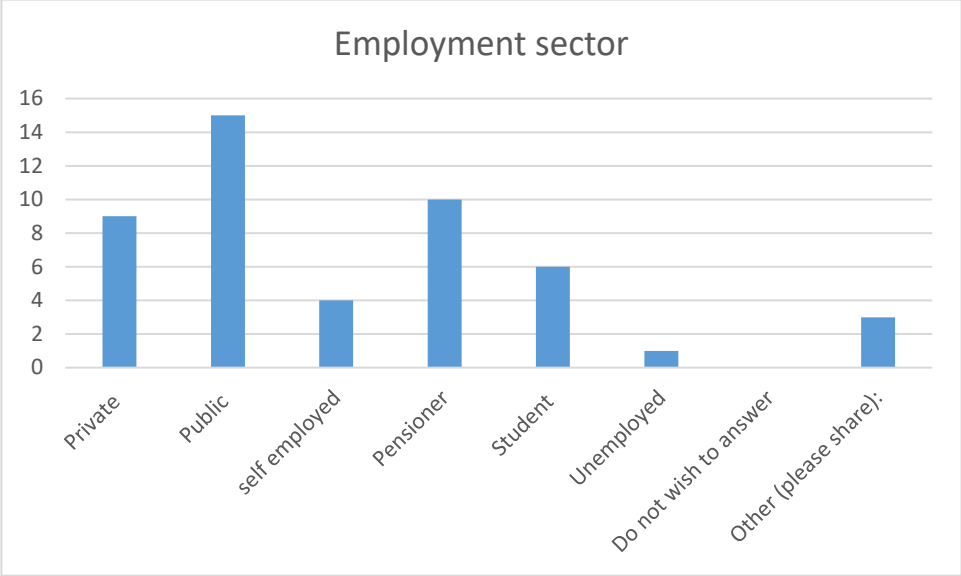


[14] OECD MSTI database, 2017 figures, https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB#

[15] Gross domestic expenditure on research and development (GERD) is the total intramural expenditure on research and development performed on the national territory during a given period. https://stats.oecd.org/glossary/detail.asp?ID=1162

The participants worked in the following employment sectors:

Figure 49 - Employment sector



With regard to the degree of urbanity 17,5% of the participants originated from a region of moderate urbanity (*matig stedelijk)*, 17,5% from a region of strong urbanity (*sterk stedelijk)* and 65% from a region of very strong degree of urbanity (*zeer sterk stedelijk*).[16]

Another indicator that was used to select the participants for the meeting was the highest level of education followed. Of the participants 35% followed a higher (scientific) education (*WO)*, 50% followed a Vocational education and Training (*HBO*) and 15% followed a General upper secondary education (*MBO*).

5.4.2.2 Reason for participation

'A fascination towards technological development and progress' was the answer that was most often given as a reason for participation in the workshop (40%). A considerable lesser, but still large amount (20%) of participants was inspired by a worry towards the risks of innovation. The 'opportunity to have their voice heard in a EU-project' had the lowest percentage (13%) of the votes.

5.4.2.3 Genetically modified organisms

A strong majority of the participants (80%) agreed that the utility value of GMO's should be assessed on a case-by-case basis against harm to the environment, public health and consumer safety before use of them is permitted. A majority (70%) recognized that control

[16] The degree of urbanity used is derived from the CBS (a Dutch governmental institution that gathers statistical information about the Netherlands).

over GMO's is necessary to avoid harm to the environment. However, only 15% thought that the ecological implications of GMO's in the wild could not be overseen, and should therefore not be permitted.

Of the participants 53% argued that GMO's are a necessity for feeding the growing world population, but exactly the same percentage also stated that the technology of genetic modification of plants leads to an imbalance of power of multinationals in relation to third world farmers. In their opinion, the possible value of GMO's in relation to mitigating climate changes (15%) or as an alternative to pesticides (38%) was not much acknowledged. A significant result was also that 45% of the participants thought that creating unnatural life forms was of ethical concern.

By far the most people (83%) argued that it would be fair to label products containing GMO's without evidence of them being harmful to human health. And moreover, 68% also thought that this labelling should also be applicable on food products which are manufactured using genetically modified animal feed or other genetically modified ingredients.

5.4.2.4 Nanotechnology

Just as was the case with GMO's, a majority of participants argued that the utility value of nanotechnology should be assessed on a case-by-case basis against harm to the environment, public health and consumer safety before use is permitted (75%). Strict measures and control are necessary according to many participants (63%). A considerable amount of the participants nevertheless seemed to be enthusiastic about the potential of nanotechnology; 58% agrees with the statement that it poses endless opportunities to improve health and prosperity.

Furthermore only a very small percentage argued that the nanotechnology should not be permitted to use (8%) or that it should only be used in medical products (13%). The utility of nanotechnology, however, did not seem to be self-evident to some of the participants. Three of them chose the option 'other' and wrote down that they did not know enough about it.

In relation to targeted medicine, it having unacceptable undesirable consequences that we do not yet know, seemed to invoke the most support for banning it (72,5%). Not being able to control discharges of certain nanoparticles and the subsequent harm to health, seemed to be the most important reason to ban nanomaterials (60%).

5.4.2.5 Pesticides

None of the participants thought that there are no problems with pesticides. Most of them (70%) agreed that it should be used, but that strict measures and control are necessary to avoid harm to the environment. Just as with the previous cases, the importance of case-by-case assessment of the utility value against environmental harm, public health and consumer safety was acknowledged (60%).

A considerable percentage (55%) stated that the use of pesticides should be restricted because of the uncertainty with regard to the cocktail-effect. Moreover, not that many people (38%) thought that the use of pesticides is a necessity for having a secure food supply. A relatively small percentage thought that pesticides should not be used in modern agriculture (23%).

5.4.2.6 Precaution and innovation

A majority of the participants (53%) seemed to sympathize with precaution and marked that it is a logical and rational way to protect public health and the environment. Only 5% thought that it amounted to overprotection, fear and anxiety (5%) or as an hindrance to innovation (8%). A considerable percentage (33%) saw it as a way to encourage cautious decision-making, a good way to promote responsible innovation (43%) or as the ability to ban undesired products and/or technology (45%).

Many participants agreed with the importance of innovation. Half of them (50%) saw it as a logical and rational way to secure growth and prosperity, 43% saw it as a necessity for human survival and 30% thought that everyone will benefit from innovation. Moreover, 33% thought that innovation is as inevitable as a force of nature.

The positive attitude towards both precaution and innovation seemed to be reflected in how people thought they related to each other. A majority (65%) did not think that there existed a trade-of between precaution and innovation (only 18% agreed with this question, others chose 'I don't know'). If it was argued that there existed a trade-of, 43% thought that precaution should have a priority, 39% that the priority should be equal and only 11% prioritized innovation, and 7% chose 'other'.

Most people (85%) argued that a precautionary approach should also cover ethical and moral aspects and an assessment of social consequences. Nevertheless, the groups of people that they though that should be involved when the precautionary principle is *invoked* seemed to consist primarily of 'experts'. An overwhelming majority (90%) thought that 'Research' should be involved, as well as governmental agencies (75%) and Academia (63%). However, there seemed to be considerable disagreement about the question of the involvement of citizens, NGO's and intergovernmental organizations. Respectively 53%, 55% and 50% marked these groups. Half of the participants (50%) stated that they did not trust politicians and authorities to regulate technology, and 18% answered that they didn't know. A similar picture emerges from the answers to the question about who should be involved in the *development* of the principle.

With regard to the 'burden of proof' the answer that both the state and industry had responsibility was the most popular (50%). After this, most people argued that the industry should prove that a product or technology is safe (38%).

Many participants seemed to opt for a very precautious approach, since most of them argued that a relative small amount of uncertainty can justify banning a product or technology. Reasonable, articulable grounds for suspicion were seen by 28% as sufficient, and 10% even indicated that 'a hunch' would be enough. However, all in all (due to the fact that some marked multiple answers) the general attitude was difficult to ascertain and generally seemed to be spread quite evenly among the participants; most answers getting a percentage of around 10-20%.

An overwhelming majority (93%) chose the precautionary principle over no regulation. With regard to this question relatively a lot of people (41%) prioritized that products can come to market only when there is guaranteed absence of risk or argued that a democratic debate with direct involvement of citizens, stakeholders and experts is necessary (38%). Only 22% prioritized that the decisions should be made by experts and none prioritized the decision-making of politicians (indirect representation). A considerable amount of people, as can perhaps be deduced from this, think that the application of precaution requires a dialogue with different types of groups in society. This might also be derived from the fact that the participants marked relatively a lot of different actor groups as to involve, with most options having more than 30%.

Though the majority of participants emphasized the importance and value of precaution, many of them also, somewhat paradoxically, seemed to be of the opinion that the development of technology cannot be controlled. Of all the participants, 45% thought that regulating technology is utopian, 15% thought that industries and markets are too powerful and 15% thought that the regulation of technology would only be possible via international rules. Only one person (3%) was of the opinion that technology can be regulated.

5.4.2.7 Final remarks

In general, the participants were positive about the information material and the questionnaire. Most of them thought that both the information material and the questionnaire (78%) gave a good overview of issues related to precaution and innovation, and that they gave a good overview of issues related to precaution and innovation (also 78%). Just below half of the participants (respectively 48% and 43%) thought that the information material and the questionnaire were easy to understand (with respect to 8% and 5% that thought they were too hard to understand).

5.4.3 Themes from the group interviews

In general, the group discussions could be described as lively and friendly. A common thread was that people thought that the topic discussed was interesting, important and that they were happy that they were involved ('I would like to give a compliment about the way this process is organized. That we, as ordinary citizens, though it will probably not be much, can have some influence on that very large EU.')

It seemed that most people were open to share their opinion and the discussions went in a respectful manner, though – because the topic was so broad – a lot of different themes and subjects were discussed. The participants nevertheless seemed to be very well capable to make the concepts of the material their own and apply it on historical, contemporary or even personal issues or examples.

Sometimes, it seemed that personal stories would set the tone and, especially in relation to controversial topics, people would parrot each other. However, when people got into the details, the opinions became more nuanced. Many participants said that they had learned a lot from the information material, that it had changed their mind or even that they would take home some of the arguments that were put forward during a discussion ('I have written down topics in my agenda, which I will read in a different way; more intensively and more consciously too.').

The main points and opinions brought forward during the discussions seemed to largely overlap with the results of the questionnaires. The alternative options that people had suggested when they filled in the questionnaire also surfaced during the discussions. The discussions thus proved to be accessible enough for participants to bring forth specific suggestions they had thought of on their own.[17]

[17] See annex 2 for an overview of these alternative answers.

5.4.3.1 Precaution and innovation

5.4.3.1.1 Is there a trade-off between the two? And if so, which should be prioritized?

A common theme in the discussions, which was also reflected in the answers of the questionnaires, was that it depends a lot on the specific case to what extent and how the precautionary principle should be applied.

During the discussions the importance of both innovation and precaution was emphasized. Each of them have been characterized as being 'fundamental for the survival of the human race'. In favour of innovation it was argued that it is necessary for progress 'to take risks' 'to try things out' or to preserve a competitive advantage (towards China for instance). ('You can be innovative, but if you did not foresee a risk somewhere, then you will be charged with a million and you will still be completely bankrupt'). Another person noted that the discussion about precaution might be one-sided because all the technological development that happens without problems doesn't reach the news: 'There are many hundreds of scientific projects or developments that went well and of which we did not know the risks. But these are not published in the papers.'

Some argued that innovation should not beforehand be fixed by guidelines so that it would not come to a standstill, and that it is difficult to aptly apply precaution since innovation is about something fundamentally new. Those who prioritized precaution often emphasized that the economic interests that pushed innovation often clash with general interests and they argued that 'people and the environment must always have priority'.

A reoccurring theme however was that innovation and precaution could be in line with each other; as a 'synergetic relation', 'a balance' and precaution was characterized as something that steers innovation in the right direction. One participant summarized: 'It (*the relation between precaution and innovation*) is not like a seesaw that goes one way up and another way down.'

5.4.3.1.2 Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?

With regard to this question, ethical and moral aspects were often contrasted with economic benefits. 'In the end it is all about money' was a reoccurring statement. Some argued however that one should only look at facts, while moral and ethical aspects were subjective and relative to one's culture or generation.

The moral, ethical and social aspects mentioned were (public) health, the environment, privacy, international relations, medical-ethical issues (such as growing a pig lung inside a human body, cloning and embryo's), the distribution of power (this issue was especially often mentioned in relation to Big Tech-firms) and the division of food and wealth worldwide.

Often people expressed their concerns of innovation in relation to the growth of the world population; especially the question if the profit and power that comes with innovation is fairly distributed.

5.4.3.1.3 Who should be involved when the precautionary principle has been invoked?

The participants described 'expertise' and 'independency' as necessary qualities for those involved in the application of the precautionary principle. This seemed to mirror the results of the questionnaires. Scientists were almost unanimously thought to fit these criteria.

