A report on Responsible Research & Innovation

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matter
making new technologies work for us all

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What do we understand under Responsible Research and Innovation?

What is Responsible Research and Innovation?

The term is new, so definitions are evolving. Current debates suggest that it includes the following[1][2][3] [4]:

1. The deliberate focus of research and the products of innovation to achieve a social or environmental benefit.

2. The consistent, ongoing involvement of society, from beginning to end of the innovation process, including the public & non-governmental groups, who are themselves mindful of the public good.

3. Assessing and effectively prioritising social, ethical and environmental impacts, risks and opportunities, both now and in the future, alongside the technical and commercial.

4. Where oversight mechanisms are better able to anticipate and manage problems and opportunities and which are also able to adapt and respond quickly to changing knowledge and circumstances.

5. Where openness and transparency are an integral component of the research and innovation process.

What areas does it cover?

The debate is currently centred on science and technology-based research and innovation, in particular on emerging technologies - notably nanotechnologies, genomics, synthetic biology and geoengineering. However, the use of the word 'innovation' is commonly used to describe the application of any type of invention which significantly improves products, systems or services.

Responsible Research and Innovation could therefore also encompass, for example, financial instruments, ICT, public policy or community innovations, distribution, service or system innovations, which usually develop separately from the university-led research pathway followed by science and technology and may require different interventions.
(See Table 1 on page 5 below)

> ***Research*** *=systematic investigation to establish facts & reach new conclusions*
>
> ***Invention*** *= a creation resulting from study & experimentation*
>
> ***Innovation*** *= a superior process or product, often the effective commercialisation of an invention*

In addition other communities of interest - for example the business and corporate responsibility communities; sustainable development, human rights or consumer groups are also articulating their aspirations for the responsible development of products and services along similar lines to those currently being debated in science and technology - though these discussions are not yet connected. [5]

Trends, technology innovations and platforms which may shape the future

Global Trends

Climate change, environment, and sustainability	Increasing scarcity and unequal distribution of water
Rapidly growing demand for energy	Corporate global citizenship Limited resources
Limited resources	Social life in a technological world
Shifting centers of economic activity	Demographics, including shifting populations and mobility
Growing demand for food, nutrition, and health	

Technology Innovations

Vaccines	Carbon sequestration	Smart grids	Better health diagnostics
Advanced sensors	Soil management	Smart materials	High conductivity materials
Next generation electronics	Efficient resources use	Bottom-up manufacturing	Safer nuclear power
Point of use energy generation	Climate control	Renewable energy sources	Substitute materials
Better food preservation	Resilient crops	Immersive communications	Targeted pesticides
Smart drugs	Increased land productivity	High value crops	Biofuels
Water desalination	Thermal insulators	Efficient resource extraction	Water separation
Strong, lightweight materials	Irrigation	Disease management	Sustainable production processes
Automated traffic management	Better batteries	Advanced prosthetics	At-source water purification

Technology Platforms

Nanotechnology	Synthetic Biology	Information technology	Bio-interfaces
Geoengineering	Robotics	Biotechnology	Web 2.0
Cognitive technology	Computational chemistry	Artificial Intelligence	Data interfaces

Table 1: Prof Andrew Maynard, Tim Harper, Building a Sustainable Future - Rethinking the Role of Technology Innovation in an increasingly interdepndent, Complex & resource-constrained world. Report for World Economic Forum Global Agenda Council on Emerging Technologies, WEFAnnual Meeting 2011

Why is it important now?

Why now - Learning the lessons of the past

A number of specific factors have led to the current interest in Responsible Research and Innovation among policy makers, scientists, civil society groups and businesses. These include, but are not limited to, the following concepts:[67]

To motive the use of new technologies for social benefit

Innovations in medicines, energy, electronics, materials and computing are becoming more complex, more disruptive and global in their reach and impact (see Table 1 above). But their promise to help solve some of the most pressing problems we face appears more significant and more urgent.

To avoid losing out on another technological advance...

The total ban on genetically modified organisms, many believe, has been a significant competitive disadvantage, preventing Europe reaping some of the benefits of this powerful technology, not just commercial benefits, but for people and the environment. As a direct response to this, among other reasons, both the European Commission and member states have sought to engage citizens in evidence-based discussions relatively early in the development of new technologies, particularly nanotechnology and synthetic biology, explicitly to build the knowledge and confidence of citizens.

To prevent another disaster like…..

The genuinely catastrophic effects of, for example, asbestos, CFCs, some put GM crops in this category, has focused the concern of politicians, businesses, civil society groups and the public on how to prevent such disasters occurring yet again.

Fear of unintended consequences…..

The potential for negative unintended consequences, of even seemingly beneficial innovations, is a powerful driver for RRI. The impacts of our innovations are documented compellingly by Lord Robert Winston's book *Bad Ideas, An arresting history of our inventions*[8]. He demonstrates how difficult it is to anticipate negative consequences, manage for them in advance and change course when problems arise.

> *"in every act of creation and innovation there exists the potential, also, for our undoing."*
>
> *Lord Robert Winston*
> *Bad Ideas; an arresting history of our inventions*

Fear of Irreversible consequences - *we can't put it back in the box*

The potential for and fear of irreversible human health or environmental disruption, accidental or deliberate, is magnified as the technologies become more complex, more difficult for non-experts to understand and more disruptive or pervasive.

RRI is about trying to get better at anticipating problems, taking into account wider social, ethical and environmental issues and being able to create flexible and adaptive systems to deal with these unintended consequences. This is sometimes called 'Anticipatory Governance'.[9]

Why now - The loss of trust and the 'rise' of the public

Previous 'techno-disasters' together with the many facets of the current financial crisis have resulted in a loss of public trust in business and governments across the world with European countries the least trusting of their own governments and business.[10]

Public dialogues show that citizens are often sceptical about the motivations of all groups - for example governments *"are they so busy trying to suck up to business they'll let profit trump safety?"*[11] businesses - *'"are they just trying to part me from my money?"* and even scientists who are among the most trusted - *"are they doing it for the accolades, just to prove they can?"'*

This distrust manifests itself in many ways, but has stimulated the public and civil society stakeholders to be more interested and more vocal about the way governments and companies do what they do. Their influence is increasing all the time, from the impact of public *disapproval* - such as the reaction to GM plants and nuclear power - to the impact of their *approval* - the rise of organics, the movement to improve labour standards in business, the growing public involvement in many countries in the shaping and delivery of public services.

This lack of trust makes it difficult for governments and businesses to persuade citizens that the science and technology choices they fund are for the public good and not simply for financial or personal gain and new approaches are needed to involve all groups in thinking through the choices and the decisions that are made.

RRI is about creating a shared understanding of the appropriate behaviours of the EC, governments, business and NGOs which is central to building the trust and confidence of the public and other stakeholders in the safe and effective systems, process and products of innovation.

