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Community Research



ProGReSS

## RRI and End-Users

### Deliverable 4.2

Francesca Cavallaro<sup>1</sup>, Michael Obach<sup>2</sup>, Doris Schroeder<sup>1</sup>, Roger Chennells<sup>3</sup>, Leana Snyders<sup>3</sup>, Andries Steenkamp<sup>3</sup>, Antonia Bierwirth<sup>2</sup>, Amit Kumar<sup>4</sup>

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<sup>1</sup> University of Central Lancashire, UK

<sup>2</sup> Fundación TECNALIA Research & Innovation, Spain

<sup>3</sup> South African San Institute, South Africa

<sup>4</sup> Research and Information System for Developing Countries, India

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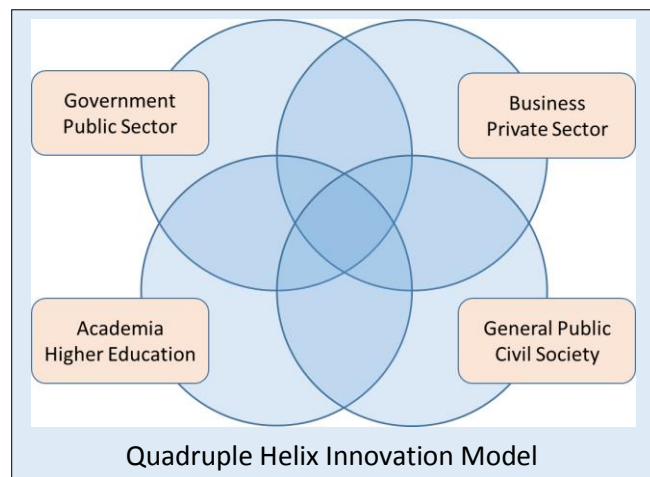
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## Executive Summary

End-user engagement has become an important topic in modern research and innovation. However, the inclusion of economically and socially marginalised populations in the end-user group globally requires special attention.

Inclusive and transparent **engagement** of all societal actors, including researchers, industry, policy-makers and civil society in science governance decision-making is the first of six key action points around which the Responsible Research and Innovation (RRI) framework for EU innovation has been articulated. For RRI to have any **normative and practical power** beyond European borders, it is also essential to engage end-users beyond national borders.

Engaging citizens and the public at large in deciding about the EU research and innovation strategy itself represents one of the drivers of innovation identified by the **Quadruple Helix Innovation Model** as stated in the Dublin Declaration (2013).



Innovation that is responsive and societally desirable allows for the engagement and participation of the most marginalised groups in society, and gives them an opportunity to become **innovators and beneficiaries** of the products to which they contributed their knowledge and resources.

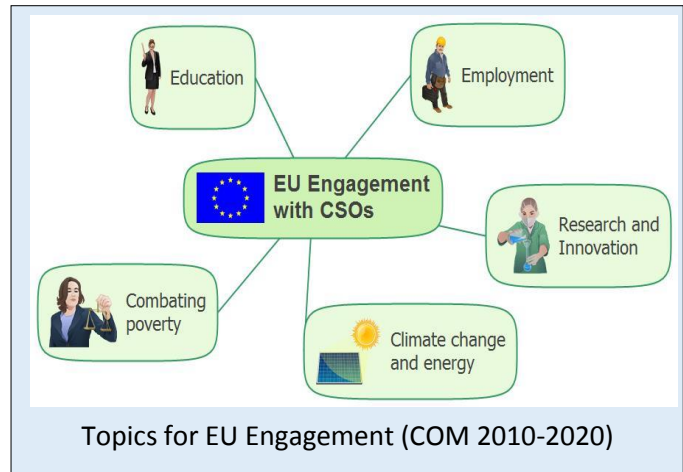
Every European Research Area (ERA) research project, including collaborations with scientists in other regions, **should seek ways to enact basic fundamental rights of dignity, freedom, equality, solidarity, citizens' rights, and justice** in ways that also seek to respect and learn from the social and cultural contexts of non-Europeans (European Commission, 2009).



Engagement and involvement of citizens cannot happen without the involvement and fundamental role of a third actor: civil society organizations (CSOs) and non-governmental organizations (NGOs). Around the world, CSOs and NGOs are performing the fundamental task of **engaging with** citizens, communities and multiple stakeholders, ensuring their requests and needs as end-users of innovation are heard. At the same time, these organizations act as engagement channels so that community knowledge can feed into better governance models for science, technology and innovation.