What was also representative of the results of the questionnaire was the considerable disagreement that existed in the discussions about the possible role of citizens. On the one hand some argued, referring to the supposedly disastrous results of the Dutch referenda, that the newness of innovation might inspire irrational fear with people that do not know enough about it. Others however called out the need to establish specific citizens group to tackle issues related to precaution and innovation.

Considerable debate existed about the possible role of companies. Some argue that they should primarily be responsible, because they are the prime developers of technology and should as such also be held responsible. Others argued that companies might not publish honest results about risks.

Another actor that was often mentioned that should be involved, was the government, though it was not often specified which agency or branch exactly.
A group that was not an option in the questionnaire, but were mentioned here were 'children'/young adults. These came up in two of the five discussions. It was expressed that it was important to involve young people, because they would suffer the consequences of innovation and should thus have a say over it. Other groups mentioned were 'journalists' ('I have noticed from the past 5 years that newspapers are conducting more and more in-depth investigations'), the consumers league (*consumentenbond*), the WHO and the ministry of Health.

All-in all, a considerable amount of scepticism and distrust was expressed however to almost all type of actors. The need for checks and balances, and transparency about interests was a theme that peppered many of the arguments.

5.4.3.1.4 Should the burden of proof be on the state or the service/technology provider?

In relation to the burden of proof there seemed to be a general agreement that both the industry and the government should carry some responsibility. Of the industry it was often argued that they had an interest to keep silent about the risks and of the government it was said that it did not have enough expertise and capacity to adequately monitor all new products or technologies. A variety of participants consequently added that an independent organization (Like 'TNO[18], KIWA[19] and the 'WHO') should acquire the responsibility to execute this task.

5.4.3.1.5 How much certainty is needed before it is justified to ban a product or technology?

Many participants noted that it is almost impossible to arrive at a 100% certainty of safety. They pointed to the fact that an apparently harmless innovation might be used in a harmful way ('A car can be used to run someone over, but is not designed to do this') and that, especially in the field of medicine, harmful (side-) effects are impossible to prevent.

A dilemma posed in one group was that it could not be foreseen to what extent a new technology would be harmful in, let's say, twenty or even hundred years. Another issue that came up was that it was deemed impossible to know risks that happen due to a combination with other things. As such, it was thought to be impossible to know the effect

[18] The '*Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek*' (TNO) is an independent research organisation in the Netherlands that focuses on applied science.

[19] '*Keurings Instituut voor Waterleiding Artikelen*' (KIWA) is a European institution, headquartered in Rijswijk, for testing, inspection and certification (TIC).

of a certain medicine in combination with all other existing medicine, diseases, nutrients or other relevant factors in the world ('Then it becomes too big of an oil stain').

5.4.3.1.6 Do you trust the politicians and authorities to regulate technology?

In the discussions a considerable amount of distrust towards politicians was noticeable. Politicians were not trusted, first of all, because they would lack the necessary knowledge and secondly because they would serve other interests ('Politicians too often change jobs'). These other interests were sometimes specified as the interests of lobbyists ('Look at the tobacco industry and environmental organizations. It is the extremes, the loud callers that indicate the direction and that is a pity.') and sometimes politicians were characterized as primarily following their own interests ('Politicians fill their own pockets', 'Politicians only think of their own career').

Some also argued that precaution towards technology, to protect health for instance, should not be made a political issue. Often some participants however turned against the cynicism or argued that politicians might not be perfect but they could not think of a better alternative (' If we talk like that about politicians and institutions that function with a mandate of people who have chosen him…. If that trust is not there then we might as well give up our political system…').

Authorities seemed to be trusted more, as long as they had sufficient knowledge and were independent from political and industrial interests.

5.4.3.1.7 Who should be involved in the further development of the precautionary principle?

The main groups that were mentioned with regard to this question were independent research institutes (like TNO), 'experts', universities and governmental institutions (like the ministry of Health). There seemed to exist disagreement about to which extent companies should be involved. On the one hand it was argued that 'companies should be involved because the measures that are taken affect the functioning of companies'. On the other hand, some argued that 'lobbyists' should be held at bay.

Young people and 'the next generation' were added to the groups besides the options in the questionnaire, especially in relation to the environment and the climate ('Maybe take it to schools. Have someone give a presentation about it in the classroom.').

Other people suggested to involve 'all those who directly have to deal with this' and 'all people of all countries' ('Because, for example, waste from Europe can cause harm in Africa').

One person suggested to establish an independent working group to control the results of the RECIPES-project, another to bring the research institute, innovating companies and citizens together to discuss the topic. Yet someone else suggested to look at historical precedents ('I would like to involve lessons learned from history').

'Citizens' was a group which was also mentioned ('The citizens have suspicions, fears, ideas and those emotions and that gut feeling is important to include in such a project.').

Finally, societal organizations and NGO's were occasionally mentioned ('When environmental aspects are at issue, I think that it's important that environmental organizations are present').

5.4.3.1.8 How do you want uncertainty with technology to be regulated?

People often referred to the governance surrounding new medicines as a good practice. Transparency and providing information about the (uncertain) risks were often mentioned as being important. The responsibility of the individual consumer was often emphasized, as long as the risks were clearly shown. This was compared to the situation in which a doctor informs the patient about the possible risks before a medical procedure.

Others argued that the developers should indicate of each part of a new technology what it's possible impact on the environment is and what a possible solution for a potential problem might be. Others emphasized that innovation should firsts take place in a 'controlled' and 'closed off' space or happen on a small scale.

Some people argued that the regulation towards technology should be made possible through a gradual step by step development of technology so that problems can more easily be revealed. The importance of iteration and feedback in this process was also emphasized.

Other participants interpreted the question more broadly and argued that precaution should be something that requires the organization of new democratic practices and/or changes in the education system. Educators should according to them learn how to make relevant information about uncertain risks more accessible and teach people the abilities to make informed decisions with regard to uncertain risks.

5.4.3.1.9 Do you think development of technology can be controlled?

Technology was often characterized as an unstoppable force, especially in relation to international dynamics, the fact that 'research and innovation will just continue' and that innovation was seen as an intrinsic quality of humanity. AI and Machine Learning were mentioned multiple times as the examples of technology of which the development would be unstoppable.

Sometimes people referred to individual cases to note that regulating technology is possible, for instance in relation to the atom bomb, the choice to take the bike instead of the car or the abolishment of CFK's.

An often expressed frustration was that 'the guy in the street' would always lag behind with regard to innovation. Another person argued that 'the developments will continue, but there will always exist a counter movement of critical people, and new things will emerge which nullify the technology'.

5.4.3.2 Summary

In general, precaution and innovation were not seen as being at odds with each other and some consensus consisted about the need to look at innovation and precaution at a case-by-case basis. Though considerable concerns, and often apathy, towards the development of innovation reoccurred, participants did not seem overly pessimistic towards innovation. People were able to cite a variety of dilemma's, worst case scenario's and problems with regard to technology, but did not seem too angry or desperate about it.

Knowledge, independence from external interest, transparency and democratic responsibility seemed to be prerequisites that often surfaced during the discussions on 'burden of proof' and invoking and developing the precautionary principle. Distrust, or at least scepticism towards the neutrality of actors and institutions (especially politicians and companies) were often expressed. In relation to technology, 'power' and 'economic interests' were constantly themes that resurfaced.

5.4.4 Conclusions

In this small sample of Dutch citizens, precaution and innovation were not seen as being at odds with each other, and some consensus consisted about the need to look at innovation and precaution at a case-by-case basis. Considerable concerns, and often apathy, towards the development of innovation occurred, however, participants did not seem overly pessimistic towards controlling innovation. They were able to cite a variety of dilemma's and worst case scenario's with regard to ensuring safety around innovation, but were less clear about solutions for handling uncertain risks. They see companies and the government as the key responsible stakeholders. However economic interest, 'power' and lack of transparency of companies were mentioned as reasons for making them less suitable to handle precaution in innovation. Preferable, a wide variety of stakeholders, including children (future generations) are involved.

Discussion points

The size of the group and the quality of the data that was collected does not warrant us to make very firm conclusions about what Dutch people think about precaution and innovation in general. The answers to the questionnaires and the input from the discussions did however give us new insights into relevant topics, examples and some common thoughts among Dutch citizens that are useful to take into account for the rest of the project.

A notable element during the discussions was that people seemed to know a lot about the controversies and problems surrounding cases of innovation and precaution and not so much about 'good examples'. Besides the topics mentioned in the information material, people also talked about the dangers of the impact of data-collection of tech-giants, pulse-fishing, medical prostheses, Wi-Fi, nuclear energy, plastics, electromagnetic fields, vaccination and cloning. People however seemed to be less informed about the governance towards these technologies; how these risks have or have not been handled, by whom and how. The cause of this discrepancy might be that the latter gets less attention in the news, is less interesting to remember and that less attention was paid to this aspect in the information material.

Another interesting observation in the discussion was that people seemed to look differently to technology or innovation in general as opposed to specific cases. When people spoke of technology or innovation in general it was often characterized as an unstoppable force that was impossible to hold back by regulation. This conviction was however less present when people got into details about precaution in relation to specific cases, such as new medicine or GMO's. Perhaps, but this is only a hypothesis, talking about innovation and technology in general terms makes the object so vague that people are more inclined to view it as unmanageable and uncontrollable, precisely because it feels conceptually ungraspable.

5.5 Briefing report - Bulgaria

Citizen's View on Precaution and Innovation

Bulgaria

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5.5.1 Executive Summary

The current report presents the outcomes of the work accomplished by a panel of 27 citizens, organised within the framework of the RECIPES project. The citizens met on 23 June 2019, at the premises of ARC Fund in Sofia, Bulgaria. RECIPES citizen meetings were set up to provide the public with an opportunity to reflect on issues concerning fairness, risk and safety in relation to research, precaution and innovation, in the areas of GMOs, nanotechnology and pesticides. During the meeting, participants expressed their opinions on precaution and innovation through a questionnaire and group interviews. They first answered a structured questionnaire, and some of the questions were then discussed in depth during group interviews (four groups of participants were formed).

Overall, the discussions in the group interviews confirmed the questionnaire-based results.

Main findings and conclusions from the discussions during the citizen meeting in Bulgaria:

- Participants were mostly motivated by their desire to learn more about precaution and innovation, as well as by their concerns about the potential risks posed by emerging technologies.
- Genetically modified organisms: strict control measures should be introduced in order to avoid harm on the environment; a case-by-case assessment of the potential effects of GMOs on environment, people's health and consumers' safety should be conducted before permitting their release on the market.
- Nanotechnologies: participants expressed concerns similar to the ones related to GMOs, but at the same time they recognised the enormous potential of nanotechnologies to improve health and prosperity in the future.
- Pesticides: the participants had deep concerns about the current and future use of pesticides. The dominating opinion was that stringent control measures should be introduced to avoid the harmful effects on environment and public health.
- Decisions on banning a product/technology should be based on scientific evidence, and experts and scientists should have the leading role in decision making.
- Ethical and moral aspects, as well as assessments of possible negative effects on society at large, should be considered when applying the precautionary principle.
- All relevant stakeholders should be involved when the precautionary principle is invoked, as well as in the further development of the principle so as to ensure that all interested parties receive a fair opportunity to present their arguments.
- The burden of proof of safety of products/technologies should be on the manufacturers, while the role of the state is to develop the legal framework.
- The precautionary principle was almost universally recognised as an appropriate and effective tool to regulate uncertainties arising from development of technologies.

5.5.1.1 Introduction

In May-June 2019, the RECIPES project hosted citizen meetings in Denmark, Norway, Netherlands, Italy and Bulgaria. RECIPES citizen meetings were set up to provide the public with an opportunity to reflect on issues concerning fairness, risk and safety in relation to research, precaution and innovation, and to share their ideas and opinions with the researchers and managers of the RECIPES project.

To prepare for the citizen meeting in Bulgaria, more than 60 invitations were sent by ARC Fund's team and 32 confirmations were received. On the day of the meeting 27 citizens attended. Prior to the event in Sofia, participants received an information material which aimed to assist them in their reflections before and during the citizen meeting. The material briefly presented the precautionary principle, its application in the EU and the relationship between precaution and innovation. It also introduced the topics of GMOs, nanotechnology and pesticides in order to exemplify precaution and innovation.

During the meeting, participants expressed their opinions on precaution and innovation through a questionnaire and group interviews. The results are presented below.

The present report is one of five country reports summarising findings from the national meetings. The results of all five citizen meetings will be collected in a main report and will be presented to policy-makers and the EU Commission.

5.5.1.2 Bulgaria

Bulgaria is a country in the Southeast Europe. Its capital and largest city is Sofia. According to data of the National Statistical Institute of Bulgaria, the population of the country as of the end of 2018 is 7,000,039 people, most of them living in urban areas.[20] Bulgaria is a unitary parliamentary republic and its official language is Bulgarian. The national currency is Bulgarian Lev (BGN).