Why now - Globalisation and the need for speed

The global nature of innovation

Innovations these days are global in reach and potential. Innovation is the source of considerable competitive advantage for all nations and Europe does not act in isolation. Achieving the balance of innovation and growth with the need for effective, safe and appropriate products is the challenge of RRI.

> *"We need to do much better at turning our research into new and better services and products if we are to remain competitive on the global marketplace and improve the quality of life in Europe."*
>
> **Europe's flagship programme - Innovation Union**

The speed of change & unstoppability of progress - if we don't do it, someone will

The way we work, the products we use and the way we live our lives appears to be changing; these

> *"innovation is society in the making."*
>
> **Pierre-Benoît JOLY**
> **Senior Research Fellow**
> **INRA/SenS and IFRIS, Paris**

changes sometimes seem to happen with breathtaking speed and 'progress' feels unstoppable. Some feel the 'tyranny'[12] of the speed of change means our governments, businesses and we as individuals make the wrong choices.

Some consider this drive for progress to be a false or illusory need, while many see it as an essential component of growth and progress and fear we will be left behind and seriously disadvantaged by those in other regions and markets who embrace these changes more readily.

RRI aims not to be a barrier to innovation but a stimulus for success. Growth based on genuine innovation; which brings to life sustainable development and involves society in the creation of its vision, the articulation of its values and the shaping of its products will allow Europe to be a hub of innovation for the benefit of us all.

Responsible Research & Innovation must consider its own social, ethical & implications

But those involved in researching and delivering RRI must also consider carefully the benefit and risks of their own proposed approaches; assessing their potential impact and the potential for unintended consequences. They must also engage their own stakeholders in developing mutually beneficial solutions with the public good in its most holistic sense in mind.

Which activities does Responsible Research and Innovation cover?

1. Activities to focus innovation on a social or environmental benefit.

The ultimate gain of new technologies, to provide socially or environmentally beneficial solutions to intractable problems and drive the growth of European economies, sounds like a simple, laudable goal, but brings with it many dilemmas and difficulties.

Responsible Research and Innovation, *as a process*, seeks to explore these dilemmas in a thoughtful, inclusive, though still practical way. Responsible Research and Innovation *as an outcome* seeks to generate the 'right' end points which benefit people, planet and profit.

Anchoring innovation in common European values?

The starting point could be to understand where we want to go with our innovations and then follow that with how we want to get there? To achieve this in a coherent way would perhaps require a common European values[13]. Though these European Values have not been codified, nor explored with its citizens, perhaps The Treaty of the European Union and Charter of Fundamental Rights of the European Union could be considered to provide 'anchorpoints' with which governments can use to begin to create a shared understanding of RRI and the common European values which underpin it? [14]

The growth strategy for the EU, Europe 2020, articulates a vision for a smart, sustainable and inclusive economy, delivering high levels of employment, productivity and social cohesion.

Research and innovation are central to delivering the five ambitious objectives on employment, innovation, education, social inclusion and climate/energy. Perhaps **Responsible** research and innovation could be said to help deliver them in a way which is smart, sustainable and inclusive?

Steering a path between different views of social benefit

Even should such common values be possible, people will always disagree about what a social benefit is. For example there are disputes about the validity of areas of research (eg technologies which 'tinker with nature'), product applications (eg alternative energy solutions) or impacts of applications (eg privacy impacts of ICT). With such disparate views it is not easy for governments, companies and research funders to steer a path which avoids being paralysed into inaction or steered into mediocrity.

RRI seeks new ways to understand these differences and explore their implications as an integral part of the innovation process. It involves stakeholders from the very earliest stages and incorporates these new perspectives into innovation design.

Avoiding the techno-fix and exploring alternative solutions

Many of the problems we face are urgent - climate change, poverty, health are not issues we can put off for another day and science and technology will undoubtedly make a real contribution to the development of solutions. But there is a growing concern that society's enthusiasm for 'quick-fix' technological solutions may not always be the best or only solution to a problem.

Different approaches, such as systems changes, distribution issues, community or simply uncommercial applications may also be part of the solution, often in conjunction with technologies. One of the great challenges of RRI is to understand how these innovations can be used appropriately and effectively and not close off other pathways which may also need to be part of our 'armoury'.

RRI seeks to find ways to think through benefits as well as risks in the round & evaluate all potential solutions as equal. Where other approaches appear important, but difficult, it seeks to find ways to motivate their consideration & use.

Business and social benefit

Though there is much work being done about the science and research aspects of Responsible Innovation, there is less debate and very few initiatives to effectively engage business about the issues which arise for them. Public dialogues indicate that it is most often at the commercialisation stage of inventions that the major concerns arise[15]. This is perhaps partly because that is the point at which they become available and begin to have their social/environmental impact, and partly because this is usually the first time that the public comes into contact with them.

Businesses argue that if there wasn't a social benefit to their product they wouldn't have any customers. Others feel that the profit motive and focus on creating shareholder value is often pursued at the expense of society or the environment and that customers are manipulated to purchase things they don't need or which are actually bad for them.

But as customers become more demanding, environmental imperatives escalate and the behaviour of companies is scrutinised more closely by investors, media and civil society, the responsible innovation imperative grows. Social responsibilities have, up to now, been focused on environmental or human rights issues such as labour standards, worker safety and product safety, this will increasingly expand to consider the focus and processes of innovation for social benefit.

RRI gets to the fundamentals of corporate responsibility: the role of companies in society, their relationships and their responsibilities for the wider impacts of their products and processes.

2. Activities to inspire the ongoing involvement of society

The involvement of the public and civil society stakeholders in the processes and outcomes of research and innovation is a key component of RRI, though the appropriate focus, timing and method of such involvement is the subject of much discussion among experts.

Why involve the public?

Building public acceptance of innovation - propaganda or democracy in action?
Innovation only works if someone wants it and is prepared to pay. The confidence of the customer - a business, government or citizen - is essential to its success. 'Smoothing the innovation pathway[16]' by trying to build public acceptance of a technological choice through communication and engagement is considered by some to be inappropriate government propaganda; whilst others see it is an essential role of government to inform its citizens appropriately of the paths to prosperity it has chosen and been democratically elected to deliver.

Moral responsibilities to citizens and taxpayers?
Many believe there is a moral responsibility of governments and other bodies to give citizens a genuine say in the direction and purpose of innovation over and above that given by exorcising their rights through the democratic process. This moral aspect focuses particularly on the use of taxpayers money on EC and government-funded research programmes, but also can encompass the responsibilities of companies in society.

Citizen's as co-creators of innovation
Other public involvement puts citizens at the centre of innovation, such as open source software, wikipedia, customer developed mountain bikes and kite surfers, 'crowd-funding' and other customer-led entrepreneurial ventures. In fact these types of organisation rely on their customers for their R&D. It is unclear how far this melding can go, but even large companies such as Procter and Gamble and GSK seek innovative ways to engage with more unusual partners and members of society as a central part of their R&D. P&G aiming to 'embrace the collective brains of the world', to tap the input of scientists, inventors, suppliers and the public to ensure it doesn't miss out on new opportunities and it gets the buy-in of customers right at the start.

