



Information and discussion material used in the national citizen panel (first meeting) in the UK

Grant Agreement	665947
Project Acronym	PROSO
Project Title	Promoting Societal Engagement under the Terms of Responsible Research and Innovation (RRI)
Topic	GARRI-1-2014 Fostering RRI uptake in current research and innovations systems
Project website	http://www.proso-project.eu
Starting date	01 January 2016
Duration	26 months
WP4 Leader	ARC Fund



The project is financed by the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement no 665947 and runs from January 2016 to February 2018.

Research on Nanotechnology: “Nanotechnology to clean up the environment?”

The challenge

Modern society’s dependence on fossil fuels for energy, transport, and the manufacture of many other products has led to a global increase in pollution. Many of the pollutants produced have been linked with climate change, as well as with other impacts on the environment and human health, including respiratory illnesses like asthma.

Current research

Current research focuses on how nanoparticles can be used to reduce pollution. These particles are so small that they are not visible to the naked eye:



When a material in its natural state (made up of large crystals or particles and visible to the naked eye) is reduced in size to the nanoscale, it can gain new properties. Nanomaterials can be stronger than the original materials, have different optical or magnetic properties, or react more with other chemicals. This increased reactivity of some nanomaterials means they can be used to combat pollution.

Example: “Nano titanium dioxide in cement”

Titanium dioxide is an abundant mineral that is mined in Europe and across the globe. In its natural state it is inert and used as a white pigment for paint, plastics and cosmetics. However, at the nanoscale titanium dioxide can capture the energy from normal sunlight and use this to convert common pollutants into less harmful chemicals. A number of companies around the globe are incorporating nanoscale titanium dioxide into cement products. Studies have shown that buildings, bridges and roads that are made from such products can help clean up the environment by actively breaking down pollutants in the air, water, or earth they come into contact with.

Possible benefits and possible drawbacks

Materials that are more chemically reactive at the nanoscale can be incorporated into products during their manufacture or applied as coatings to finished products. Many of these materials (such as titanium dioxide, see box) come from abundant sources and are only required in small amounts to produce the desired effect. As such, costs can be low and it is easy to supply enough titanium dioxide to meet demand. This has the potential to allow nanoscale materials to be incorporated widely across the built environment.

However, we now know that some of the new properties of these nanomaterials also have potential risks. For example, nanoscale zinc oxide, which also harnesses energy from sunlight to break down pollutants, is toxic to microbes in the environment. This can affect levels of nutrients in soil, which makes it difficult for plants to grow. We need to understand and anticipate these hazards and how to manage the exposure of people and the environment to such nanomaterials. This could involve limiting their use to certain products or only certain conditions, or combining nanomaterials with something else to reduce their toxicity.

Year of Science 2016: Latest research for curious citizens

The **Science Café Association of Guildford** cordially invites you to a

Science Café

"Nanotechnology to clean up the environment?"

Have you ever wondered what researchers are doing about the global increase in pollution? From reducing modern society's dependence on fossil fuels, to filter technologies to protect the environment, there are many options to tackle the pollution problem. During the science café, you will have the opportunity to learn about and discuss the possible applications from a new but controversial field of research: nanotechnology.

Meet chemist Jill Green (South Downs University) and environmental social scientist Benjamin Miller (Watts University) in a relaxed and informal atmosphere to find out more about their work. Jill Green will talk about her research on the use of nanoparticles in cement to reduce pollution and the challenges of using nanotechnology to solve environmental problems.

Whilst the ongoing development of nanotechnology is exciting for many people, its real-life consequences are not yet clear. Benjamin Miller will address the potential problems for people, other species, and the environment that are linked to the use of nanotechnology, and which should be taken into account when introducing this emerging science.

After their talks, you will have the opportunity to discuss your questions and comments with both speakers and the audience.

The event will be facilitated by Sebastian Potter (Watts Campus Radio).

Where: Town Hall Café, Guildford Town Centre.