In 2017, the GDP at market prices was EUR 7,300 per capita which is much less than the average for the EU countries for this period – EUR 30,000 per capita.[21] The major economic sectors that generated the most gross value added in the country in 2017 were: i) "Mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities" (BGN 21,300,000); ii) "Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities" (BGN 19,400,000); and iii) "Public administration and defence; compulsory social security; education; human health and social work activities" (BGN 11,900,000). [22]

R&D expenditure as a percentage of GDP in Bulgaria for 2017 was 0.75% with the EU average for that period being 2.06%.[23] The table below shows the R&D expenditures by source of funds and sectors in Bulgaria for the same year. It could be concluded that the business sector is leading with a share of ~70.25% of the total gross expenditure on R&D in Bulgaria.

[20] http://www.nsi.bg/en/content/6704/population-districts-municipalities-place-residence-and-sex

[21] https://ec.europa.eu/eurostat/databrowser/view/tec00001/default/table?lang=en

[22] http://www.nsi.bg/en/content/5484/gdp-production-approach-%E2%80%93-total-economy

[23] https://ec.europa.eu/eurostat/databrowser/view/tsc00001/default/table?lang=en

Table 12 - R&D expenditure

R&D expenditures by source of funds and sectors in Bulgaria, 2017 (in thousand BGN)					
Source of funds	**Total**	**Sectors:**			
		Business enterprises	**Government**	**Higher education**	**Non-profit institutions**
Total	760 234	534 071	176 262	43 442	6 459
Business enterprises	328 498	313 335	4 980	9 567	616
Government	184 973	9 923	157 241	17 571	238
Higher education	424	144	151	..	..
Non-profit institutions	1 677	1 341	57	..	..
Abroad	244 662	209 328	13 833	16 008	5 493

Source: National Statistical Institute of Bulgaria, Official web-site. Page accessed: 10/07/2019

http://www.nsi.bg/en/content/6755/total-intramural-rd-expenditure-gerd-source-funds-and-sectors

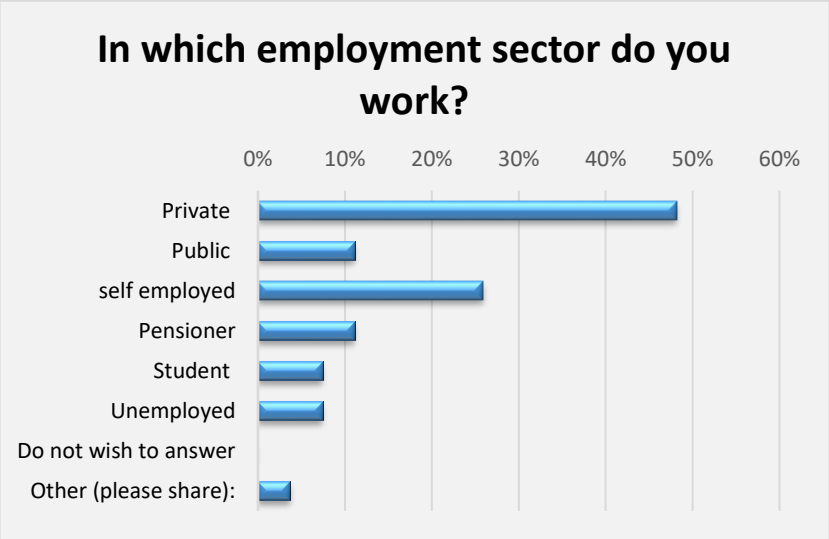
5.5.2 Results from the questionnaire

During the meeting, participants were given 30 minutes to answer a questionnaire, which aimed to gather their opinion on various questions related to precaution and innovation, GMOs, nanotechnology and pesticides. All these issues have been briefly discussed in the information material participants received prior to the meeting. The results of the questionnaire are presented below.

5.5.2.1 Demographics

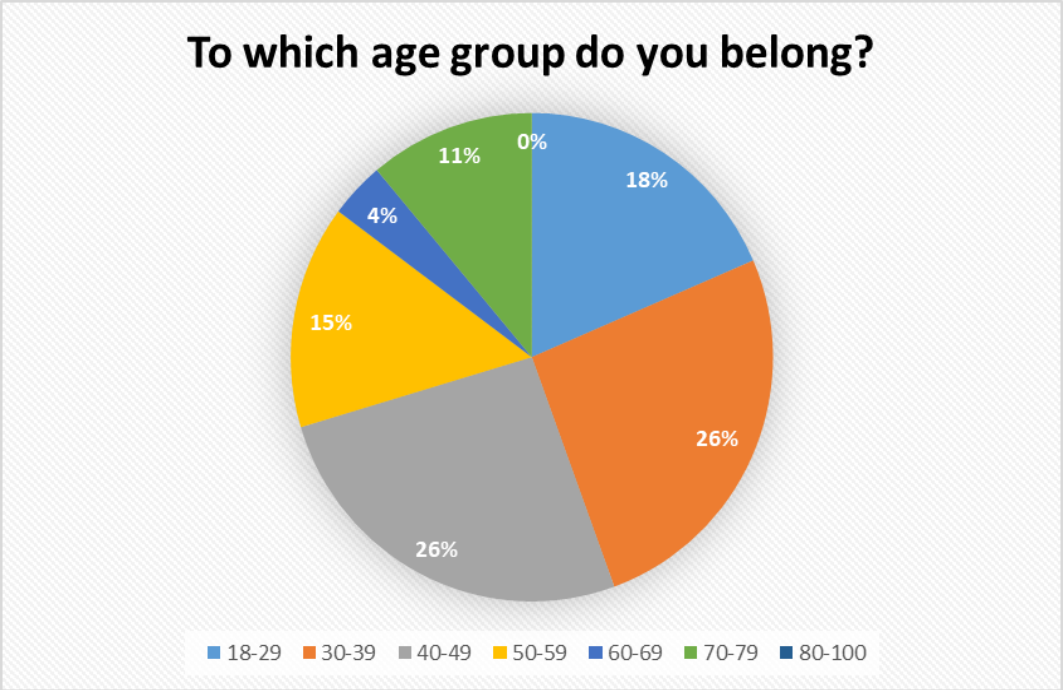
Men and women were almost equally represented – 52% of the participants were female and 48% male. Most of the participants work in the private sector (48%), followed by the share of self-employed (26%) and the public sector (11%). There were also a few retirees (11%), unemployed (7%) and students (7%). Some of the participants have indicated more than one sector (private and self-employed, private and student,) which resulted in the overall percentage of the answers exceeding 100%.

Figure 50 - Employment sector



A broad age range was covered as well. The highest share of participants belonged to the 30-39 (26%) and 40-49 (26%) age groups, followed by the age groups of 18-29 (18%), 50-59 (15%), and 60-69 (4%). Three of the participants belonged to the 70-79 age group.

Figure 51 - Age group



5.5.2.2 Reason for participation

Participants' motivation to join the meeting varied. Most of them considered the meeting a good opportunity to learn more about the topics of precaution and innovation (41%), others attended the meeting because they were concerned about the risks posed by the emerging technologies (30%). The belief in the democratic process and citizens' participation has also prompted many to take part in the meeting (19%). The increased personal interest in the topics of precaution and/or innovation has also been a motivator for few of the participants (11%). One of the participants has indicated that their fascination by technological development and progress was the reason to join the meeting. None of the participants has indicated the option "I wouldn't miss the opportunity to have my voice heard in an EU research project".

Figure 52 - Motivation to join

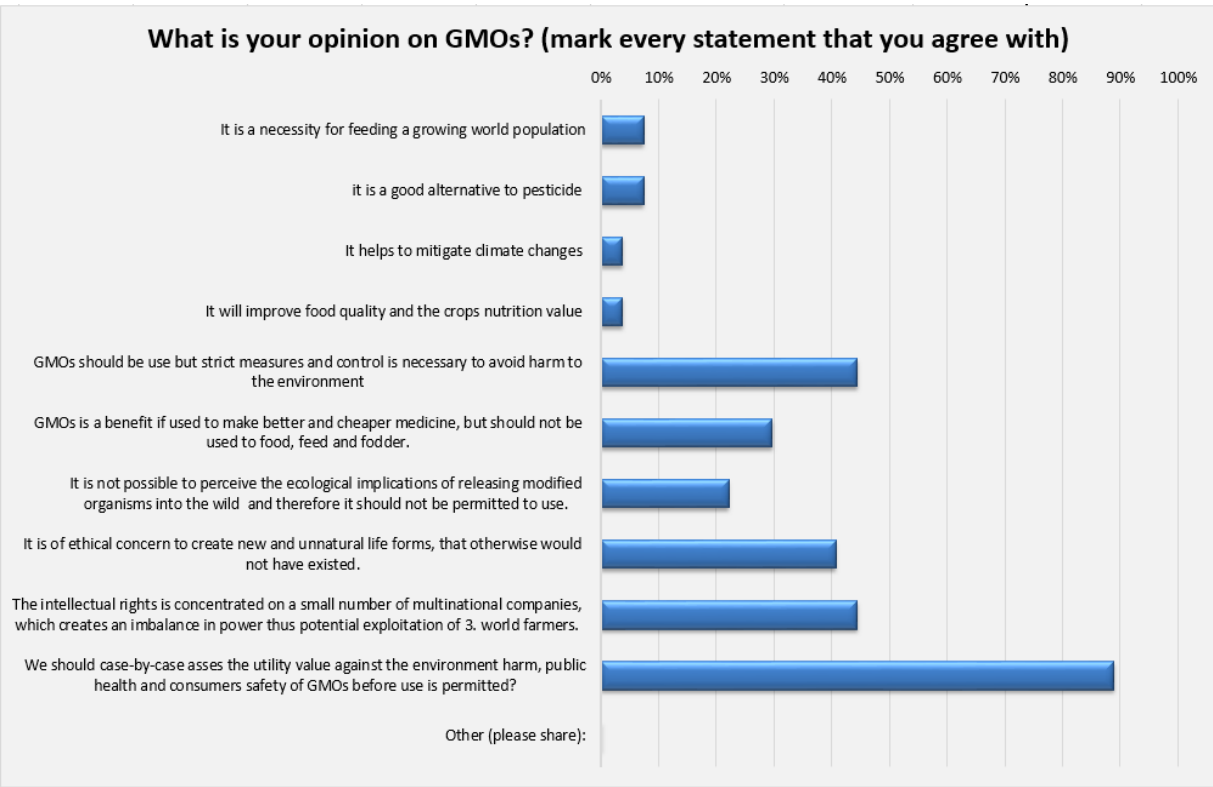
5.5.2.3 Genetically modified organisms

According to the results of the questionnaire, the citizens have expressed the following concerns related to GMOs:

- Before a certain GMO is permitted to be used and introduced on the market, a case-by-case assessment of the utility value against the environment harm, public health and consumers' safety should be conducted (89%).
- Strict GMOs control measures should be introduced in order to avoid harm to the environment (44%).
- Small number of multinational companies hold the intellectual rights for GMOs, which could create power imbalances and put smaller farmers in dependent positions thus inducing them to purchase seeds only from these multinationals (44%).
- Creating new and unnatural forms of life that otherwise would not have existed is a strong ethical issue (41%).

Those are the statements that got most of the participants' votes. The rest of the answers are shown on the figure below.

Figure 53 - Opinion on GMOs

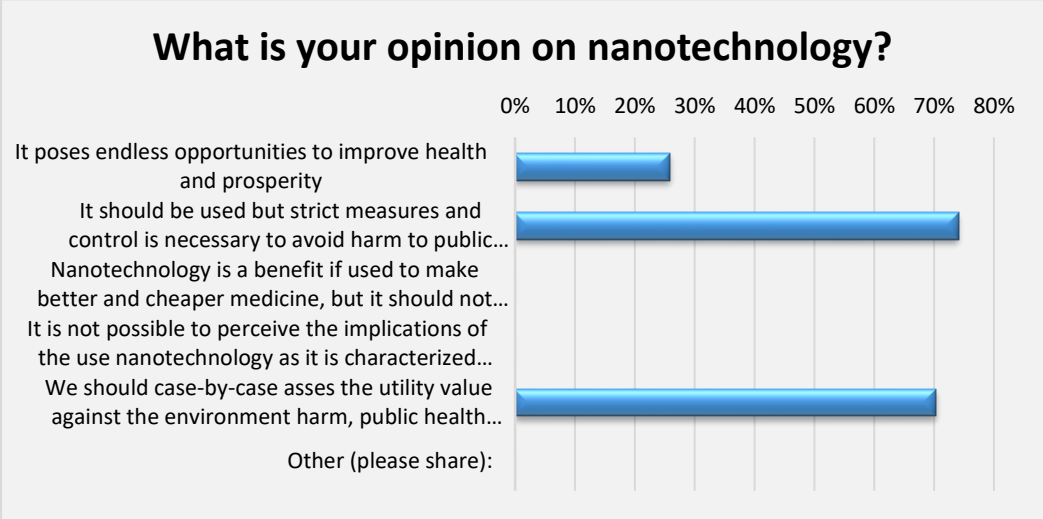


The larger part of the participants (81%) showed a cautious attitude towards GMOs, stating that products containing GMOs should be labelled even when there is no evidence that GMOs are harmful to human health. They further claimed that labelling of genetically modified foods should also encompass products which are manufactured using genetically modified fodder or other genetically modified ingredients (89%).