Because it makes innovation more effective

In the 'old days' governments invested in science, supported businesses start ups and then new products came out of the innovation pipeline and they let the market decide which was best. But with greater need to get the 'right' impacts and serious pressures to provide value for tax payers' money, there is a shift to identifying societal challenges as the basis for research and innovation. For example - climate change mitigation, ageing populations, poverty alleviation, disease prevention.

But there is not yet consensus about whether this is the best route to achieving these solutions. Though evidence is building, the question remains - is 'directed' research like this, in fact, the most effective way of achieving the social impacts which are sought? Inventions and innovations notoriously *don't* come from 'Eureka' moments, but through long processes of reflection, by accident or through unusual collaborations and connections[17]. But on other occasions the pressing need to respond to events or solve immediate problems inspires quantum leaps that would not have been achievable without that stimulus - eg the Manhattan project or the Space Race.

> *"Great breakthroughs are closer to what happens in a flood plain: a dozen separate tributaries converge, and the rising waters lift the genius high enough that he or she can see around the conceptual obstructions of the age"*
> **Stephen B Johnson**
> **The Ghost Road**
> **and Where good ideas come from.**
> **A natural history of innovation**

RRI does not shut off options, but opens them up. If connections are what makes inventions and innovation happen, RRI is a more deliberate way of making that happen. It is fundamentally about making better connections with more people to enrich our innovation process and create better, more sustainable products.

When to involve the public?

One of the challenges of RRI is to be more innovative and inclusive about embedding the involvement of the public within at all stages of research and innovation without wasting their time and other people's money.

This could entail the participation of the public and other stakeholders right at the start of the process in shaping a vision of the future to which innovation can be directed. It may then be appropriate to help prioritise the directions of research; the inclusion, or not, of cutting edge science; the shaping of the applications of invention and their use, disposal or recycling.

RRI challenges each actor in the innovation process to play their part and it explores when and how best to involve the public and others stakeholders appropriately and effectively in their particular part of the process.

Who to involve?

Developing the appropriate strategy to involve the different groups in innovative and mutually useful ways is central to effective Responsible Research and Innovation.

Who is 'The Public'?

The public tends to mean ordinary people from all walks of life in their personal capacity. They are 'recruited' by professional research organisations to represent the views of the rest of us and are usually chosen to be demographically representative to ensure as fair a cross-section as possible.

Civil Society Groups - providing valuable independence & oversight or malicious scare-mongerers?

However 'professional stakeholders' - campaigning groups, consumer organisations, think tanks, independent social science institutions and others are also trusted and important intermediaries between governments, businesses and the public and are considered 'publics' in their own right.

Public dialogues have made clear that independent oversight of business and government plays a valued role in holding institutions to account and building reassurance among the public that 'the system' is working effectively.[18] Responsible governments themselves set up independent bodies to keep them honest and provide impartial advice in many different areas from climate change to drugs policy.

Civil society groups, for the moment, are the most trusted groups in society among members of the public.[19] However others are concerned that campaigning groups, far from upholding the public good, have sometimes deliberately manipulated the public for political ends resulting in the spread of incorrect information and ultimately lost commercial and social or environmental opportunities.

The legitimacy of such civil society groups is on occasion called into question, sometimes appropriately and sometimes for political or more mischievous ends. But if these groups are the play the role of calling to account those in power and representing the public good and alternative views of society, they must also be mindful of their own responsibility and accountabilities.

There is little help and guidance on this in relation to RRI, but the Global Reporting Initiative (an independent network-based organisation that produces a comprehensive sustainability reporting framework) has a supplement now for NGOs to support them in demonstrating their own social responsibility[20].

RRI explores how to build the capacity of the civil society groups to provide this independent view and enable them to hold institutions to account effectively on behalf of the public, the environment or society as a whole.

Hasn't 'society' got something better to do? Making public involvement worth it

Some go as far as to suggest that it is one's 'duty as a citizen' to engage with governments, academics and business about various subjects, from community policing and town planning to alternative energy and synthetic biology. That may or may not be so, but certainly public engagement sponsors must be careful to make sure it worth the valuable spare time of a member of the public, usually giving up an evening after a hard day's work, to participate in their initiatives.

When is it worth it?

The public considers it 'worth it' when their views have been listened to and taken into account.[21] This is particularly so where their personal interest is engaged - eg observations on medical applications, or community initiatives.

Could 'empowerment' be a substitute for taking responsibility?

Anecdotal concerns suggest that public engagement can be interpreted as a distraction from the very tough task of all those involved simply fulfilling their responsibilities to develop effective, safe sustainable innovations.

RRI seeks to inspire and motivate public engagement funders to ensure that participants involvement is sought in a rigorous and professional manner and that their perspectives are considered and taken into account. Notably absent in virtually every dialogue to date is any attempt to feedback to participants and to wider society about how the input was used, how it influenced the process under discussion and why the chosen cause of action was taken, particularly if it is contrary to the views elicited through the involvement process.

With information everywhere - how can the public form their opinion?

An 'informed public' is the aspiration behind many of the theories and practice of public participation. The concept being that if the public has a basic understanding of science and the scientific process it will equip them to make 'better' judgements.

> *"When we change the way we communicate, we change society"*
> **Clay Shirky**
> **Here Comes Everybody**

More information is available as the use of the internet and social media increases; scientific papers increasingly published on the internet; other 'open source' initiatives give greater access to previously proprietary information and 'old' media becomes more interested in the process and products of innovation.

However, information does not necessarily inform. Does all this simply add to information overload? Can scientific papers be understood or put in context by the ordinary citizen? Should more be done to 'translate' science and social science for the public? But the nature of science is that experts disagree, which is often unsettling to the non-scientist.

As conflicting opinions and different perspectives are aired and there is also more ill informed, simplistic or deliberately misleading information to consider, it is increasingly difficult for media[22], policy makers, let alone the public, to make sense out of the 'noise'.   This adds to the uncertainty and heightens concern, leaving citizens confused, bored or disengaged and policy makers paralysed or hedging their bets.

One of the most significant challenges of RRI is to consider carefully what information and engagement people want and need to help them give an informed opinion and deliver it clearly and effectively

How can we make 'intelligent use of this information'

Experts call for the 'intelligent use of information'. Again, it is by no means clear what 'intelligent' is in many circumstances.   Certainly those it affects negatively will rarely think it intelligent, whether that be business, the public or civil society.

For example, is the response of some European governments to the Fukushima nuclear accident by closing or cancelling nuclear power plants intelligent use of new information which RRI advocates - or is it an electorate-pleasing response at the expense of the long term health of the planet and the benefit of society? Was the banning of GM in Europe an irrational reaction to minority opinions to the long term detriment of society, or was it an example of precaution in the face of real uncertainty and appropriate responsiveness to the views of the public?