CSOs and NGOs carry out a fundamental role in the implementation of Inclusive Business Models through which industry tries to target the 'Bottom of the Pyramid'; those potential consumers, world-wide, who face the hardest income limitations. Inclusive Business Models, or commercially viable business models that incorporate poor people into their value chains, open up new growth opportunities for businesses, while simultaneously promoting **sustainable development**.

In this report we provide two cases in which inclusive innovation has been made possible through the engagement of end-users as innovators: innovations in the medicinal field, based on the knowledge of the Southern African San people mediated through an NGO (SASI), and grassroots innovations in India.



We conclude that:

**The involvement and, moreover, the engagement of end-users in particular, and the society in general (meaning the public and civil society stakeholders), is a necessary path towards the implementation of RRI, making innovation with and for end-users and society more effective, ethical and societally desirable.**

Three reflections summarize the core of this report:

1. *Societally desirable research and innovation* is inclusive innovation based on a participatory approach to research and innovation governance.
2. *Innovation by users and through end-user engagement* is one of the sources of innovation that has been long pursued by researchers and industry across the world. Evolving from this pre-existing knowledge and methodology allows RRI to address Grand Challenges globally.
3. *Inclusive innovation* that allows poor and marginalized groups to be both recipients and co-creators of innovation opens up new markets for Industry, enhances its profitability, and generates more business value; “using business as a force for good is also good for business.” (Honeyman, 2014)

## Introduction<sup>1</sup>

*Democracy and human rights are inextricably linked.*

*COM/2006/0023 final*

How to engage with end-users is a topic for any researcher or developer in the 21st century, as research tailored towards the aspirations, needs and wishes of users are more likely to be successful. A lot has been published on this topic over recent decades (Funtowicz & Ravetz, 1990; Bogers *et al.*, 2010; McNie, 2007). Here we focus on the global context and the inclusion of economically and socially marginalized populations in the end-user group. This is an ambitious topic on two fronts. First, when dealing with commercial research and innovation, end-user engagement is usually undertaken with potential users who are likely to be willing and able to pay for an innovation. This cannot be said for the end-user group we are focusing on in this report. To date, nobody has ever undertaken comprehensive end-user engagement about research and innovation with the marginalized group which is represented in the ProGReSS consortium, the South African San population. Second, participatory approaches to research and innovation governance with significant end-user engagement are possibly one of the last bastions of the nation state and perhaps rightly so. It is difficult to imagine, for example, a French team travelling to China to lead local end-user engagement and for the results to be suitable and welcome by Chinese policy makers or industry. However, researchers and industry already regularly and globally engage with marginalized populations in terms of resource use in a specific context, namely the use of traditional knowledge as a research lead. This report will frame engagement between industry and marginalized populations around human rights.

The link between human rights, development and governance is a reality that was formally acknowledged with the publication of the 2000 Millennium declaration and the resulting statement of the *Millennium Development Goals*. Development cannot be achieved without respect for *human rights* and the adoption of participatory approaches for the *inclusion of marginalized groups*.

“All ERA research projects, including collaborations with scientists in other countries, should seek ways to enact basic fundamental rights of dignity, freedom, equality, solidarity, citizens’ rights, and justice in ways that also seek to respect and learn from the social and cultural contexts of non-Europeans – by, e.g., expert and public deliberations that develop and apply ideals of reconciliation” (European Commission, 2009).

Social, political, economic, cultural and civil rights are not just a set of legal obligations, they are correlated with progress and economic development, and in many ways can lead to economic growth. Indeed, not respecting human rights can often result in negative economic consequences, as social instability, poverty, and war often arise when human rights are denied.

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<sup>1</sup> The present report is a result of the European coordination and support action entitled “PROmoting Global REsponsible research and Social and Scientific innovation” (ProGReSS). It is the second report emerging from the work package “Outreach”, which aims at ensuring that industry and end-users’ views are taken into account in the main result of the project, a convergence roadmap. While the first deliverable ([http://www.progressproject.eu/wp-content/uploads/2013/05/PROGRESS\\_D4.1.pdf](http://www.progressproject.eu/wp-content/uploads/2013/05/PROGRESS_D4.1.pdf)) identified best practises in responsible research and innovation from the point of view of industrial stakeholders, this second study focuses on reporting *how to engage with end-users* and, more generally, the society, with a special focus on marginalised communities.

*“Societies that do not create the conditions for their citizens to realise these rights cannot be said to be ‘developed’.” (Seymour & Pincus, 2008)*

Since 1999, companies that are willing to align their strategy and operations with the respect and protection of international human rights, and do not want to be complicit in human rights abuses, can adhere to the *UN Global Compact* policy initiative, and commit to universally accepted principles in the areas of human rights, labour, environment and anti-corruption (United Nations, 2014).