5.5.2.4 Nanotechnology

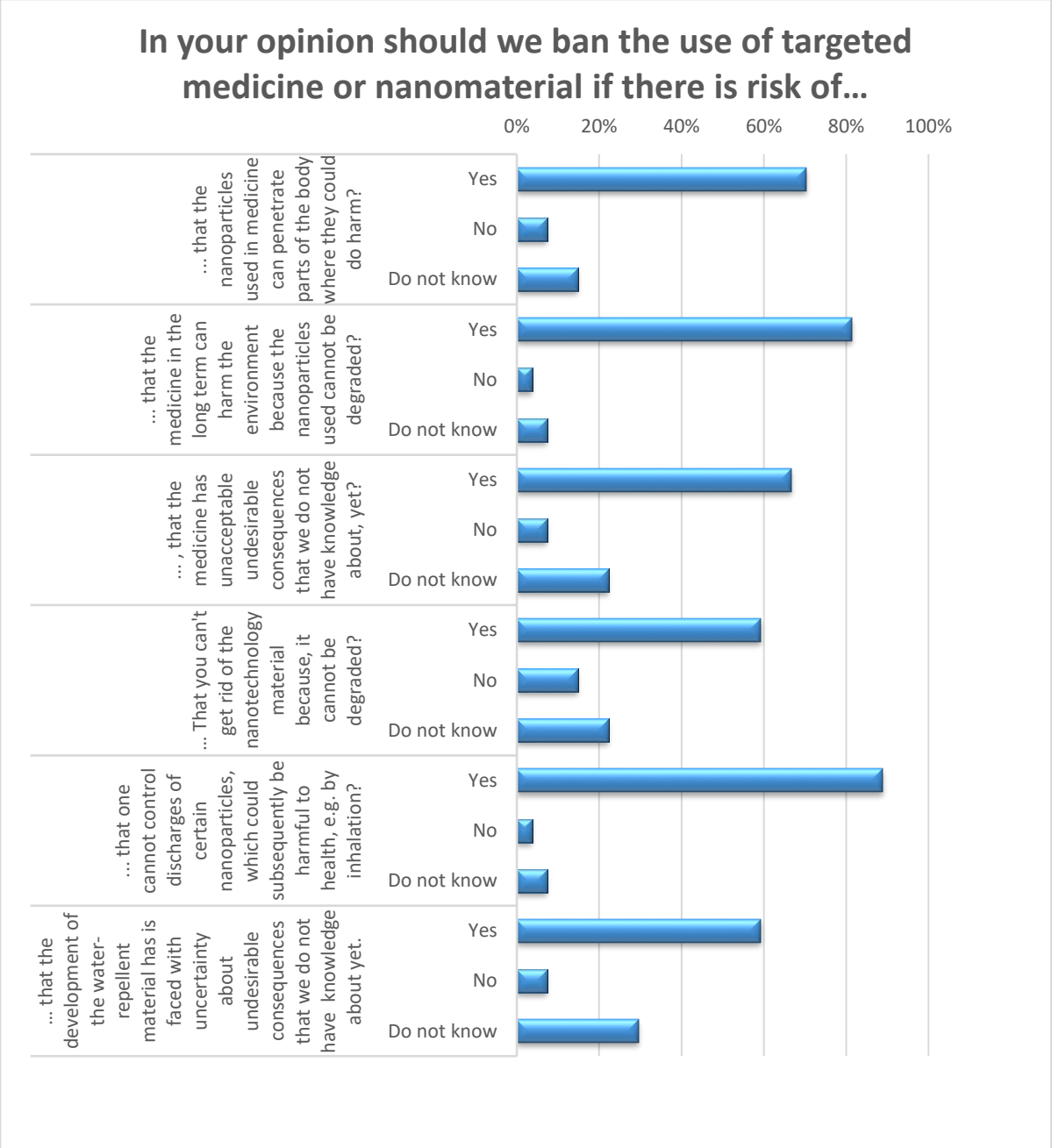
Participants' remarks on the topic of nanotechnology were similar to the ones they shared about GMOs. Citizens considered important to introduce strict control measures to nanotechnologies in order to avoid harm to public health and environment (74%). Another concern expressed by the respondents was that the value of each nanotechnology should be first assessed against its impact on environmental and public health, as well as consumers' safety (70%), before permitting the use of this nanotechnology. Around one quarter of the participants (26%) have supported nanotechnology stating that it holds huge opportunities to improve health and prosperity.

Figure 54 - Opinion on nanotechnology



Majority of participants believe that the use of targeted medicine or nanomaterial should be banned whenever a certain risk is suspected.

Figure 55 - Opinion on bans

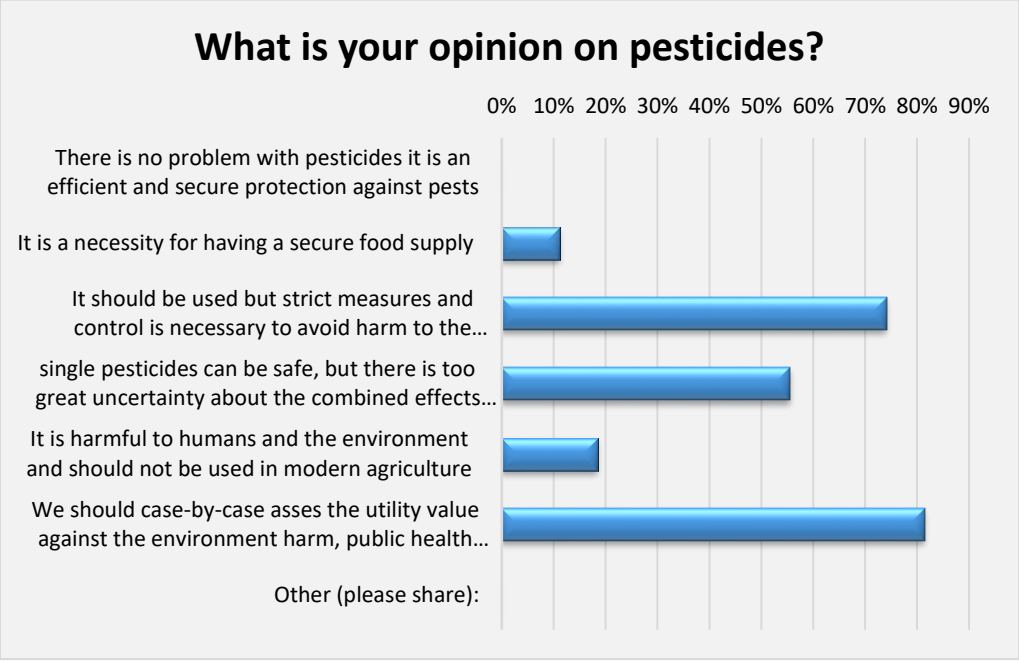


The opinions in favour of the ban were most numerous in case when discharges of certain nanoparticles, which could subsequently be harmful to health, cannot be controlled. The risk of a medicine being harmful to environment in the long term (due to the use of non-degradable nanoparticles) was also identified as a valid reason to ban the use of targeted medicines or nanomaterials. The third most popular answer was the risk that nanoparticles used in medicines can penetrate in the human body and cause harm. The distribution of votes to the rest of the answers are presented on the figure above.

5.5.2.5 Pesticides

Participants' answers to the questions on pesticides show that they are rather cautious when it comes to allowing their use. A high percentage (81%) voted that prior to permitting the use of a single pesticide, assessment of its effects on the environment and public health, and consumers' safety should be made. A statement that strict control measures should be introduced to avoid pesticides harming the environment was supported by 74% of the citizens. The concern about the unknown effects of the combined use of pesticides was also raised with 56% of the participants ticking this answer.

Figure 56 - Opinion on pesticides



One of the questions provided the opportunity to collect participants' opinion on the use of neonicotinoids (neonics). The topic of neonicotinoids and its effect on environment and human health was briefly presented in the information material that participants received before the meeting. When asked if the EU should apply the precautionary principle and ban the use of neonics, 44% of the respondents answered that a total ban of neonics should be introduced. Another group of participants (30%) voted that the use of neonics should not be banned but the use of these pesticides should be restricted and under stringent control. The rest of the votes were distributed among the following answers: i) "Don't know" (19%); ii) "Only ban of outside use" (7%); iii) "Ban for use on specifically selected crops" (4%).

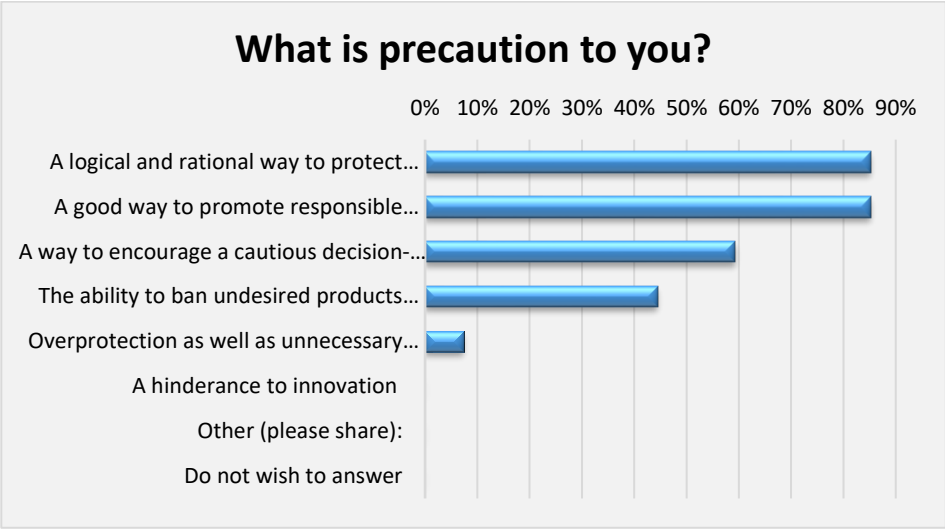
5.5.2.6 Precaution and innovation

Although the topics of precaution, precautionary principle and innovation were new to most of the participants, the information provided in the introductory presentation and the information material gave them a good overview of both the scope and the importance of these topics.

For 85% of the respondents, precaution is a logical and rational way to protect public health and environment. The same share of participants were of the opinion that precaution is a good way to promote responsible innovation. Many (59%) consider precaution as a way to

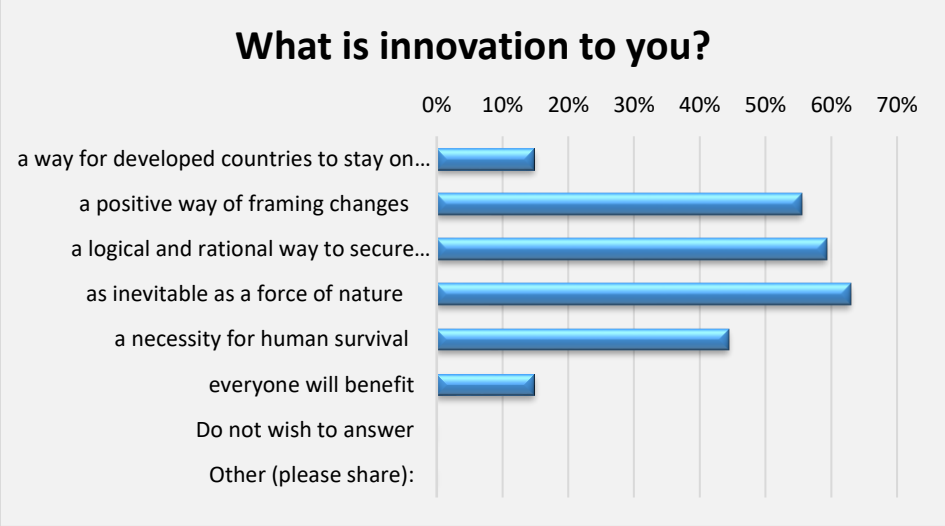
encourage a cautious decision-making, while 44% perceive it as a way to ban undesired products and/or technology. Only 7% of the participants were critical to precaution, considering it as overprotection and unnecessary fear and anxiety.

Figure 57 - Precaution



Participants defined innovation mostly as something inevitable and natural (63%), as a logical and rational way to secure growth and prosperity (59%) and a positive way of framing changes (56%). Innovations were also considered as a necessity for human survival (44%). The rest of the answers are shown in the figure below.

Figure 58 - Innovation



The questionnaire inquired whether precaution or innovation were of higher priority according to the participants and if there is a trade-off between them. According to 52% of the participants, there is a trade-off between precaution and innovation, while 41% think this is not the case.