RRI seeks to allow all actors to reflect on these issues openly and with society to encourage use of this input more openly and inclusively.

> *"We all know what to do, but what we don't know is how to get re-elected once we have done it."*
>
> **Luxembourg president Jean-Claude Junker regarding the EU - this view has relevance in relation to many other difficult political decisions**

But what if we engage and the public disagrees?

What if the EC, government, businesses or NGOs deliver perfect public involvement and the public doesn't want the invention, product or positioning? Do they just go ahead anyway and lose any residual trust they have built or cut off what many other constituencies believe is vital to growth and competitiveness?

Sometimes difficult and unpopular decisions have to be taken. There are always going to be differences of opinion but RRI seeks to involve the public as early in the process as possible ('upstream' in social science speak) to help shape the process from the start. It also communicates clearly and effectively about the decisions taken and the influences which led to the chosen path.   In this way the decision-making process is legitimate, inclusive, and transparent which will build confidence in the process even if we don't always agree with the outcome.

> *"if I had listened to my customers I would have given them a faster horse!"*
>
> **Henry Ford**

How to engage the public?

Many governments, research organisations, businesses and civil society groups are seeking new and innovative ways of involving the public and other stakeholders to contribute to the assessment and prioritisation of research and innovation. Methodologies may include Citizen's Juries, brainstorm events, focus groups, partnerships, co-creation or crowd-sourcing initiatives. (Some examples of these are found on page 28 and beyond.)

However, many fall short in terms of true citizen participation, as an EC sponsored evaluation of 70 international engagement initiatives on nanotechnology pointed out.[23] When evaluated against the 'Ladder of Citizen Participation' (see Figure 2 right)[24] most fell in the lower categories of manipulation or tokenism.
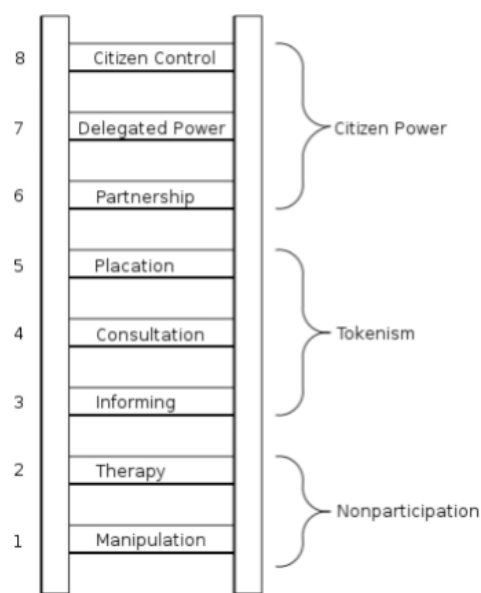
Figure 2. Eight rungs on the ladder of citizen participation

It should be noted that the provision of information on their processes and products to citizens by government and business is a key component of transparency and accountability and though it is likely to be categorised as 'informing' it is essential to effective RRI.

Business and public engagement

Many businesses are very familiar with 'social intelligence gathering' as the basis for product development though, like governments, they are less open about what impact that information has had on their decisions and products.

Companies increasingly see the need to engage their stakeholders far beyond 'customer market research' a staple of business intelligence for decades. Companies with more ambitious social goals, such as Unilever's Sustainable Living Plan, or Marks and Spencer's Plan A have identified a clear business case for social and environmental responsibility and the engagement of stakeholders, particularly the public and civil society groups, is central part of that process. Other commercial ventures such as large infrastructure projects, have increasingly incorporate credible stakeholder engagement components.

The Stakeholder Engagement Standard - AA1000SES - gives guidance on the quality of stakeholder engagement[25] and mechanisms such as the Global Compact, Global Reporting Initiative and recently revised OECD Guidelines for Multinational Enterprises all include various elements of stakeholder engagement. However all these need to be evaluated with Responsible Research and Innovation in mind as they are very limited in that area despite having similar goals.

3. Activities to explore and prioritise social, ethical and environmental issues now and in the future

To avoid unintended or irreversible negative consequences we need to find new ways of uncovering the potential for these impacts in advance and considering ways to anticipate and respond.

Exploring impacts in advance

Social, ethical and environmental implications are often not known or possibly even knowable in advance. Could Marie Curie have anticipated the atomic bomb, even if so, what should she have done? When CFCs were created should we have known they would make a hole in the ozone layer? Perhaps, but probably not, and as technologies become more invasive and pervasive the need to know more about impacts in advance appears even more important.

But it is also not clear if knowledge of potential negative impacts may close off innovative responses or kill of potentially useful technological applications before their potential is really understood.

Similarly with positive impacts, how do we facilitate the best pathways for the best impacts? Even positive impacts, eg green energy options, have consequences which need to be considered alongside their seemingly obvious benefits.

The activities which currently being explored for these purposes include:

- **Participatory agenda-setting** - finding new and innovative ways of involving the public either the prioritising of innovation or its implementation. These may include stakeholder fora, Citizen's Juries, dialogues, events, focus groups, partnerships, co-creation or crowd-sourcing initiatives.

- **Real Time and other forms of Technology Assessment** - this is the evaluation of the social and ethical implications of the use of science or technology, and possible responses, particularly involving the public and civil society groups in that process. There are a number of Technology Assessment bodies in Europe who are exploring this area, the [European Parliamentary Technology Assessment](#) group brings together many of these.

- **Impact assessments -** considering how to embed the consideration of the wider impact of the research or product into the process of development.

- **Ethical assessment** - ethical assessments may be considered as part of technology assessment or separately. This process explores ethical implications of pathways and trajectories.

- **Foresight** - Foresight is the process of better understanding and preparing for the future. Organisations explore what events or changes may occur and prepare accordingly to reduce risks and maximise opportunities.

- **Scenarios** - are methods of envisaging and exploring different potential ways the future may unfold so organisations may understand what strategies and adaptations are needed under different circumstances. Scenarios are particularly popular with businesses looking at long term societal trends

- **Self-reflection initiatives -** initiatives to motivate individuals rather than organisations to reflect on the impact of their work. Eg Codes of conduct, eg a 'Hippocratic Oath. for individual scientists.

- **Education initiatives** - promoting a culture of responsibility, participative inquiry, nuanced debate - starting in primary or high schools and including governments, scientists, businesses and civil society.

4. Activities to developed effective, adaptable & responsive oversight

How to anticipate regulatory needs?

It seems logical and eminently sensible to propose that issues of safety and oversight are thought about in the early stages of the research of new technologies and the governance of them designed in advance.

But unfortunately this is not always possible.   Innovation happens in messy, stop & start sorts of ways, if we regulate for some of the over-inflated promises which are proposed in the early stages we would be wasting our time - our 'flying car' and 'personal jet pack' regulation would be a bit underused for example!