When: Tuesday 19:00-20:30

Admission: Free (40 places available)

Please register via info@sciencecafe-watts.ac.uk

We hope to see you there for a fun and interesting evening!

Your views matter: Where should research and innovation go next?

Dear _____,

We are writing to invite you to participate in our

Citizen Dialogue

"Nanotechnology to clean up the environment?"

Have you ever wondered what researchers are doing about the global increase in pollution? Nanotechnology is a research field that aims to find solutions to this challenge. By using nanoparticles in cement to break down pollutants from fossil fuels, this novel technology may be able to drastically reduce air pollution. However, nanotechnology is controversial because it could create additional problems for humans and other species.

Why should you participate? To ensure that research on global pollution takes a course acceptable to the public, we are interested in **your perspective** about this new research field and invite you to participate in the citizen dialogue event. We want to know about your views, concerns, and hopes about the development and use of nanotechnology. In the citizen dialogue you and other citizens will discuss whether and how research on nanotechnology should be pursued and developed. The citizen dialogue will be carried out by the Institute of Technology and Society, and has been commissioned by the Ministry of Research.

What does participation involve? You will meet during one day with up to **20 other citizens** and selected researchers for a discussion. Before the event, we will send you an information brochure about current research on using nanotechnology to address pollution.

During the citizen dialogue:

1. Researchers will describe the current state of scientific and technological developments in this research area, and give insight into social and ethical perspectives related to the development of nanotechnology.
2. With other citizens in small groups of 6-7 people, you will discuss your views, concerns, expectations, and hopes for this research area. Researchers will be there to answer any issue-related questions. We are interested in on your personal opinion on the issue and you do not need to have a technical knowledge and understanding.
3. Each group will present their results to the other groups, and discuss them together with the researchers. Everyone will work together to write a joint statement about whether and how nanotechnology should play a role in solving the problem of global pollution.

What happens with the results? We will provide the results of the citizen dialogue to the Ministry of Research. Your views will provide the Ministry with valuable information about whether and how nanotechnology may be a solution for reducing global levels of pollution.

When: Saturday, 09:00-17:00h

Where: Conference Centre, Guildford Town Centre

If you are interested to participate, please contact us at info@citizendialogue.org. We will contact you by phone to ask you a set of questions to confirm whether you are able to participate.

Participants will be paid a stipend to thank them for their contribution to the citizen dialogue.

We look forward to seeing you there!

Sincerely,

Institute for Technology and Society

FICTIVE INVITATIONS

Which research deserves funding?

Dear _____,

We are writing to invite you to participate in our

Citizen Evaluation Board

"Nanotechnology to clean up the environment?"

Have you ever wondered what researchers are doing about the global increase in pollution? The National Research Foundation (NRF) has recently launched a new research programme called "Nanotechnology to clean up the environment". Over the next two years the programme will evaluate and fund research projects that explore new ways of addressing pollution through nanotechnology.

Some researchers are trying to find solutions to the challenge of global pollution through nanotechnology. By mixing nanoparticles into cement used to make buildings, this novel technology may be able to break down pollutants from fossil fuels and drastically reduce air pollution. However, nanotechnology is controversial because it could create additional problems for humans and other species.

Why should you participate? We are interested in your perspective on this new research field and invite you to participate in the NRF's newly established Citizen Evaluation Board (CEB). With the CEB the NRF aims to include the opinions and needs of citizens in its funding decisions. Research on important societal challenges, such as global pollution, should no longer be carried out separately from society. Instead, scientists should be engaged with the public from the beginning of their research. The CEB will ensure that research projects are not only assessed by their scientific excellence, but also by their alignment with societal needs, values, and concerns. As part of the CEB, you will reflect on the environmental uses of nanotechnology by discussing research proposals and examining their potential benefits and risks for society.