The participants who voted for a trade-off between precaution and innovation had the opportunity to answer an additional, clarifying question to indicate whether precaution or innovation should have a higher priority. 6 out of 14 participants have answered that

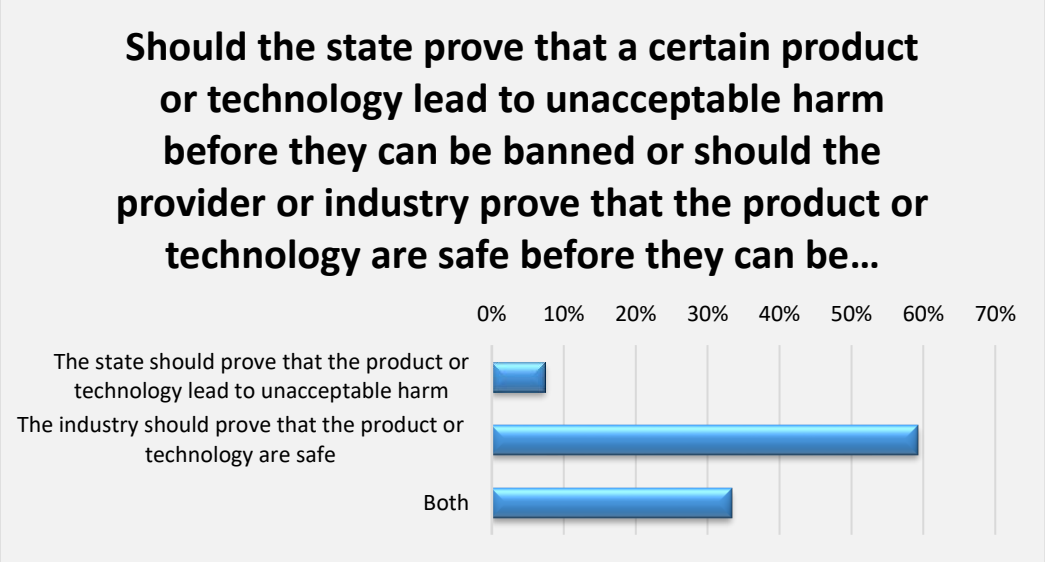
precaution is to be of higher priority, and 7 participants are of the opinion that precaution and innovation are of equal priority. Only one participant has voted that innovation should have a higher priority.

Almost all participants (96%) responded that ethical and moral aspects and assessments of possible negative consequences should be considered as well when the precautionary principle is applied.

Two of the questions addressed the actors that should be involved in the implementation and in the further development of the precautionary principle. According to the respondents all listed actors - Academia, Research, Governmental executives, Governmental legislators, Governmental agencies, NGOs, Large industry, SMEs, Advocacy groups, Unions, Consultancies, Intergovernmental organizations, and Citizens - should play a role in implementing and further developing the principle. The groups that stand out and have collected the most votes for both questions are researchers, NGOs, citizens and academia.

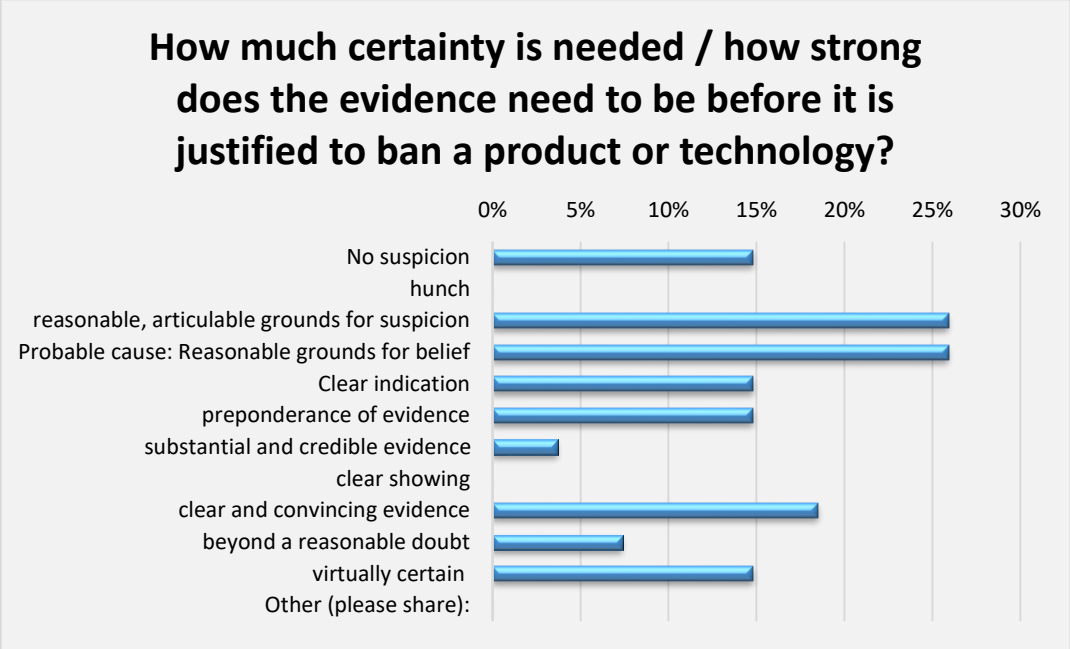
According to participants, the industry has a higher responsibility when having to prove that a particular product or technology is safe enough to be put on the market (59%). At the same time, almost one third of the respondents (33%) claimed that both industry and state should prove that a product/technology is safe. A few participants answered that the state is responsible for proving that the product/technology leads to unacceptable harm in order to ban it (7%).

Figure 59 - Proof of burden



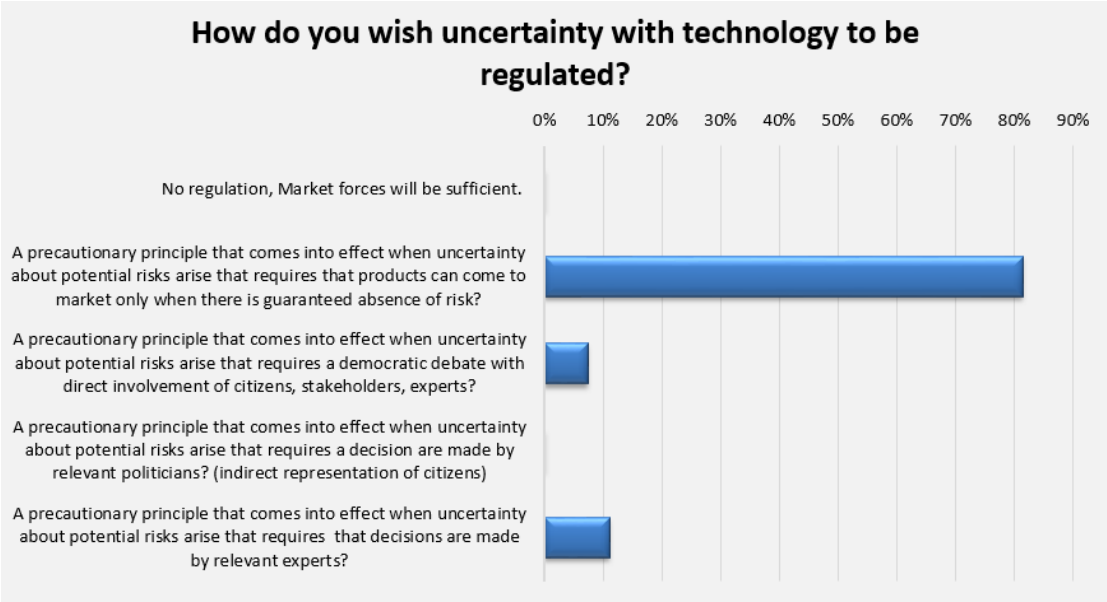
The next question concerned the level of certainty that is needed to ban a certain product or technology. It was difficult for the participants to distinguish between the proposed options and some of them asked for further clarification in order to be able to make their choice. In the end, the most popular answers were "reasonable, articulable grounds for suspicion" (26%) and "a reasonable grounds for belief" (26%), followed by "clear and convincing evidence" (19%).

Figure 60 - Certainty



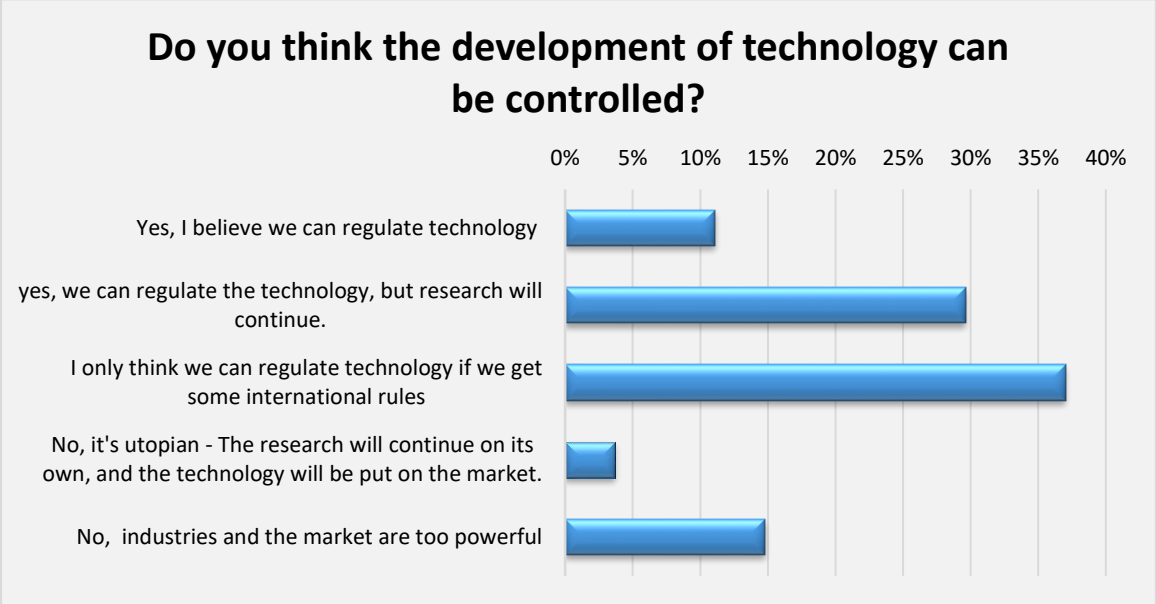
Regulation of technology and control of its development were also addressed in the questionnaire. It could be concluded that participants have low levels of trust in politicians and authorities in Bulgaria to regulate technology (81%). Most respondents (81%) stated that uncertainty with technology should be regulated through the application of the precautionary principle and products should be put on the market only when there is guaranteed absence of risk.

Figure 61 - Regulation of uncertainty



Most participants agreed that development of technology can be controlled, but the largest share (37%) stated that this could be done only if some international rules are developed. 19% answered that for different reasons, technology development cannot be controlled.

Figure 62 - COntrol of the development of technology



5.5.2.7 Final remarks

In the process of answering the questionnaire a few comments emerged, stating that some of the questions were difficult to understand and answer, and needed further clarification. However, according to the answers of the last two questions, most of the participants were satisfied with the questionnaire and the information material stating that both of them give a good overview of the main issues related to precaution and innovation and were easy to understand. One participant criticised the information material for not providing sufficient information about the risks, impact and benefits of using pesticides, nanotechnologies and GMO. A few participants noted that the information material and the questionnaire gave biased overview of the topics under scrutiny.

5.5.3 Themes from the group interviews

5.5.3.1 Precaution and innovation

5.5.3.1.1 Is there a trade-off between the two? And if so, which should be prioritized?

When discussing the question whether there is a trade-off between innovation and precaution and which one should be prioritised, various opinions were shared. Participants were divided into two groups of roughly equal size – one believed there is a trade-off, while the others disagreed, saying that precaution and innovation can and should be in balance. Some participants explicitly stated that precautionary measures must be prioritised especially when it comes to human health. Others supported innovations as being more important, stating that innovations are something natural that facilitates human progress and can lead to better health and lifestyle. Although no clear consensus was reached in the end, the question provoked a lively discussion with different groups giving valid arguments for their statements.

When asked to choose which of the two – precaution or innovation – should have a priority, the following arguments were shared:

- Most participants opted for precautionary measures, underlining their importance for regulating and controlling the development of innovation, and for protecting public health and environment. Since the long-term impact of a particular innovation cannot be known in advance, it would be better to be more cautious when developing the innovation and before putting it on the market.
- Precautionary measures should not stop innovations but regulate them in order to make them safer. Precaution should therefore precede innovation. There are many examples showing how much damage has been done for the sake of progress. Another concern are companies looking for short-term large profits. The quest for profits often outweighs the precautionary measures. On a global scale, industry and the development of innovations are usually motivated by the pursuit of increasing profits rather than providing safe products or technologies.
- In case the long-term effects of one innovation cannot be sufficiently determined, the precautionary measures should prevail.