Regulation tends to govern products - but in the early stages of research it isn't clear what the products will be down the line. Regulation tends to govern processes - but as technologies are often applied in many different ways that is not always easy and sometimes they are not comparable to those of the past. Perhaps the uses to which inventions are put defy our ability to anticipate - then what? When computers were first used in the 80s, is it reasonable, for example, to have thought up a privacy law? [26]

How to adapt to changing circumstances?

Discussions about 'what is *irresponsible* innovation' show that what some groups consider irresponsible (eg palm oil, biofuels, CFCs, genetically modified plants) were specifically designed to have a positive beneficial social or environmental impact, but inadvertently generated negative impacts[27].

These were perhaps because the potential wider social, ethical, environmental or commercial implications had not been considered and prevented, or the benefit, either financial or social, was prioritise over other issues. Very often the negative impacts were not known until the product was in use for some time.

Where it is not possible or feasible to anticipate or prevent the negative social, ethical or environmental consequences of innovation, the design of systems of oversight is required to be flexible and adaptive enough to change direction when evidence of harm is uncovered.[28] This is often called Adaptive Governance[29].

Defining a proportionate response

Sometimes the response to such knowledge is relatively straight-forward - eg ban CFCs. In other circumstances the response is less clear cut or more widely contested - governments' response to understanding of the harmful effects of tobacco, for example, or the banning of genetically modified plants.

Innovations are sometimes brought to market so quickly that changes in the law, which need to be thought through carefully, would be a knee jerk reaction and perhaps not be fit for purpose and have negative unintended implications in their own right.

But learning from the past[30] also shows that governments and businesses have often been slow to respond where negative impacts became well known and that governance mechanisms are not equipped to respond effectively to these 'early warnings' on a consistent basis. Sometimes these early warnings are given by ngos or scientists who are not part of the mainstream assessment processes. Understanding what information is an 'early warning' and what is simply wrong is a real challenge.

Many feel that the products can simply wait until the regulation is in place, though there are implications of competitiveness, need and sheer scale of manpower to consider when developing appropriate regulations for the millions of products available in Europe.

But when it goes wrong who is responsible? How are they accountable and who pays?

Public dialogues show that people are generally pragmatic and understand that sometimes things do go wrong. Their concern is that when, (not if!), it does happen that someone is held responsible, and liable, and thought has been given in advance to how will it be put right.

The accountability for the adverse effects of the development or use of a technology is, like everything else involved, complex and difficult to unravel. Defining who is responsible, accountable and liable under what legislation, for what negative impacts at what stages of research and innovation is perhaps the most contested and intractable of the issues associated with RRI.

> *"Regulatory appraisal and control of technologies and economic development involves balancing the costs of being too restrictive on innovation with the hazards and costs of being too permissive, in situations of scientific uncertainty and ignorance"*
> **Late lessons from early warnings - the precautionary principle 1896-2000 European Environment Agency**

RRI seeks to better anticipate and prevent the negative consequences of innovation, but it also looks to consider how governance can be made more effective, and understand where it is important to be flexible, whilst safeguarding citizens and the environment.

Activities to developed effective, adaptable & responsive oversight

The activities to develop such responsive mechanisms are inextricably linked to the foresight activities of the previous section and the participation of citizens. As such mechanisms of anticipatory governance are developed as part of, or ahead of, regulation many of the activities are by nature voluntary, which in itself brings criticism and raises issues of legitimacy and effectiveness. Examples include:

- **Voluntary Accountability frameworks** - eg Codes of Conduct, guidance and benchmarking, European Commission Code of Conduct on Nanotechnology Research and Responsible Nano Code
- **Standards**, eg ISO standards on characterisation, safety and measurement of nano materials
- **Risk management initiatives** eg Nano Risk Framework, Cenarios, CodeMeter
- **Regulation evaluation -** eg regulation recasting, temporary licences, stage-gated regulation
- **Scientific committees** - eg SCENIHR (Scientific Committee on Emerging & Newly Identified Health Risks) and OECD and UN committees on emerging technologies and governance
- **Commercial accountability bodies** - Global Reporting Initiative, Global Compact, AA1000
- **Intellectual Property regimes** - eg reviews, temporary licensing, open source initatives
- **Corporate responsibility governance** - eg BASF Dialogueforum Nano, Du Pont Nano Risk Framework, Chemical Industry Association Responsible Care Code of Conduct, Swiss Retailers Nano Code
- **Insurers** - coordinated pressure from insurers and reinsurers for better information
- **Investors** - coordinated pressure for new governance, particularly from socially responsible investors

5. Activities to embed openness & transparency in the research & innovation process

Uncertainties, ignorance, problems and opportunities

However, regardless of how much foresight, engagement and thinking in the round goes on, there will always be uncertainties and ignorance and there will always be problems and opportunities. Managing in conditions of uncertainty and ignorance is what governments and businesses do all the time, but there is an increasing expectation for this to be more transparent, more inclusive and more adaptive than ever before.

Openness and transparency is the underpinning principle of Responsible Research and Innovation and is an important aspect of all of the previous components.

Though debate is in its early stages, expectations may focus on:

- Governments sharing their innovation strategy and the trade offs and assumptions they have made with all citizens

- Governments taking steps to communicate clearly about how decisions are made about the research and applications of innovation and how the public interest has been embedded

- Feedback to participants in dialogues about how their views influenced the decision making process

- Businesses being open about their use of new and controversial technologies in their products. At what stage in the research process this happens is moot because of concerns about IP, but as products are brought on to the market then this should be made clear, if not before. This is currently not the case, for example with nanotechnologies.

- All actors being honest and open about the potential benefits in the round and the potential negative impacts of their use of a technology and their solutions.

- All actors opening up about the processes they have undertaken to ensure that the product or technology is safe for the public or the environment.

Activities to embed transparency and openness

- [European Code of Conduct for Responsible Nanoscience and Nanotechnologies Research](#)

- [Responsible Nano Code for Business](#)

- [UK Voluntary Reporting Scheme for engineered nanomaterials](#) - a scheme which was not successful for various reasons, but which sought to develop a database of products using nanomaterials.

- [Woodrow Wilson Centre Nano Consumer Products Inventory](#) - a voluntary initiative to map the uses of nanotechnologies in products.

- [Walking with Stakeholders Project](#) to understand how companies can respond to public expectations about communication and transparency

Examples of Responsible Research & Innovation

A more comprehensive listing of examples of RRI[31] is attached as Appendix 1. Below are some examples of the work being done by the member states, research institutions and companies across Europe.

Example 1 - Research focus on social benefit

The Netherlands Responsible Innovation Project (MVI) 2008-

The programme's objective is to help ensure that technological and scientific advances become appropriately embedded in society by incorporating research into social and ethical issues into the innovation design process.