What does participating involve? For the next two years, together with 20 other citizens, you would become a member of the Citizen Evaluation Board of the National Research Foundation. The role of the Citizen Evaluation Board is to provide the NRF with recommendations about relevance of research to society and whether it should be funded by the NRF. This means:

1. In the beginning you will participate in a half-day introduction to the aims and objectives of the Citizen Evaluation Board. You will be introduced to research in the area of nanotechnology to address environmental problems such as global pollution within the NRF. We will also explain the roles and responsibilities of the CEB in detail.
2. Over the next two years, the CEB will meet twice per year, each time over one weekend. During these two days, you and other members of the public will recommend which projects about using nanotechnology to reduce pollution should receive research funding from the NRF. These weekend meetings will include the following activities:

- On Saturday, researchers will present their new projects through research proposals. You will also have time to read more about their projects and ask questions.
- On Sunday, you will be asked to think about the research proposals and whether they should receive funding. You will rank them on factors that include societal need, public benefit, improving quality of life etc. You will then discuss your evaluation together within the Citizen Evaluation Board to make final recommendations to the National Research Foundation about which research proposals should receive funding.

What is a research proposal?

Researchers often have to apply for money to do their research. To do this, they write down their research ideas and how they want to carry them out through a research project. These texts are called proposals. These proposals are evaluated by funding organisations like the National Research Foundation whose job is to distribute government money to researchers.

What happens with the recommendations? The National Research Foundation will include the recommendations of the Citizen Evaluation Board as key information in their final assessment process. Your perspectives will complement the assessment of the research proposals by other researchers (a process called 'peer review'). The NRF will then publicly justify its funding decisions not only in terms of scientific excellence, but also in terms of societal relevance.

When: Meeting every 6 months in the period 2017 and 2018, four meetings in total:

- First meeting in 2017: Information meeting on a Friday (1/2-day meeting); Saturday (whole day) and Sunday (1/2-day meeting).
- Meetings two, three and four: one meeting in 2017, two meetings in 2018: Saturday (whole day) and Sunday (1/2-day meeting)

Where: National Research Foundation, London

If you are interested to participate, please contact us at info@nrf-citizenboard.org. The CEB aims to bring together a diverse group of citizens. We will contact you by phone to ask you a set of questions and to confirm, whether you are able to participate.

We would be pleased to answer any initial questions you might have by email. Further information on the citizen panel and on the NRF is available on www.nrf-citizenboard.org.

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We hope to see you at the information meeting, and to welcome you as a member of our Citizen Evaluation Board!

Sincerely,

National Research Foundation

Research on bio-economy: “Synthetic biology for green energy?”

The Challenge

The safe and sustainable production of energy is key to reducing the impact of climate change. One option is to substitute fossil fuels, such as diesel and petrol, with biofuels. Biofuels can be based on ‘biomass’, which includes plant oils (biodiesel), or on cane sugar and crop starch (ethanol). Despite their potential for more sustainable energy production, early biofuels have been criticised because of their reliance on resources and land that could otherwise be used to feed humans or other species. They are also less efficient than fossil fuels, and many do not work with existing fuel infrastructures, like combustion engines and petrol stations.

Current Research

One field of research that may improve biofuel production is synthetic biology. This emerging research area aims to design new biological parts and organisms that are not found in nature, or to redesign existing biological systems to perform specific tasks. Researchers in biofuel production want to “reprogram” existing micro-organisms such as algae, yeast, or bacteria through genetic modifications. One strategy is to modify these organisms so they produce more biofuel from biomass. These micro-organisms could also be modified to break down new types of biomass, such as the non-edible parts of plants, into biofuel. Scientists are also exploring ways to use these organisms to produce fuels with high energy content (which are called “drop-in” fuels), or to use photosynthesis to produce fuels without the use of biomass (see example).

Possible Benefits and Drawbacks

The production of biofuels through engineered micro-organisms has the potential to create a more sustainable energy production. New biofuels that rely on non-edible plant parts or sun, water, and CO₂, could reduce the need for land or food crops in comparison to conventional biofuels. Since “drop-in” fuels are compatible with existing fuel infrastructures, fossil fuels could gradually be replaced by biofuels more cheaply.