The following arguments were shared by participants who do not think there is a trade-off between precaution and innovation:

- Precaution and innovation should not oppose, but complement each other. In order to avoid contradiction between the two, it was proposed to develop specific regulations.
- Business will evolve anyway, with or without precautionary measures. Technological development will continue.
- Equality between precaution and innovation is a way to take advantage of both the innovative technologies and the care for safety of the future.
- There should be a framework to lead the development of innovations, otherwise economic interest could prevail. Economic interest was defined as something temporary, aiming to generate as higher profits as possible. Participants proposed that there has to be a mechanism in place that takes into account the long-term effects and is able to control the temporary economic interest at the expense of safe future. They agreed that this could be the precautionary measures that in some cases should be considered a must. The question that participants raised in this regard (but did not discuss in detail) was to what extent those measures should be restrictive and how they should be determined.
- Another point that some participants emphasised was that innovation does not stop because of precaution. It was stated that people do not stop innovating in their daily lives because of precautionary measures and science does not stop innovating because there could be no industrial application of its discoveries. The principle "the polluter pays" was regarded as another way to regulate safety of innovation. The idea of the principle is to increase the responsibility for the company that introduces innovation by making the company pay all the damages its product causes after being put on the market. It was argued that this would make companies stricter about the quality and safety of the products they offer in order to avoid huge penalty in the future.
- A few participants agreed that innovation is not affected by precautionary measures. They further commented that innovations are largely developed by the academic community and in Bulgaria it is a widespread opinion that mainly science is supposed to innovate. But science is either dependent on public funds or dependent on funds from the business. It was mentioned that the main problem with innovations could be the precautionary measures to a certain extent but could also be the funds that stimulate their development and that direct them to achieving certain results that support certain interests.

To conclude, one group of participants expressed their concern that overregulation would slow down innovation. But too much freedom in developing innovation and putting it on the market could be harmful as well. Therefore, the precautionary measures are important but they are not always based on scientific evidence, they take into account political views, they depend on new trends and movements. They are not always strictly scientific. Considering all these arguments, it was concluded that precaution and innovation will always be in conflict as well as in balance.

5.5.3.1.2 Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?

Some of the participants needed further clarification of the question. It was difficult for them to think of ethical and moral aspects and social consequences related to the precautionary principle. The moderators on some tables had to provide examples with GMOs, pesticides and nanotechnologies to illustrate which ethical or moral issues arise with regard to their development and introduction to the market.

Summary of the discussions:

- One of the participants pointed out that it is really difficult to answer this question because morality and ethics are different in different parts of the world. Nanotechnologies were given as an example – they are mainly developed in Malaysia and Japan and not that much in Europe or the USA, and morality and ethics in Malaysia and Japan are much different than in Europe. It should be clarified which ethical norms are acceptable to everyone on a global scale and then discuss how these ethical norms can be applied to precautionary principle and innovation.
- There should be some common universally accepted criteria according to which an innovation can be defined as morally and ethically acceptable or unacceptable.
- When public health is concerned, ethical and moral aspects should be taken into account when applying the precautionary principle.
- Ethical principles are very important for science. From an ethical point of view, it is important to have information about the long-term effect of GMOs, nanotechnology and pesticides so that the consumers are able to make an informed choice whether to use them.
- One of the groups touched upon the topic of hybrid seeds. Their concern was that the hybrid seeds lead to a moral, ethical, social, economic and political issues concerning the control of big corporations over small producers. Small producers are forced to buy such seeds from big corporations every year. The question whether this is ethically/morally acceptable was raised. It was argued that on the one hand, the companies selling hybrid seeds have their merit for having developed them, hence it is normal for them to benefit from this and there is nothing unethical or unmoral. However, an ethical and moral issues could arise when innovations in particular areas are hampered because of a small share of producers dominating the market and underlying their commercial interests.

5.5.3.1.3 Who should be involved when the precautionary principle has been invoked?

During the discussions, the opinions of participants on the roles of the different stakeholders were quite diverse in the beginning, but later consensus was reached that all relevant stakeholders should be involved when the precautionary principle is invoked: the research organisations, the Government and the Parliament, the businesses, as well as the civil society organisations and the society at large. Having such a large stakeholder base

was deemed by the participants as a prerequisite for achieving objectivity in the application of the precautionary principle.

Summary of the discussions:

- The three technology areas should not be politicised.
- Each EU country should have its own legislation addressing the three technology areas: GMOs, nanotech and pesticides. At the moment there is no such legislation in Bulgaria. But we have to apply precautionary measures, which are to be backed up by scientific evidence, stemming from impartial scientific research, so as to avoid possible influence by interested organisations. Funding for conducting such research is also important.
- Another interesting opinion was that the precautionary measures should be applied by the scientific research organisations themselves. The reasoning behind was that policy makers and politicians are not well informed on specific issues related to the three technology areas, and thus they need to be supported by researchers. A counter opinion expressed by some of the participants was that if the research organisations are given the opportunity for self-regulation, this may create unfair bias, i.e. working on research topics of interest to few researchers/research institutes, and providing false information to society.
- Coordination between the ones who develop the innovation and the ones who will bring it into exploitation (industry and SMEs) was deemed very important.
- Another opinion was that civil society organisations and experts have to be involved. It will be beneficial for society at large to have CSOs involved as well, since through them the citizens will be able to access information on results and benefits of the use of research results and innovations in the three technology areas.
- Participants expressed strong opinion that it will be counter-productive if only one stakeholder takes over the application and the control of the precautionary measures. This is why the mandate of each organisation in the process of applying precautionary measures should be clearly defined.
- Other group of participants were united by the opinion that the state should have the leading role when the precautionary principle is invoked, through its ministries and executive agencies.
- When it is about control, the unanimous opinion was that the state should decide on giving a green light to one innovation, and should monitor if the precautionary principle is applied. The civil society organisations should be empowered to control the application of the precautionary principle and precautionary measures. The research community in the country should give their opinion. Society should be informed, and more, should be properly informed.
- Participants also commented on the questions who develops the measures and who applies the measures. The elaboration of the measures should be based on a social contract and the society at large should agree with concrete measures. This approach has been followed for many years by the pharmaceutical industry. It was noted that we all are well aware of the many negative effects of medicines, but we all take medicines. With the application of the measures it is different – in many countries there are fines, which are very high. When the risk of fines is very high, the producers (large industries as well as SMES) start to self-control themselves. Thus industry and SMEs are the ones to apply the precautionary principle. The question here is whether this self-control is because of the high fines or because of ethical concerns.

5.5.3.1.4 Should the burden of proof be on the state or the service/technology provider?

Summary of the opinions expressed by the participants:

- The participants were of the opinion that there must be very strict regulations regarding the safety of products at all levels – European, supranational/international, national, with which manufacturers have to comply with.
- One of the participants asked the question whether it must first be proven that a certain product is not harmful or it is released on the market first and then, in case of harmful effects on people's health and/or nature, the state should start exploring the safety of this product. The example of the Roundup product (Monsanto) was given. Participants reached consensus that it first must be proven that a given product has no harmful effects on people and nature before it is released on the market.
- Participants discussed that this is the responsibility of businesses/manufacturers to monitor and control the safety of their produce. On the other hand, the state must have the controlling function (through a controlling authority) to ensure that products that are released on the market are safe. Thus state control comes secondary. These two levels of control do not exclude each other, but the first level of control is with the manufacturers. It was further commented that manufacturers are mainly interested in profits, thus in many cases they cannot be relied upon to offer a fully safe product without a state control in place.
- One of the participants raised the issue that it will be a conflict of interest if the company itself has to prove the safety of its own products. Other participants commented that safety has to be proven/confirmed by independent control bodies rather than by the company itself. It was further clarified by the participants that a company will have to provide its products to another organisation (a research laboratory for instance) which is accredited by the state to conduct the research on the safety of products and deliver an opinion based on which the state authority will decide whether to certify the products for sales on the national market or not. This will avoid any conflicts of interest.
- The state must assume its responsibility by working out a legal framework with certain criteria and procedures, indicating the competent state bodies and experts/researchers/laboratories, who will be tasked with applying this framework to check and confirm products' safety before these are launched on the national market.
- Although we have EU-level regulations, if a company wants to introduce a product on the Bulgarian market, then this product should go through the national verification procedures so that there is a proof that the product is safe and only then this product can be released on the Bulgarian market. Thus this is the responsibility of the manufacturer to prove the safety of their product(s), not the state to prove the possible harm. It means that the manufacturer has to invest a certain amount of money to perform tests for safety, and then provide the necessary information to the relevant state bodies which will take a decision.
- It was noted by one of the discussants that the state must have specific research laboratories to explore a case if the precautionary principle is invoked. It was further discussed that the current procedures of verification and certification are very slow, the same is valid for changes in legislation or adoption of new legislation.
- In summary, the participants reached consensus that the burden of proof of safety of products should rest on the manufacturers. The state should develop the relevant legislation and establish the necessary infrastructure (accredited research

laboratories) to verify the safety of products and certify them or not for release on the market.

5.5.3.1.5 How much certainty is needed before it is justified to ban a product or technology?

This was the most debated topic on all discussion tables.

Summary of the discussions:

- As per some of the participants, independent scientific evidence must be established prior to taking a decision to ban a product or technology, but in most cases this is difficult to accomplish. This would motivate further research and stimulate innovation development.
- Strong evidence is needed that a certain product is dangerous or harmful. In cases of uncertainty there must be national agencies that have to make further tests/checks. These agencies have to be independent bodies.
- As a general approach, the release of a product or technology on the market could be postponed in order to perform scientific tests. But there are other issues to be considered in such approach: whether the scientific tests are completely independent, the efficacy of such tests, the owners of the relevant expertise, etc.
- Participants further discussed that the whole process of decision making and decision taking must be transparent, as no decision can be taken when there is lack of information and opacity. Information campaigns organised by the state and relevant organisations were considered as a possible measure towards transparency.
- It was commented that in nanotechnology, regulations are stringent due to higher level of uncertainty. Another opinion was that the politicians in the 'old' Member States are committed to safety. In Bulgaria for the time being we rely on media on issues of high concern to people's health, like GMOs, nanotech and pesticides.
- An issue with the experts, as per some of the discussants, is that they give their opinion, but this opinion does not reflect the perspective of the consumers, who in general are non-experts. This is why the participants deemed necessary to take into account the opinion of the ordinary citizens as well, as they motivate their choice on the basis of their own knowledge.
- Another interesting opinion was that on the one hand, we have many manufacturers, countless products and limited resources of the state to check and control all of them. On the other hand, if a manufacturer has invested hundreds of millions of euros in the development of a product or technology, they certainly have produced enough convincing evidence that everything is fine. In such a case, what is the level of certainty/uncertainty that the state or society will need so as to decide to remove a product or technology from the market? Can we draw a clear demarcation line or we have to judge on a case by case basis?
- One participant commented that lobbyist interests are leading and that companies should have higher morality and responsibility to society.
- Negative effects may be manifested in the longer term, which have not been considered when developing a product/technology or launching it on the market. Perhaps not all potential effects can be foreseen beforehand. And here comes the authority and trust in the state, the state institutions, the control bodies and how they perform their job. The following example was given: on the information sheet of every medicine there is a phone that we can call in the case of side effects and

report them. But we do not know what happens to the database of these complaints. We do not have information how it is judged if a certain reaction is drug-induced or is just an accident. The very fact that we have no information how this collected information is handled gives us a sense of insecurity. We are not well informed. We, as citizens, need wider awareness raising campaigns. Further, more information and clarity on the procedures of state control would be beneficial to everyone.

- The discussants further distinguished between temporary stoppage and complete ban of a product/technology. The participants agreed that a temporary stoppage could be based on uncertainty due to incompleteness of scientific evidence, i.e. when there are doubts of potential harm, but the available information is not enough to judge if a product/technology is harmful or not. In such a case further scientific facts will be needed so as to decide if a product/technology is harmful or safe.
- One of the participants commented that a precautionary measure is something that temporarily imposes some constraints until relevant evidence is collected. The idea of precautionary measures in the European Union is such. Stopping the product should be done with much less evidence than its complete ban. There is no way we can get all the evidence in the first place, it is not possible. Still, we are talking about precautions, not a final ban.
- The following question arose during the discussions: there is a case in which we have, on the basis of scientific studies and evidence, good reasons to conclude that there is a potential danger of placing a product on the market. We trigger the precautionary principle and we have a temporary ban. But research continues to expand the evidence base. It was commented by the participants that in such a case the ban should be lifted when there is enough scientific evidence that the product/technology is not harmful, so that the innovation development can be continued.
- One of the participants gave the example with mobile phones in the airplanes – all passengers have to switch off their mobile phones or switch them to airplane mode. It has not been proven that each phone could affect the aircraft systems, but a ban is still needed. This is an example of application of the precautionary principle, because the consequences could endanger the lives of many people.
- Another participant commented that the level of risk also matters – it should be considered if a given product is likely to negatively impact one person, or may lead to negative consequences for many people.
- A similar case represent fruits or vegetables on the cooperative market. If you go to the market, there is no information if these were sprayed with pesticides. Many pesticides are banned in the EU, but are allowed in Turkey. Many farm owners buy cheap, but highly poisonous pesticides from Turkey at very low prices and use them in their farms. When we have a demand to buy domestic production of fruits and vegetables, nobody takes these issues into consideration. In such cases the ethics and morality of the manufacturer or the person who offers the products on the market are very important.
- The role of control was also mentioned. Each producer, in order to sell on the market, must prove the quality and the origin of the products. The participants commented again the importance of testing and certifying laboratories in Bulgaria. The main issue is how we implement the control on the producers. The main priority of the business is to make profits. The notion of "responsible business", which is ethical, is gone. Businesses work best under the immense threat of large fines.
- The damage to environment was of concern to the participants as well. In such a case – who will we be penalised? The company may no longer be there when the results of using its products is evident. Therefore, the precautionary measures should come first, as there is no way to anticipate everything.