It is funded by six Dutch government ministries and undertaken by the various departments of the Netherlands Organisation for Scientific Research (NWO), WOTRO Science for Global Development, the Technology Foundation STW, and the Netherlands organisation for health research and development (ZonMw)

It has a budget of £12€ and so far 17 long-term and 6 short-term projects have been funded.

The programme is distinctive in a number of ways:

- The projects it funds must be interdisciplinary, involving collaboration between researchers in such diverse fields as ethics, social science, law, economics, applied science and engineering

- Projects have to be innovative, design-oriented and relevant to policy goals

- Social and ethical issues are considered as part of the research and design process

- In addition to the Scientific Advisory Board a Societal Panel considers the proposals and awards the projects. It insisted that each proposal has an impact in the 'real world' ensuring that the Scientific Advisory Board could not select applications that were based solely on an academic approach.

- These projects were not just about projects in the Netherlands, but often international, particularly in developing countries.

Example 2

The work of the German NanoKomission 2008

The NanoKommission was a stakeholder forum on Nanotechnologies established by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) at the end of 2006-2008 to contribute to the Federal Government's High-Tech Strategy.

The NanoKommission sought to create a structured dialogue between stakeholders - representatives of environmental and consumer organisations, unions, the science sector, industry and the government (ministries, federal authorities) - to understand and evaluate the issues associated with the use of nanotechnologies in various sectors.

The NanoKommission had three main aims:

1. To explore nanotechnologies' potential for contributing to sustainable development by reducing the negative impacts on the environment, on human health and on our limited resources, including the presentation of examples that can help shape an appropriate policy to support the development of nanotechnologies in Germany.

2. Work on the question of potential risks that nanomaterials can present for the environment and for human health. This effort especially involves identifying what findings concerning potential risks are already available and what additional research is needed in the short-to-medium time frames.

3. Develop recommendations regarding ways in which voluntary commitments could already contribute to responsible use of nanomaterials, even though too little is known about this area at present. In addition, develop recommendations for preliminary classification of nanomaterials in accordance with their potential risks, in the interest of ensuring that innovation respects criteria for sustainability and precaution.

The NanoKommission findings included recommendations on

- The need for further cross-departmental and interdisciplinary research on safety and risk assessment

- Implementation of preliminary assessment criteria and of principles for responsible and further work to consider the move from voluntary to legal frameworks

- More transparency for consumers on ingredients, functions, effects, safety and the findings of research using innovative techniques.

- The continuation of the work of the stakeholder forum to consider regulatory issues; broadening the dialogue towards social and ethical issues; further precaution-oriented procedures for risk assessment and evaluation and intensified public communication of ongoing efforts and current findings.

Example 3

The UK EPSRC Nanomedicine public dialogue

In 2008 the UK's Engineering and Physical Sciences Research Council (EPSRC) initiated a 'grand challenge' to provide a focus for UK nanotechnology research by considering its potential contribution to healthcare. Grand challenges are defined through a scoping exercise to focus the topic onto practical contributions and for the first time the EPSRC involved the general public in this scoping exercise. The aim of this was to:

1. Identify their concerns and priorities in relation to healthcare research using nanotech
2. Inform decisions about the direction of the call
3. Inform researchers undertaking projects subsequent to the call
4. Help the EPSRC learn about public dialogue and how to use it

Two workshops were held by an independent research organisation. The key conclusions were:

- Healthcare applications of nanotechnology are greatly valued
- Equity, empowerment and empathy are important
- People value technology which empowers them to have more control over their lives
- Safety and reliability remain major concerns
- 'Tipping points' (that is the advantages and disadvantages of particular technologies) are a major concern for investment in technology
- There were concerns about whose agenda is being served?
- Regulation is necessary, and should be rigorous but fair

The report from the public workshops were considered alongside the advice from the consultations with researchers and users, and helped to inform the choice of areas for the call. Participants were informed of how their views had influenced the process and of the final decision made. The chosen directions were:

- Nanotechnologies for the targeted delivery of therapeutic agents
- Nanotechnologies for healthcare diagnostics

Example 4

***The European Code of Conduct for Responsible Nanosciences and Nanotechnologies Research* 2008**

The European Commission developed a Code of Conduct (CoC) Recommendation for European Code of Conduct for Responsible Nanosciences and Nanotechnologies Research which sets out a number of principles aimed at guiding stakeholders towards undertaking nanotechnologies research in the European Community in a safe, ethical and effective framework, so as to support sustainable economic, social and environmental development.

The Code collects together a set of principles, based on concepts and values that have emerged in recent years concerning the governance and ethics of nanotechnologies. It was developed to promote the principles that should underpin research activities, interaction amongst key stakeholders and, in general, "good governance" for the responsible development of nanotechnologies. The full text of the Code is [here](#).

The CoC itself is voluntary but is intended to facilitate and underpin regulatory and governance approaches towards nanotechnologies and to help cope with scientific uncertainties. It is also intended to provide a European basis for dialogue with third countries and international organisations.

Consultation has shown, however, that not all stakeholders are aware of the CoC and that, due to the general way its principles and provisions are expressed, others have had difficulty in implementing it in a consistent way. A new project, the NanoCode project has therefore been supported by the EC in order to analyse user perspectives in more detail and to develop and provide guidance and tools to address these issues.
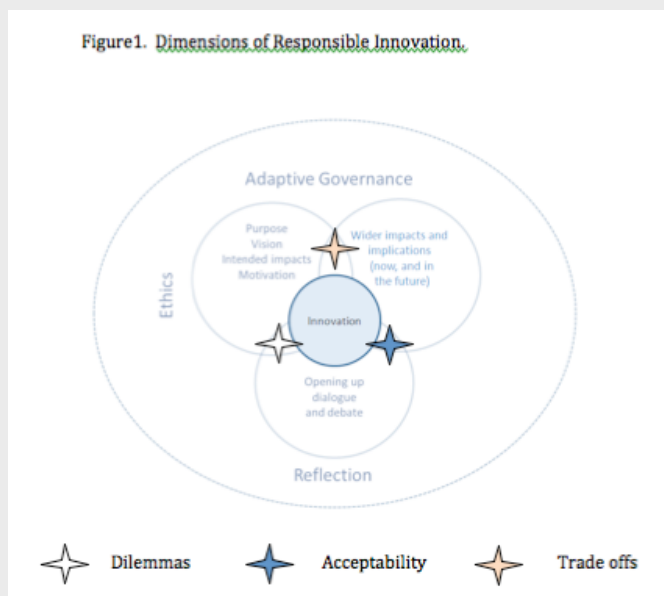
In addition, the European Commission is also considering whether the Code of Conduct for Nanotechnologies could be redesigned to apply to all emerging technologies.

A synthesis of International codes and voluntary measures has been prepared by the NanoCode project, an EC sponsored initiative to explore with stakeholders the implementation of the EC Code with stakeholders. It is available on the www.NanoCode.eu website and [here](#)

Example 5

A framework for Responsible Innovation at the UK EPSRC

The UK's Engineering and Physical Sciences Research Council (EPSRC) has commissioned a project to better understand the dimensions of Responsible Research and Innovation and embed them in how they fund and manage research. Professor Richard Owen from the University of Exeter is leading the work. The current thinking is encompassed in this diagramme below:

Figure1. Dimensions of Responsible Innovation.