However, the individual commitment of a company to those principles may not be enough to avoid violation and infringement of human rights. It is often the case that the violation is the result of the concurrent and combined action of multiple actors—the company and its suppliers, for example, as well as the effect over time of cumulative impacts of a company/companies and possibly other actors on the human rights situation in particular locations. In order to address these problems, the UN Global Compact is leading the research and analysis of worldwide cases leading to the *Cumulative Human Rights Impacts* (UN Global Compact, 2014).

According to the *World Commission on Environment and Development* (1987), long-term global development requires **sustainable development** as a guiding principle, which is based on three pillars: economic prosperity, environmental protection and social development (see Figure 1). Economic prosperity addresses the use of available resources in an efficient and responsible way. Environmental protection aims at guarding the natural world, which supports human life, for current but also importantly for future generations. Social justice, and more general, social sustainability, refer to the widest possible elimination of poverty and inequities, to secure the highest level of wellbeing and quality of life possible for all.



*Figure 1: The three pillars of sustainable development (Fiksel et al., 2011).*

In 2000, world leaders recognized a collective responsibility to work towards “a more peaceful, prosperous and just world” (UN, 2000). The *Millennium Development Goals* (MDGs) have mobilized resources and achieved some success, see e.g. *MDG Progress Index: Gauging Country-Level Achievements* (Center for Global Development, 2011). In particular, primary education rates in developing countries increased thanks to MDG-linked initiatives, such as the Global Partnership for Education, launched in 2002 by the World Bank and other development organizations; malaria-related mortality has dropped by approximately 25% since 2000; child mortality (before their fifth birthdays) has decreased worldwide, from 11.7 million in 1990 to 9.4 million in 2000, and to 6.8 million in 2011 (McArthur, 2013). However, some goals have not been met in their entirety and critics state that the goals did not place enough emphasis on sustainable development, and that



crucial issues such as peace and security were excluded (Guardian Interactive team *et al.*, 2013). Currently there is a discussion over the successor of the MDGs, which is known as the *Post-2015 development agenda* (UN Foundation, 2013).

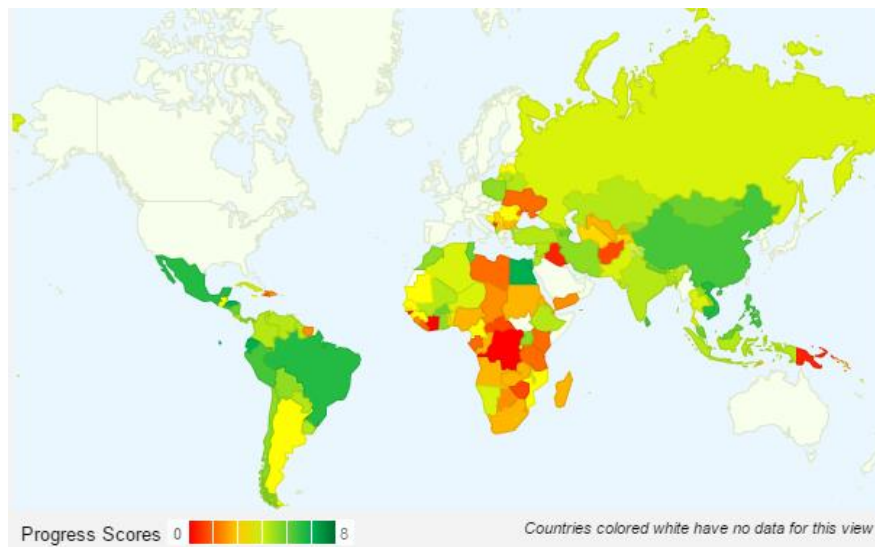


Figure 2: MDG Progress Index: Gauging Country-Level; overall MDG Progress Score based on poverty, hunger, education, gender, child mortality, maternal mortality, HIV/AIDS, water (Center for Global Development, 2011).

According to Bates-Eamer *et al.* (2012), “there is an emerging consensus that, to be relevant, the post-2015 development agenda needs to go well beyond a poverty focus, given the dramatic changes in the international development landscape over the past two decades.” Moreover, they stated that the concept of poverty reduction would be replaced by, “the more ambitious and challenging notion of *inclusive growth*, as many low and middle income countries are confronted with the phenomenon of increasing inequality amid declining poverty” (Bates-Eamer *et al.* 2012).