- Participants reached consensus that only scientific evidence, clear and conclusive, can provide the basis for banning a product or technology.

5.5.3.1.6 Do you trust the politicians and authorities to regulate technology?

Summary of the discussions:

- Overall, participants expressed low level of trust in the national politicians and public authorities in regard to regulation of new technologies. The main supporting arguments were the lack of relevant expertise on technology regulation, low or almost missing demand for experts who could provide advice on the issues related to regulation of technologies. Another strong argument for the low level of trust was lobbyism.
- Politicians are not expected to be experts in certain technology areas, this is why they are given opportunities to consult external experts on certain issues, but the opinion of the discussants was that politicians in Bulgaria not always tend to look for the opinion of experts.
- At the same time, participants expressed high level of trust in experts and scientists. The argumentation was that they can set the criteria for assessment of new technologies and as well could implement some sort of monitoring and control. For the discussants it was important that politicians and public authorities can make expert-based judgements, which are adequate to the questions/issues put to them.
- Overall, participants have more confidence in the EU institutions, namely the European Commission and the European Parliament. High level of trust was expressed also for the in-house research organisations of the European Union institutions (like JRC of the European Commission and STOA of the European Parliament) and in EU regulations and the restrictions therein. Another argument was that control is more stringent when funding comes from the EU programmes.
- Regulation without controls makes no sense, as well as controls without regulation.

5.5.3.1.7 Who should be involved in the further development of the precautionary principle?

Participants initially proposed different answers, but gradually converged on the opinion that all relevant stakeholder groups should play a role in the process. The only point of contention was the role of large industry and multinational companies. In other words, practically all stakeholders listed in question 21 in the questionnaire should have their say regarding the further development of the precautionary principle. The society can form a balanced and well-informed opinion only if all interested sides have a fair opportunity to present their arguments. Giving all stakeholders a chance to be involved in the process is also democratic. The participants noted that the tricky question is what comes next – when all stakeholders have voiced their opinions about the future of precautionary principle, someone needs to take the decision and pass the necessary legislation. This would naturally be the task for politicians, but here the concerns described in the previous question come to the fore: can the politicians in Bulgaria be trusted to take measures which are indeed in the interest of the society?

Summary of the discussions:

- Politicians should initiate debates with the wide participation of all segments of society, and should take decisions that are informed by these debates. The more varied and larger the participation in these processes, the better.

- While opinions and concerns of ordinary citizens are important, the arguments of experts and academia carry the most weight. However, the problem in Bulgaria is that academia and research organisations are underfunded and the quality of research is decreasing.
- A considerable obstacle is the lack of tradition of public engagement – interactions and cooperation between different stakeholder groups should be improved and intensified.
- The role of business, industry and especially multinational corporations was the most disputed topic. Some participants argued that these stakeholders cannot be excluded from the process, in which they have a large stake, and compared such situation with a court case in which only arguments of one side are heard and considered. Others challenged this view by claiming that industry has a vested interest in lowering the precautionary principle criteria. If included in the process of development of the principle, the industry would therefore play a role of a Trojan horse. It was also noted that the industry does not consult the society when developing their innovations – why should they be involved in consultations regarding precautionary principle? Another concern was that the industry has incomparably larger resources and capabilities to prepare convincing arguments and tip the balance in its favour, and any process in which the industry is involved would be a foregone conclusion. This was especially underlined in case of multinationals, which are often more powerful and wealthier than countries like Bulgaria, and can even sue a country, which restricts or denies access to its markets for a given product.
- A somewhat related question addressed the misbalances in privately and publicly funded research organisations. Some participants wondered how the society can take an informed and correct decision, when confronted with two opposing sets of scientific arguments – one proposed by independent researchers from poorly funded public institutions with outdated technology, and other delivered by well-funded private researchers working for corporations.
- These reservations notwithstanding, the dominating opinion was that the process of further development of the precautionary principle can only benefit from the active participation of as wide as possible range of stakeholders, not least because giving all concerned parties an opportunity to voice their opinion is a democratic and proper thing to do. The absence of democratic dialogue and transparency creates fertile soil for manipulation of public opinion and paves way for decisions made in favour of a particular party.
- Many participants underlined that institutions in Bulgaria rarely work in the interest of the society, and that one of the more effective ways to change this is active citizen participation, but this can only be achieved if the society is adequately informed about the relevant and important issues. This also includes information about benefits and risks concerning new products and technologies.

5.5.3.1.8 How do you want uncertainty with technology to be regulated?

Practically all participants recognised precautionary principle as a good and necessary measure to regulate uncertainties arising from development of technologies. Minor differences emerged only regarding the level of uncertainty needed to invoke the principle, but overall the bar was placed rather low – there should be no suspicions regarding the safety of a given product.

Summary of the discussions:

- New technologies are inevitably linked with uncertainty. There will always be unintended consequences, but every scientific-technological error also leads to new solutions. The important thing is to take measures to minimise the risks for the society and environment.
- The market cannot regulate itself and safety is never its main concern – everything that can be sold will be sold regardless if it is safe or not. Therefore, precautionary principle should be applied to guarantee that each product that reaches the market has satisfied the certain criteria, including those about safety.
- A minority opinion was expressed – that in the long run, market forces are indeed capable of self-regulation. However, in the intermediate period, which can sometimes last decades, many things can go wrong – the cost of these mistakes and unintended outcomes can be exceptionally high.
- Decisions should be made by relevant experts with knowledge and competencies, not by politicians, who are influenced by lobbyists and who are not very knowledgeable. Politicians should merely implement decisions made by independent experts

5.5.3.1.9 Do you think development of technology can be controlled?

Curiously enough, this was one question which provoked quite different opinions among the tables. Deliberations ranged from views that development of technologies simply cannot (and should not) be controlled, to beliefs that control is necessary, but difficult to implement in a society, where trust is an endangered species.

Summary of the discussions:

- Participants on one table favoured the opinion that the development of technologies and innovations simply cannot be controlled, and that nothing can stop the momentum of technological revolution. This is not necessarily bad, because innovations always appear to solve a certain problem – nobody spends time in the laboratories to create something that would harm people.
- The second table discussed whether development of technologies can be controlled, and if yes – how and to which end? Control inevitably means to limit the possibilities for development, or in more extreme case – to stop it completely. However, this table was also quite categorical that when it comes to human health and safety, and protection of environment, control is absolutely necessary. Another important dividing line participants mentioned was the boundary between development and application. The prevailing opinion was that everyone should have the right to develop (certain technology, product, innovation) without control or restricting supervision, but practical use and marketing of the results should be strictly regulated.
- The third table tried to avoid the term "control" and preferred to talk about encouragement and management of the process. Development of technologies is something natural for humankind and cannot be controlled, but it can be made more efficient and productive if properly managed. Participants also talked about the importance of transparency and information as tools for control of the technological development. If society is not aware what is happening in the scientific community, the scientific knowledge becomes encapsulated and the gap between those with the knowledge and those without it becomes larger. The more complicated the technologies, the wider the divisions in the society.
- The final table favoured the view that development of technologies should be controlled, but in practice this is very hard to achieve. Some participants said that

citizens should play a much more active role in this process, because technologies concern our everyday lives. Others opposed this, saying that control should be exercised by competent experts, who are qualified to give opinions. In the end, the discussion again returned to the question of trust – can those, who have the task to regulate and control, be trusted to do their jobs impartially and professionally?

5.5.3.2 Summary

- **Is there a trade-off between precaution and innovation? And if so, which should be prioritized?**

The participants shared various opinions, both agreeing and disagreeing that there is a trade-off between precaution and innovation. The ones supporting the statement agreed that precaution and precautionary measures should be with a higher priority than innovation. They considered precaution as a measure that controls and regulates innovations and, in some cases, as the only regulator that can protect public health and the environment. The other group considered that precaution and innovation should not oppose, but complement each other and that both must go in parallel. Although the question inspired a lively discussion, no clear consensus was reached in the end.

- **Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?**

The participants reached a consensus that ethical and moral aspects as well as assessments of possible negative effects on society at large should be considered when applying the precautionary principle. On one of the tables it was pointed out that it is difficult to answer this question, since morality and ethics are different in different parts in the world. In order to overcome this, they agreed that common universally accepted criteria should be accepted, according to which an innovation could be defined as morally and ethically acceptable or unacceptable.

- **Who should be involved when the precautionary principle has been invoked?**

The participants discussed the possible roles of the different stakeholders. In the beginning the opinions were quite diverse, but later a common view was reached that all relevant stakeholders should be involved when the precautionary principle is invoked: the research organisations, the government and the Parliament, the businesses, as well as the civil society organisations and the society at large. The participants agreed that reaching out to such a large stakeholder base will provide for objectivity in the application of the precautionary principle.

- **Should the burden of proof be on the state or the service/technology provider?**

The participants had little doubt that the burden of proof for safety of products/technologies should be on the manufacturers. The state should develop the relevant legislation and establish the necessary infrastructure (accredited research laboratories) to verify the safety of products and certify them (or not) for release on the market. The participants were of the opinion that there must be very strict regulations regarding the safety of products and technologies at all levels – European, supranational/international, national. The role of the state is to develop the legal framework and to indicate the competent state bodies to apply this legal framework.

- **How much certainty is needed before it is justified to ban a product or technology?**

After heated discussions at all tables, the participants embraced the view that only scientific evidence, clear and conclusive, can provide the basis for banning a product or technology. Other factors to be considered are: transparency of the process of decision making and decision taking; the important role of information campaigns; the opinion of

ordinary citizens; the role of the state institutions and the control; the level of risk; the effects on both human and environmental health; as well as the ethical responsibility of business.

- **Do you trust the politicians and authorities to regulate technology?**

The participants expressed low level of trust in the national politicians and public authorities in regard to regulation of new technologies. More confidence was expressed in the EU institutions, namely the European Commission and the European Parliament. The in-house research organisations of the European Union institutions (like JRC of the European Commission and STOA of the European Parliament) also enjoy high level of trust. Participants expressed high level of trust in experts and scientists.

- **Who should be involved in the further development of the precautionary principle?**

Participants think that all relevant stakeholder groups should be involved in the process, because this is the only way to ensure that all interested sides receive a fair opportunity to present their arguments. The widest possible involvement will also guarantee that the relevant policy decisions are based on well-informed opinions and taken in a democratic manner. Nevertheless, some participants said that large industry and multinational companies should be excluded from this process, because they have a vested interest in lowering the precautionary principle criteria and also have huge resources and capabilities to prepare convincing arguments and tip the balance in their favour. Participants also underlined the problem of low public trust towards state institutions and policy-makers, and the lack of tradition of public engagement. They were therefore concerned that the desired wide involved in the further development of the precautionary principle might be difficult to achieve.

- **How do you want uncertainty with technology to be regulated?**

Precautionary principle was almost universally recognised as an appropriate and effective tool to regulate uncertainties arising from development of technologies, including to minimise the risks for the society and environment. All participants dismissed the self-regulatory abilities of the market forces, explaining that for the market, safety is never an important concern – except in a very long run, when financial consequences might arise due to certain unintended and negative outcomes. Decisions regulating uncertainty related to technology should be made by relevant experts and duly implemented by politicians.

- **Do you think development of technology can be controlled?**

This question provoked quite different opinions among the tables – from views that development of technologies cannot and should not be controlled, to belief that control is necessary. Advocates of 'no control' explained that control would only arrest the technological development. Instead of imposing control over the process of development, the practical use and marketing of the final product should be strictly regulated. Some participants preferred the term 'management' instead of 'control' and highlighted the advantages of properly managed development process. Final group of participants said that development of technologies should be controlled, but was concerned that in practice, this is difficult to achieve, because the society is very passive and the impartiality and professionality of controlling institutions (in Bulgaria) are often questioned.

5.5.4 Conclusions

The question *"How much certainty is needed before it is justified to ban a product or technology?"* was the most debated one. The participants agreed that decisions on banning a product/technology should be based on scientific evidence, and that experts and scientists should have the leading role in decision making. Still, there are other important

factors to be taken into account, among which are the transparency of the process, the opinion of the ordinary citizens as complementary to the knowledge of scientists and experts, as well as the level of risk for the health of people and environment, among others.