The project is still underway, but as part of the process the EPSRC piloted a research call which sought to stimulate researchers to better understand the potential applications and implications of their research into Carbon Capture and Storage. It inserted a 'Responsible Innovation' part of the research call which encouraged those tendering to incorporate new approaches, including risk management, foresight, dialogue and social science to inform their research.

EPSRC and Richard Owen are now working with a major UK study in the controversial area of geoengineering to develop a robust governance framework for the management of emerging technologies.

Example 6

A new 'Hippocratic Oath' for Scientists

The responsibilities of individual scientists has been discussed at various times by a number of individuals and institutions. Calls for a type of 'Hippocratic Oath' for individual scientists to mirror that of the medical profession is the focus of this.

This concept of a statement of principles for individual scientists was proposed originally in 1995 by Nobel Peace Prize winner Sir Joseph Rotblat. Called the *Pugwash Pledge* it was designed to motivate scientists to make a personal commitment to use their own work science and technology in a socially responsible way , thereby, contributing to a safer, more just society. The Pugwash Pledge encourages scientists to vow:

"I promise to work for a better world, where science and technology are used in socially responsible ways. I will not use my education for any purpose intended to harm human beings or the environment. Throughout my career, I will consider the ethical implications of my work before I take action. While the demands placed upon me may be great, I sign this declaration because I recognize that individual responsibility is the first step on the path to peace."

 In 2007 UK Chief Scientist Sir David King supported this concept of a Hippcratic Oath and proposed that scientists seek to:

- *Act with skill and care in all scientific work. Maintain up to date skills and assist their development in others.*

- *Take steps to prevent corrupt practices and professional misconduct. Declare conflicts of interest.*

- *Be alert to the ways in which research derives from and affects the work of other people, and respect the rights and reputations of others.*

- *Ensure that your work is lawful and justified.*

- *Minimise and justify any adverse effect your work may have on people, animals and the natural environment.*

- *Seek to discuss the issues that science raises for society. Listen to the aspirations and concerns of others.*

- *Do not knowingly mislead, or allow others to be misled, about scientific matters. Present and review scientific evidence, theory or interpretation honestly and accurately.*

Example 7

BASF Dialogueforum Nano 2009

The chemical company BASF together with the Risk Dialogue Foundation brought together representatives of environmental and consumer organisations, trade unions, scientific institutes and churches to explore information-related issues on nanotechnologies. The starting point for the dialogue reflected the call for more information on nanotechnologies from policy-makers, NGOs, the media and consumers. It focused on *'Who should be provided with what kind of information, why what means, from whom, for what purpose and when'*.

The project sought the following outputs:
- Recommendations on information and transparency along the supply chain
- Critical review of the existing practice of providing information on the basis of specific examples of BASF products
- Development of models to demonstrate what information should be made available, processed and organised along the product lifecycle and how this should be implemented.

The final report of the project made specific recommendations for nanomaterial manufacturers, intermediaries, original equipment manufacturers, distributors, NGOs and consumers themselves and gave examples of the types of activity which may be undertaken.

Though the project did not consider social and ethical impacts and implications or consider dialogue based engagements as part of this lifecycle communication exercise, the importance of ongoing discussion between stakeholders was stressed.

The Responsible Nano Code for Business 2006-2009

The UK's Royal Society, Insight Investment and Nano Knowledge Transfer Network, (funders) together with the Brussels-based Nanotechnology Industries Association brought key stakeholders in business, ngos, science and ethics together to explore the responsibilities of business in relation to their use of nanotechnologies.

The result was the development of seven principles for the responsible development, use and retail of nanotechnologies for business. These principles have been widely used within businesses and their adaptation for use in relation to all emerging technologies is currently being explored.

Example 8

ETICA - Ethical Issues of Emerging ICT Applications 2009-2011

The ETICA project aimed to identify future applications of ICT and the potential social and ethical issues which may be associated with them over the next 10-15 years. Once identified, they were evaluated and ranked together with recommendations of potential governance structures and incorporated into recommendations for the European Commission.

Multi-stakeholder reflexive methodology
The project incorporated Technology assessment, Ethical evaluation of European institutions, gender issues and the law which also focused on new EU member states. The multi-stakeholder input also included focus groups with the lay public.

Technologies identified

i. Affective Computing   ii. Ambient Intelligence   iii. Artificial Intelligence
iv. Bioelectronics   v. Cloud Computing   vi. Future Internet
vii. Human-Machine Symbiosis viii. Neuroelectronics   ix. Quantum Computing
x. Robotics   xi. Virtual/Augmented Reality

Issues identified - 14 were identified which were clustered into 5 areas: Privacy, Autonomy, Digital divide, Equity and Informed consent

Recommendations to the EC - the detailed recommendations are summarised as follows:
- Provide regulatory framework which will support Ethical Impact Assessment
- Establish an ICT Ethics Observatory
- Establish a forum for stakeholder involvement
- Incorporate ethics into ICT research and development
- Facilitate ethical reflexivity in ICT projects and practice

What type of actions could be foreseen on RRI by the EC and by Member States of the EU

The actions below are a reflection of the views of participants at the [DG Research Workshop on Responsible Research and Innovation in Europe, held in Brussels on 16-17 May 2011](.).

What actions could be foreseen by different stakeholders?	
Area	**Examples or Ideas**
European Commission?	Do more to embed public and stakeholder engagement in the development of common European Values and visions for the EU, Europe 2020 and the Innovation Union. Fund an ethics observatory Develop a European platform of best practice to assist in finding appropriate methods of social, ethical and environmental assessment Build capacity (though funding) of stakeholders to engage in RRI Build understanding of social and ethical implications of RRI itself
Governments?	Ensure appropriate participation of civil society on all phases of research and innovation process Map/analyse relevant stakeholders and fund/coordinate capacity building of these stakeholders, including researchers Motivate understanding and delivery of impact assessments Foster interdisciplinary cooperation and education Encourage activities that integrate responsibility and creative problem solving - particularly at school level Communicate more effectively with stakeholders about the inputs and outputs of dialogues
Research funders?	Motivate understanding and delivery of impact assessment Foster interdisciplinary cooperation and education Encourage activities that integrate responsibility and creative problem solving Develop broader incentives for researchers other than citations
Universities?	Inspire and motivate researchers to consider wider impacts
Businesses?	Engage in RRI initiatives more widely Consider the wider impacts of products and services Engage with the public and other stakeholders more effectively
NGOs and civil society groups?	Consider wider implications of positions and campaigns Undertake public engagement more consistently