## Enforced Responsibility

In what appears to be a trend across *high income countries*, the concept of corporate responsibility is evolving into one of “enforced responsibility” (Gardner, 2014): companies are *required* to adopt sustainability-related rules and regulations. For instance, a European Parliament directive that will take effect from 2016 has made it mandatory for all listed companies with more than 500 employees to disclose information on environmental and social matters, human rights, anti-corruption and bribery. In the United States, public companies are required to disclose information on material and supply chain issues that can impact on investment decisions. Information related to the ratio between chief executive and average employee pay, the use of conflict minerals<sup>2</sup> and payments made to governments in pursuit of oil, gas

Almost 60% of the top economic entities in the world are companies (Strategy Dynamics Global Limited, 2013). Corporate Social Responsibility and Philanthropy alone might not be enough to regulate the power and influence companies have in shaping the

<sup>2</sup> Minerals such as gold, tantalum and tungsten, used in products from mobile phones to light bulbs, and retrieved in areas where revenues from their sale might be used to fund armed groups.

or mining concessions, must also be disclosed in accordance with the 2010 Dodd–Frank *Wall Street Reform and Consumer Protection Act*.

In **low and middle income countries** however, the regulatory requirements for sustainable growth follow a different approach. Adopted in 2013 and in force since April 2014, India's *Companies Act* requires large designated corporations to invest 2% of their average net profits in sustainability initiatives.

The Sustainable Stock Exchanges initiative (SSE) is a peer-to-peer learning platform for exploring how exchanges, in collaboration with investors, regulators, and companies, can enhance corporate transparency — and ultimately performance — on environmental, social and corporate governance issues and encourage **sustainable investment** (SSE, 2014). Similar to the SSE is the United Nations Conference on Trade and Development (UNCTAD) organisation. UNCTAD produces regional (i.e. Africa) and global analysis of the consequences of globalisation to low and middle income countries. For instance the outputs of UNCTAD span analysis of public debt and investment strategies.

A study from the Boston Consulting Group (BCG, 2013) showed increased profits for companies that embrace **sustainability**. Furthermore, BCG found that companies that profited from sustainability were almost 200% more likely to develop sustainability business cases.

According to Hernández-Murillo and Martinek (2009), firms that strategically engage in **socially responsible activities** can increase private profits and obtain additional benefits, enhancing the firm's reputation, the generation of profits by differentiation of its products, or the increased attractiveness for more highly qualified staff.

## Civil Society Organizations and Non-Governmental Organizations

At the same time as corporations are taking note of the sustainability agenda, one can observe a shift in the way governments, foundations, civil society organisations (CSOs) and corporations work together when seeking solutions to societal challenges (Klein, 2014).

CSOs and NGOs, often identified with social entrepreneurship, focus on areas and clients not served by traditional markets, deliver services according to a participatory model based on stakeholder engagement, and aim toward social inclusion and integration of marginalized people. As a consequence of the inclusion of societal challenges into their innovation agenda, corporations across the world are increasingly choosing partnerships where CSOs or NGOs fulfil essential roles as intermediaries and user needs advocates. Since the traditional social and business sector divide has proven to be an antiquated and inadequate approach, and philanthropy is not enough in a new era of massive societal and environmental change, novel ways of co-operation are emerging. The business perspective and social entrepreneurship now often converge into a **co-creation** model of innovation across sectors. Companies learn about innovation approaches implemented by CSOs and not-for-profit organizations that are “better in initializing, launching and enabling innovation”, while CSOs and not-for-profit organizations learn from companies how to commercialize their outcomes and services (Spruijt *et al.*, 2013).

## The Rights of Indigenous Peoples

Some of the territories which are richest in natural resources and therefore of great interest to industry are home to a variety of indigenous groups. These territories are the main focus of the world's extractive industries, which are eager to gain access to those resources, even if it can sometimes lead to the violation, directly or indirectly, of the human rights of those who call these



places home. Indigenous peoples are also holders of intellectual assets and cultural property deriving from their traditional knowledge. However, they are among the most marginalized groups globally, and continue to fight for their rights to self-governance and control over their assets as well as involvement in any discussions about innovation.

The fight against corporations' abuse of human rights has been traditionally supported by the work of NGOs. Currently however, the UN Working Group on business and human rights is leading the effort for combined action by governments, NGOs, and industry to promote a new alternative, according to which respect for basic rights can be integrated into companies' business models and practices, enabling more inclusive growth, and avoiding the involvement of companies in abuses.