Yet, the promised benefits of new biofuels will ultimately depend on the type of biomass that is being converted, and on the resources needed, such as water and energy. More broadly, synthetic also raises concerns about ethics and risks. Genetically engineered organisms could pose environmental risks if they escape. They could become invasive or evolve rapidly. Since new approaches to synthetic biology allow for organisms to be modified in a way that cannot be traced, it could become impossible to distinguish between “naturally occurring” and “artificially created” organisms. This would make their removal from the environment more difficult.

Example: “Fuels from sun and water”

Hydrogen is now being used as an alternative to fossil fuels. Hydrogen fuel has typically been produced by passing electricity through water to split the hydrogen molecules from the oxygen molecule, or by reacting steam with coal. Neither of these methods is environmentally friendly. Instead, synthetic biologists are exploring how to use the photosynthesis process of certain algae and bacteria as a different way to produce hydrogen. Scientists hope to enhance these natural processes by altering specific genes related to photosynthesis in these organisms. They are also trying to increase the overall amount of hydrogen that algae and bacteria can produce.

Year of Science 2016: Latest research for curious citizens

The **Science Café Association of Guildford** cordially invites you to a

Science Café

"Synthetic biology for green energy?"

Have you ever wondered what researchers are doing about the challenge of sustainable energy production? From wind parks to fuels, sugar to hydrogen power – there are many options to address the problem of sustainable energy. During the science café, you will have the opportunity to learn about and discuss a new, but controversial research field: biofuel production through **synthetic biology**.

Meet biologist Jill Green (South Downs University) and philosopher Benjamin Miller (Watts University) in a relaxed and informal atmosphere to find out more about their work. Jill Green will talk about her research on genetically altering algae for fuel production and challenges of modifying organisms for a specific purpose.

Whilst the development of synthetic biology is exciting for many people, its real-life consequences are not yet clear. Benjamin Miller will address the ethical and societal aspects that should be taken into account when developing this emerging science.

After their talks, you will have the opportunity to discuss your questions and comments with both speakers and the audience.

The event will be facilitated by Sebastian Potter (Watts Campus Radio).

Where: Town Hall Café, Guildford Town Centre.

When: Tuesday 19:00-20:30

Admission: Free (40 places available)

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Your views matter: Where should research and innovation go next?

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Citizen Dialogue

"Synthetic biology for green energy?"

Have you ever wondered what researchers are doing about the challenge of sustainable energy production? 'Synthetic biology' is an emerging research field that aims to find solutions to this challenge. By engineering micro-organisms such as algae and bacteria, this novel technology may be able to create new and more sustainable biofuels. At the same time, synthetic biology is controversial because it could create other problems.

Why should you participate? To ensure that research on green energy takes a course that is acceptable to the public, we are interested in **your perspective** on this new research field and invite you to participate in the citizen dialogue event. We want to know about your views, concerns, and hopes about the development and use of synthetic biology. In the citizen dialogue you and other citizens will discuss whether and how research on synthetic biology should be pursued and developed. The citizen dialogue will be carried out by the Institute of Technology and Society, and has been commissioned by the Ministry of Research.

What does participation involve? You will meet during one day with up to **20 other citizens** and selected researchers for a discussion. Before the event, we will send you an information brochure about current research on synthetic biology for the production of green energy.

During the citizen dialogue:

4. Researchers will describe the current state of scientific and technological developments in this research area, and give insight into social and ethical perspectives related to the development of synthetic biology in the context of new biofuels.
5. With other citizens in small groups of 6-7 people, you will discuss your views, concerns, expectations, and hopes for this research area. Researchers will be there to answer any issue-related questions. We are interested in on your personal opinion on the issue and you do not need to have a technical knowledge and understanding.
6. Each group will present their results to the other groups, and discuss them together with the researchers. Everyone will work together to write a joint statement about whether and how synthetic biology should play a role in solving the problem of "greener energy production".