The two most controversial questions during the group interviews were:

- **Is there a trade-off between precaution and innovation? And if so, which should be prioritised?**

As per the supporters to the trade-off between precaution and innovation, precautionary measures should enjoy higher priority to innovation as the precautionary principle was perceived as the only regulator that can protect public and environmental health. Opponents to the trade-off agreed that precaution and innovation should complement each other. Although the question inspired a lively discussion, no clear consensus was reached in the end.

- **Do you think development of technology can be controlled?**

The opinions varied from views that development of technologies cannot and should not be controlled, to beliefs that control is necessary. Three groups of converging opinions emerged in the end of the discussions: first, control would only arrest the technological development and focus should be placed upon regulation of the practical use and marketing of the final product; second, the term 'management' was preferred to 'control' and the advantages of properly managed development process were highlighted; third, development of technologies should be controlled, which is difficult to achieve, as society is very passive.

The discussants reached consensus on the following:

- ethical and moral aspects as well as assessments of possible negative effects on society at large should be considered when applying the precautionary principle;
- all relevant stakeholders should be involved when the precautionary principle is invoked: the research organisations, the government and the Parliament, the businesses, as well as the civil society organisations and the society at large, as this is the way to achieve objectivity in the application of the precautionary principle;
- the burden of proof of safety of products/technologies should be on the manufacturers, while the role of the state is to develop the legal framework;
- low level of trust in the national politicians and public authorities in regard to regulation of new technologies, and high level of trust in experts and scientists;
- all relevant stakeholder groups should be involved in the further development of the precautionary principle so as to ensure that all interested parties receive a fair opportunity to present their arguments;
- *precautionary principle was almost universally recognised as an appropriate and* effective tool to regulate uncertainties arising from development of technologies.

5.6 Citizens meeting guide

Citizens meetings Guide

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5.6.1 Introduction to the Citizens meetings

The Citizens meeting is a method to gain knowledge of what a group of citizens (not stakeholders) think and feel about complex issues. It is not a representative method, but it aims at including a diverse group of citizens who cover a broad spectrum of demographic criteria such as age, sex, religion, education, geographical zone and occupation.

Using group interviews and a questionnaire, a group of about 30 people are asked at the Citizens meeting about their perceptions and preferences in relation to a technology, a technological development, challenge or problem. As a rule, interviewees do not possess any expert or professional knowledge about the issue under exploration. However, prior to and during the meeting, the participants are informed about the controversies and perspectives on the topic to be addressed, so that they share a balanced and factual starting point.

The Citizens meeting method employs a combination of a questionnaire and group interviews. These two methods complement one another well; the questionnaire ensures that all the participants are heard and that there is comparable data relating to the most important areas. The group interview, on the other hand, creates a lively debate and ensures that the participants can include aspects that are not addressed by the questionnaire. Citizens meetings are particularly suitable in cases where:

- There are complex issues (technically complex and/or ones posing a dilemma)
- Prior public knowledge is limited
- An ethical dimension is involved

5.6.1.1 Purpose

The purpose of the Citizens meeting is to gain insight into the various notions, wishes, concerns and attitudes prevalent among the interviewees. The Citizens meeting must provide an indication of the general views of the interviewees and the underlying reasons for these. The purpose is thus not to conduct an actual opinion poll. The interviewees' answers provide insight into:

- fundamental attitudes towards a complex issue
- the underlying reasons for these attitudes
- the variety of arguments that exist among the interviewees
- how interviewees weigh different arguments and ethical principles against one another

5.6.1.2 Staff requirements and assignment of roles

- 1 project manager / coordinator
- 1 Head facilitator
- 5 interviewers
- Min. 1 Assistant

Project manager: The project manager's main responsibility is to make sure that the Citizens meeting proceeds according to the method described. She/he should have the overview of all tasks, and make sure that everything is executed as planned.

Head facilitator: The citizen consultation is facilitated by the head facilitator whose main responsibility is to make sure that everybody in the room feels welcome and that all citizens understand what to do and do it within the given time frame. The head facilitator will instruct everyone in the room about what exactly to do every time a new session begins.

Table moderator: The role of the interviewer is to mediate the group interview and ensure that all of the participants are heard and that all themes and questions are discussed and answered (It is very important that the table moderator has read the information material).

Assistants: For all the practicalities

5.6.1.3 Procedure of the RECIPES Citizens meeting

The Citizens meeting is usually held in the evening and takes the form of a three-hour after-work meeting. Before the Citizens meeting, a short informational material developed by the RECIPES consortium is sent to the participants. The information material will give the participants an insight to the Precautionary Principle (PP) and innovation, as well as the dilemmas and controversies connected to three selected cases: GMO, Nanotechnology and pesticides.

The Citizens meeting begins with an introduction that sums up the information material.

The introduction is presented by the facilitator. Following this, participants can put forward clarifying questions. The answers should stick to clarifying the presented material and should not include personal opinions or any other kind of bias.

After the introduction, participants are individually handed a questionnaire. Participants should have approximately 30 minutes in which to complete the questionnaire. The questionnaire focuses on the same dilemmas as the introduction presentation and the information material. Clarifying questions can be put to the organizers throughout the session if need be.

After the questionnaire, participants are divided into groups of 5-7 people and group interviews are subsequently carried out. The group interviews focus on selected questions from the questionnaire. The table moderator for each table will be taking notes and the interviews are tape-recorded.

5.6.1.4 Draft program

Time	Points on agenda
	Participants arrive
(5 min)	Welcome
(10 min)	Introduction at the tables
(20 min)	Introduction of the information material
(30 min)	Questionnaire
(20 min)	Sandwich break
(15 min)	Explanation of group interview procedure
(60 min)	Group interviews

(15 min) Thank you for today

5.6.1.5 Questions

The questionnaire ensures that there is comparable data relating to the most important areas and is designed to gain valuable insights in to how citizens view the PP and innovation. The questions for the group interview are selected from the questionnaire to give insight into what kind of concerns and wishes the citizens have, and the underlying reasoning for this.

(the full version of the questionnaire is found in a separate document)

5.6.1.6 Group interview guide

The job of the table moderator is to function as a neutral moderator of the deliberations at the group interview. The table moderator's main role is to make sure, that the citizens focus on the assigned discussion theme, and that all citizens at the table have a say. The table moderator should also keep track of time and take notes about major points from the discussion.

It is important that the table moderator understand and accept that they are not there to state their own opinions, but to help citizens state theirs. Citizens should be able to consider them as neutral, and they should therefore not come from e.g. an organisation, which could be accused of being biased, or wear clothes that could send signals to the citizens that certain opinions are better than others.

They can only answer questions from the citizens if the answer can be found in the information material (they cant take part in the discussions in any way). It is necessary to train the table moderator before the citizen meetings. Go through the guidelines together with the table moderator before the citizen meeting in order to develop a common understanding of the rules. Make sure to engage some extras in case of illness, etc. The table moderator at each table can be employees in the national partner organisations, volunteers from various organisations, or graduate students..

The group interview questions are about

1. The reasoning behind the answers given to the selected questions from the questionnaire and
2. Selected because they directly address issues regarding precaution and innovation

Q no.	Question
14	Do you think that there is a trade-of between precaution and innovation?
15	If, yes? Which should have a higher priority?

Q no.	Question
16	Should a precautionary approach also cover ethical and moral aspects and assessments of possible social consequences?
17	Who should be involved when the precautionary principle has been invoked?
18	Burden of proof: Should the state prove that a certain product or technology lead to unacceptable harm before they can be banned, or should the provider or industry prove that the product or technology are safe before they can be brought on the market?
19	How much certainty is needed / how strong does the evidence need to be before it is justified to ban a product or technology?
20	Do you trust the politicians and authorities to regulate technology?
21	Who should be involved in the further develop the precautionary principle
22	How do you want uncertainty with technology to be regulated?
23	Do you think the development of technology can be controlled?

Interview guide

In the following you will find a number of "rules of thumb" and tips on how to carry out the group interview in a good way.

- Start by presenting yourself, "My name is … I'm from …, and I'm going to be the moderator at is group conversation. But you just talk and I will make a list of speakers if necessary.

- After that the RECORDER IS STARTED!! This is done in a free-and-easy way and by an easy comment. It is important to create a light atmosphere and play down the seriousness to make sure that the participants are not oppressed by the situation.

- The first question is often the hardest in terms of getting the interview started.

- The moderator will pick one of the participants (let us say the participant to the left) and ask him/her to tell the group what he/she voted in the first question of the selected questions from the questionnaire and his/her reasons behind.

- The table moderator will afterwards ask if anyone around the table has any clarifying questions or comments. It is not important that all participants answer all questions, but the interviewer should have an impression of what they all think.

  If anyone is hiding, the table moderator can always ask "Do you agree, John, or what do you think?"

- It is important that all questions are debated. But questions that are more important to the participants than the ones in the interview guide can appear in the discussion and there should always be time to discuss these questions (as long as they are related to the precaution and innovation debate).

- If someone becomes too dominating, it is the table moderators' job to bring on the other participants. Ask e.g. "What do the rest of you think?" Interrupt if necessary, it is important that everybody is heard.

- Of the participants don't say too much at the group interview, the interviewer can "take a round" saying that "at the next question I would like to take a round where everybody gives an answer"

- If needed then ask for reasons and arguments, "How come you think that… / What is the reason for…

- Be aware of the participants reactions; Do they feel comfortable, do they seem under pressure or uneasy etc.

- If you are through all the questions before time, you can go back to some of the questions that have not been debated that much on the way.

- **Closing** - When there is 7-8 minutes left, it is a good idea to take a round where everybody gets to make a final remark. The final remark can be things that they have not have the time to state already or points or messages they would like to underline.

  You can also ask if something has made a special impression during the conversation.

5.6.1.7 Procedure after the Citizens meeting

After the Citizens meetings all information is gathered and processed by the RECIPES host partner.

- The filled in questionnaires is transferred from the printed handouts into the original excel file and sent to DBT
- The table moderators' notes are expanded upon with the recordings from the group interview and translated into English. The document with the expanded notes is

written by the RECIPES host partner and sent to DBT (guidelines and a template will be provided).

5.6.1.8 Results

A comparison and analysis of the questionnaire and the abovementioned document offers a balanced indication of public attitudes towards the given issue. In the final analysis the quantitative and the qualitative data from the five Citizens meetings is combined to assess which criteria are relevant and why and how far the consensus reaches among the citizens.

The results will basically give insight into the citizens' priorities and their evaluation of dilemmas connected to issue of PP and innovation. The citizens will give their unique input from their "citizen logic".

5.6.1.9 Detailed program

Time	Point on agenda	Description
	Before the meeting	• Make sure the technology works (PPTX etc.) • Make sure refreshments are readily available • Make sure there are pens, paper and 'rules for good dialogue' distributed on the tables
	Participants arrive	Facilitator (and if any assistants) • Receive the participants and help them find their place. Make sure they can make a name tag from materials you have ready, if you haven't made them in advance. • Make sure everyone signs the attendance sheet and consent form Consider if you have the opportunity to take pictures. Remember to ask for permission.
(5 min)	**Welcome**	The facilitator welcome everyone, makes sure to ***tell everyone his/her name and role***, and explains the background for the meetings (RECIPES, Danish Board of Technology Foundation organising meetings), purpose of the day, the program, what will happen with the results and explains • How about the food? • Where are the bathrooms? • Can we take your picture? • What are rules for good dialogue? Allow time for **practical** questions – questions of content will have a place later

Time	Point on agenda	Description
(10 min)	**Introduction at the tables**	In order for the participants to feel comfortable, it is important to give them time to introduce themselves to each other. The facilitator should be the good example. The facilitator will therefore begin the introductions by repeating his/her name, telling what he/she finds interesting about the topic of the meeting. Then the facilitator encourages the participants to do the same around the tables (not in the plenary). For this there is a 'talking stick' on the table (it can be a pen with a coloured post-it. Whoever holds the talking stick is the one introducing him/herself, with name and a few words about the persons motivations to participate in the meeting. The participants can choose who they will pass the 'talking stick' to next, just as long as everyone gets to introduce themselves.
(20 min)	**Introduction of the information material**	The facilitator takes 10 minutes to go through the information material using the PP. Allow 5 minutes for general questions Make sure the conversations touches on the following questions (or use them to get the participants to ask questions) 3 The relationship of precaution and innovation 4 The implementation of the precautionary principle in EU 5 The three cases
(30 min)	**Questionnaire**	The facilitator manages the transition to the questionnaire. The facilitator explains how we will fill out the questionnaires together. The facilitator reads out loud the questions in the questionnaire, and if there are questions to filling in the questionnaire answers them.
(20 min)	**Sandwich break**	
(15 min)	**Explanation of group interview procedure**	The facilitator explains the group interview procedure in plenary:
(60 min)	**Group interviews**	The table moderator will start the interview according to 5.6.1.6 Group interview guide
less than (15 min)	**End and thank you for today**	The facilitator gives the participants the opportunity to ask questions or provide comment in the plenary

Time	Point on agenda	Description
		The facilitator thanks the participants for their participation, and again let them know how the results will be used and contact info, can we contact them again, and hand out the 'reimbursement or bonus for the meeting'.