Appendix 1

Examples of initiatives exploring components of RRI

Researcher Funders & Responsible Innovation	
Area	**Examples or Ideas**
Stakeholder Involvement in research and exploring potential impacts	**Facilitating Alternative Agro-food Networks:** **http://www.faanweb.eu/** Stakeholder Perspectives on Research Needs –project. FAAN is a project, which engages academics and civil society organisations (CSOs) in a 'co-operative research' (CR) activity and in future research agenda-setting on 'Alternative Agro-Food Networks' (AAFNs)
	The French National Institute of Health and Medical Research (INSERM) Develops dialogue and partnership between patients organisations (and their families) and medical research http://extranet.inserm.fr/ & http://extranet.inserm.fr/associations-de-malades
	Netherlands Responsible Innovation Project (MVI) See Case Study 1 Extensive dialogue to inform research directions and explore social and ethical issues
	UK EPSRC - Public dialogue to inform direction of nano & health care http://www.epsrc.ac.uk/SiteCollectionDocuments/Publications/reports/ReportPublicDialogueNanotechHealthcare.doc See Case Study 3
	EPSRC Responsible Innovation Project See Case Study 5 Exploring the impact of research http://www.rcuknano.org.uk/what-were-funding/responsible-innovation.html

Individual Researchers and Responsible Innovation	
Governance How individual scientists can reflect on their own approach	**Hippocratic Oath for Scientists** See example 6 http://en.wikipedia.org/wiki/Hippocratic_Oath_for_scientists
Public engagement	**Socio-Technical Integration Research (STIR) project** http://cns.asu.edu/stir/ Centre for Nanotechnology in Society at Arizona State University (CNS-ASU) 20 laboratory engagement studies to assess and compare the varying pressures on – and capacities for – laboratories to integrate broader societal considerations into their work
	UK National Coordinating Centre for Public Engagement http://www.publicengagement.ac.uk/ Provides assistance to scientists looking to undertake public engagement in relation to their research.

Universities/Research Institutions & Responsible Innovation	
Area	**Examples or Ideas**
Motivating researchers to consider the wider impact of their work	**Socio-Technical Integration Research (STIR) project** http://cns.asu.edu/stir/ Centre for Nanotechnology in Society at Arizona State University (CNS-ASU) 20 laboratory engagement studies to assess and compare the varying pressures on – and capacities for – laboratories to integrate broader societal considerations into their work

Companies & Responsible Innovation	
Concepts	**Examples or Ideas**
Stakeholder engagement	**BASF Dialogueforumnano** http://www.risiko-dialog.ch/images/RD-Media/PDF/Themen/Nanotechnologie/basf_dialogueforum_nano_2010_en.pdf See Example 7
	DuPont EDF - Nano Risk Framework http://nanoriskframework.com/page.cfm?tagID=1095

Governments/Parliaments & Responsible Innovation	
Concepts	**Examples or Ideas**
Public engagement and innovation strategy	**United Kingdom** Nanotechnologies Issues Dialogue Group and subsequent Stakeholder Forum http://webarchive.nationalarchives.gov.uk/+/http://www.dius.gov.uk/ office_for_science/science_in_government/key_issues/nanotechnologies/nidg UK Government public dialogues on Synthetic biology http://www.raeng.org.uk/news/publications/list/reports/ Syn_bio_dialogue_report.pdf Geoengineering http://www.nerc.ac.uk/about/consult/geoengineering-dialogue-final-report.pdf A pilot website www.nanoandme.org for citizens to engage in issues around nanotechnologies and to provide information on regulation, CSR, ethics etc. Voluntary Reporting Scheme for Engineered Nanomaterials
	Germany German NanoKommission See Example 2 ForumNano - to facilitate RRI among companies http://www.gesis.org GESIS – Leibniz-Institute for the Social Sciences is the largest infrastructure institution in Germany. Search: PIAAC (The Program for the International Assessment of Adult Competencies)
	Netherlands Netherlands Responsible Innovation Project (MVI) See Example1 The Dutch NanoPodium project engaged citizens in a constructive dialogue on nanotechnology risks and http://www.nanopodium.nl/CieMDN/
	France FAAN is a project, which engages academics and civil society organisations (CSOs) in a 'co-operative research' (CR) activity and in future research agenda-setting on 'Alternative Agro-Food Networks' (AAFNs)

Governments/Parliaments & Responsible Innovation	
Concepts	**Examples or Ideas**
	Technology Assessment There are technology assessment offices which are created to inform parliaments. These include the Danish Board of Technology Rathenau, Office for Technology Assessment of the German Parliament. STOA office of EU Parliament
Governance	**Switzerland** http://www.dcaf.ch/ DCAF (a centre for security, development and the rule of law) is an international foundation on the initiative of the Swiss Confederation, as the 'Geneva Centre for the Democratic Control of Armed Forces'

NGOs & Responsible Innovation	
Area	**Examples or Ideas**
Public engagement	NGOs have also involved the public in their deliberations. Friends of the Earth Germany has undertaken a series of engagements to reflect on what would be a socially desirable future for nanotechnologies and the Federation of German Consumer Organisations (VZVB) also undertook public dialogues to inform their approach. In the UK, Greenpeace together with the Universities of Cambridge and Newcastle and the UK's Guardian newspaper held a 'Citizen's Jury' on nanotechnologies in 2005 while the consumer group Which? undertook it's own public engagement regarding Nanotechnologies to help inform its programme on Nano and Cosmetics in 2008.

About this report

This report is intended to explore the issues around Responsible Research and Innovation, particularly, though not exclusively, as expressed by participants at the DG Research Workshop on Responsible Research and Innovation in Europe in Brussels on 16-17 May 2011

About Hilary Sutcliffe

Hilary is the Director of MATTER, a 'think tank' with a multi-stakeholder steering group which seeks to 'make new technologies work for us all' through the promotion of strong governance, the engagement of stakeholders and the focus of science and technology for social and environmental benefit.

Prior to MATTER she initiated and ran the secretariat of the Responsible Nano Code - a multi-stakeholder initiative to develop a principles-based code of conduct for companies involved in the development of nanotechnologies and developed www.nanoandme.org a pilot website to provide the public with easy to understand information on nanotechnologies.

This followed a career in corporate responsibility and stakeholder engagement and communication in London and New York with clients as diverse as BT, Novo Nordisk, Allied Domeq, the UK Government's Cabinet Office and the Ethical Trading Initiative. She has a Masters degree in Responsibility in Business Practice from the University of Bath, sat on Amnesty International UK Business Group and was a founder of the Resource Centre for the Social Dimensions of Business Practice and a board director of the Ethical Investment Research Service.

Hilary is currently on the External Advisory Board of the University of Michigan Risk Science Centre in the USA & on the Advisory Board of the Institute of Innovation Research at Manchester Business School, University of Manchester, UK.

From Hilary Sutcliffe: The views expressed in this report are entirely my own and do not, necessarily, reflect the views of MATTER Steering Group or Businesses Group or the European Commission.

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