What happens with the results? We will provide the results of the citizen dialogue to the Ministry of Research. Your views will provide the Ministry with valuable information whether and how 'synthetic biology' may be an appropriate solution to producing sustainable energy.

When: Saturday, 9:00 – 17:00

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Some researchers are trying to find solutions to the challenge of "greener" energy production through synthetic biology. By engineering micro-organisms such as algae and bacteria, this novel technology may be able to create new and sustainable biofuels that could replace fossil fuels and reduce the impact of climate change. At the same time, synthetic biology is controversial because it could create other problems.

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4. Over the next two years, the CEB will meet twice per year, each time over one weekend. During these two days, you and other members of the public will recommend which projects about the

production of green energy through synthetic biology should receive research funding from the NRF. These weekend meetings will include the following activities:

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National Research Foundation

Research on food and health: “New foods to promote better health?”

The Challenge

People in Western cultures have become more sedentary than ever before and high calorie foods are readily available. This has resulted in widespread lifestyle-related illnesses, such as type II diabetes and heart disease. There is an assumption that replacing refined sugar with low-calorie sweeteners will reduce the number of people who have lifestyle-related illnesses. This is fuelling the research, development, and testing of new food products and, as a result, a growing number of manufactured drinks and foods are being made with low- or no-calorie sweeteners instead of sugar.

Current Research

Sweeteners can be sourced from nature, like honey, or created in a lab, like aspartame. Much lab-based research focuses on sweeteners called ‘non-nutritive sweeteners’ (NNS), like saccharin and sucralose, because they have no or fewer calories than sugar, and might help to reduce life-style related illnesses. Although many people think that the only role of refined sugar is to sweeten food, it also contributes other properties to a food product. These include preserving food so it has a longer shelf life, adding bulk, and contributing to the overall texture of the food. As such, when researchers develop new products that contain sweeteners instead of sugar, they also have to use other ingredients – or develop new ingredients entirely – to make the food taste like it did in the original product.

Example: “New sweeteners in food & drinks”

Derived from the leaf of the stevia plant, steviol glycosides are 10-15 times sweeter than refined sugar. However, this means there have been major challenges with adding this non-nutritive sweetener to drinks. Researchers are now focusing on sweetening more natural products like bottled teas and juices with steviol glycosides. However, adding sweeteners to juices and nectars is controversial because these products are already naturally sweet. This may encourage people to maintain their ‘sweet tooth’ and not help them to reduce their taste for sweet foods and drinks.

Possible Benefits and Drawbacks

There are many challenges to creating new foods that have the taste and texture of a food manufactured with sugar, but which are made with sweeteners instead. The intense sweetness of non-nutritive sweeteners means that very little is required relative to the amount of sugar previously used. As a result, they need to be bulked up with other products. Adding bulking agents like dietary fibre may have a positive effect on consumer health. However, adding other ingredients also means that a food product could end up being higher in fat or salt than the original product.

There is strong evidence that NNS promote good dental health because, unlike sugar, they do not cause tooth cavities. However, because these sweeteners are not digested in the small intestine and pass intact into the large intestine, there is inadequate understanding of the impact they may have on bacteria in the gut, which can impact overall health. More research is being done in this area. There are also concerns that NNS do not trigger a feeling of satisfaction or fullness the way that sugar does, and this may prompt people to consume more calories as a result.

Year of Science 2016: Latest research for curious citizens

The **Science Café Association of Guildford** cordially invites you to a

Science Café

"New foods to promote better health?"

Have you ever wondered what researchers are doing about the challenge of lifestyle-related illnesses, such as type II diabetes and heart disease? There are many possible solutions to these illnesses, which include medicine, diet, and exercise. During the science café, you will have the opportunity to learn about and discuss a new, but controversial research field: the development of manufactured foods with potential health benefits.

Meet chemist Dr Jill Green (South Downs University) and social scientist Dr Benjamin Miller (Watts University) in a relaxed and informal atmosphere to find out more about their work. Jill Green will talk about her research on new sweeteners that contain no calories and the challenges involved in developing new foods.

Whilst the development of these new foods with potential health benefits is exciting for many people, including scientists, food manufacturers, policy leaders, and members of the public, its real-life consequences are not yet clear. Benjamin Miller will address the public health and wider impacts on society that would accompany the widespread replacement of sugar by new sweeteners in manufactured foods and drinks.

After their talks, you will have the opportunity to discuss your questions and comments with both speakers and the audience.

The event will be facilitated by Sebastian Potter (Watts Campus Radio).

Where: Town Hall Café, Guildford Town Centre.

When: Tuesday 19:00-20:30

Admission: Free (40 places available)

Please register via info@sciencecafe-watts.ac.uk

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Your views matter: Where should research and innovation go next?

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"New foods to promote better health?"

Have you ever wondered what researchers are doing about the challenge of lifestyle-related illnesses, such as type II diabetes and heart disease? Some researchers are trying to find solutions to this challenge by developing new foods with potential health benefits. These manufactured foods and drinks often contain sweeteners, which have no or very few calories. These sweeteners have the potential to contribute to healthier diets and to the reduction of lifestyle-related diseases. At the same time, the development and widespread use of these new foods is controversial because they could create other problems.

Why should you participate? To ensure that research on lifestyle-related illnesses takes a course acceptable to the public, we are interested in **your perspective** on this research area and invite you to participate in the citizen dialogue event. We want to know about your views, concerns, and hopes about the development and use of new foods with potential health benefits. In this citizen dialogue you and other citizens will discuss whether and how research on new foods to promote better health should be pursued and developed. The citizen dialogue will be conducted by the Institute of Technology and Society, and has been commissioned by the Ministry of Research.

What does participation involve? You will meet during one day with up to **20 other citizens** and selected researchers for a discussion. Before the event, we will send you an information brochure about current research on the development of new foods with potential health benefits.

During the citizen dialogue:

7. Researchers will describe the current state of scientific and technological developments in this research area, and give insights into the social and public health perspective related to the development of new foods to promote better health.
8. With other citizens in small groups of 6-7 people, you will discuss your views, concerns, expectations, and hopes for this research area. Researchers will be there to answer any issue-related questions. We are interested in on your personal opinion on the issue and you do not need to have a technical knowledge and understanding.
9. Each group will present their results to the other groups, and discuss them together with the researchers. Everyone will work together to write a joint statement about whether and how new foods with potential health benefits should play a role in solving the problem of lifestyle-related illnesses.

What happens with the results? We will provide the results of the citizen dialogue to the Ministry of Research. Your views will provide the Ministry with valuable information about whether and how new sweeteners may be one solution to challenging lifestyle-related illnesses.

When: Saturday, 9:00 – 17:00

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Which research deserves funding?

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"New foods to promote better health?"

Have you ever wondered what researchers are doing about the challenge of lifestyle-related illnesses, such as type II diabetes and heart disease? The National Research Foundation (NRF) has recently launched a new research programme on "New foods to promote better health." Over the next two years the programme will evaluate and fund research projects that explore the development and use of new foods with potential health benefits.

Some researchers are trying to find solutions to this challenge by developing new foods with potential health benefits. These manufactured foods and drinks often contain sweeteners, which have no or very few calories. These sweeteners have the potential to contribute to healthier diets and to the reduction of lifestyle-related diseases. At the same time, the development and widespread use of these new foods is controversial because they could create other problems.

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Where: National Research Foundation, London

If you are interested to participate, please contact us at info@nrf-citizenboard.org. The CEB aims to bring together a diverse group of citizens. We will contact you by phone to ask you a set of questions and to confirm whether you are able to participate.

We would be pleased to answer any initial questions you might have by email. Further information on the citizen panel and on the NRF is available on www.nrf-citizenboard.org.

Participants will receive a stipend for their contribution to the CEB. In addition, we also cover travel and hotel costs.

We hope to see you at the information meeting, and to welcome you as a member of our Citizen Evaluation Board!

Sincerely,

The National Research Foundation