**"The challenges with which we are faced can no longer be tackled within national borders.** This is as true in Europe as it is in Africa or elsewhere. This is why I have proposed to create a Pan-African programme to find solutions at regional and continental scale and support the process of African integration, where the African Union plays a critical role. The alliance between Africa and Europe is indispensable, today more than ever. This programme will make it even stronger" (Barroso, 2014 (our emphasis) ).

The European Union has recently renewed its commitment to the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP) issuing an official statement (Mann, 2014) on the occasion of the 2014 International Day of the World's Indigenous Peoples. The statement pledged €5 million funding for new projects that aimed to promote the rights of indigenous peoples, and reiterated the full commitment of the EU towards a more active engagement of indigenous peoples in the elaboration of the post-2015 development agenda.

As part of its external policies (political dialogues, multilateral forums, financial support) the European Union is also funding worldwide projects addressing indigenous issues through the *European Instrument for Democracy and Human Rights*. NGOs with indigenous representatives sometimes lead these projects together with international organizations, such as the International Labour Organisation (ILO), and the Office of the High Commissioner for Human Rights (OHCHR).

On June 26, 2014, as a result of a "treaty alliance" between some 600 NGOs, the UN Human Rights Council voted and approved Ecuador's proposal to establish an intergovernmental working group (IGWG) to negotiate an *international legally binding framework* on the issue of human rights and transnational corporations and other business enterprises (Ruggie, 2014). Such an initiative should further contribute to a radical shift in the approach of corporations from pure exploitation and potential human rights abuse to investment, inclusive growth and co-creation of innovative products.

## Responsible Innovation in word and deed

*“Ultimately RRI is something that could become a meaningful and even transformational way of governing innovation responsibly in the EU, both in word and deed...” (Owen, 2013).*

Three key fields have been identified in which Europe must invest in order to close the innovation performance gap with other global competitors, such as the US and Japan, and to recover from the economic downturn of 2008/9, namely: Research, Innovation and Entrepreneurship.

To overcome the marked differences both within and between Member States and the regions, which have been obstacles to Europe’s innovation performance, the European Commission has devised a three-fold strategy that ensures:

- a) The existence of the right framework conditions,
- b) Policy analysis enhancing investment in Research and Innovation (R&I) and,
- c) The availability of funding to support the R&I efforts of the Member States. (Smits, 2014)

Within this strategy, and with a budget of some €80 billion for the period 2014-20, Horizon 2020 represents the new EU funding programme devised by the European Commission to support R&I efforts across Europe, leading to effective economic growth and social impact.

*The Dublin Declaration* (2013), the Open Innovation 2.0 strategy and the work done by the [Open Innovation Strategy](#) and Policy Group (OISPG) have contributed to and informed the reforms and investment that Horizon 2020 is intended to catalyse:

*“When you consider the recommendations of the Dublin Declaration, many of the proposals made are embedded in Horizon 2020 thinking and action, including several new instruments of the framework programme.” (Salmelin, 2014)*



Drafted at the Open Innovation 2.0 Conference in Dublin, *The Dublin Declaration* is a document that identifies 11 actions through which Europe can increase wealth, boost growth and create more jobs across the region (Newsroom Editor of the European Commission, 2014), see Table 1.

The implementation of this new business model, that is referred to in Action 1, through the activity of the European Research Area (ERA), will enable the European Commission to create a European Innovation Ecosystem (Action 4), enabling a “cultural shift as we move from a research tradition to a research and innovation tradition” (Salmelin, 2014).

A “solid research base” is the core of any innovation process. Thus, ERA aims at creating a stronger EU research system that will enable researchers, research institutions and businesses to tackle major societal challenges effectively thanks to better co-operation and interaction across borders.

Table 1: Dublin Declaration 2013 (Curley &amp; Salmelin, 2013).

No.	Action
1	Develop a new business model for the European Union
2	Design for a new end state
3	Create an EU Innovation Strategy
4	Move from European Research Area to European Innovation Ecosystem
5	Create a European Innovation System and Capability
6	Quadruple Helix Innovation
7	Focus on Innovation – <i>Adoption Matters</i>
8	Create incentives to encourage Openness to Innovation and Experimentation
9	Stimulate High Expectation Entrepreneurship
10	Drive Intersectional Innovation
11	Promote Successful Innovators and entrepreneurs as Heroes

In 2014, the European Commission proposed a Reinforced European Research Area Partnership for Excellence and Growth, which identified five priorities that Member States, Stakeholders and the European Commission itself should address in order to achieve the aims of ERA, namely:

1. Effectiveness of national research systems;
2. Transnational cooperation;
3. An open labour market for researchers;
4. Gender equality and gender mainstreaming in research and,
5. Optimal circulation and transfer of scientific knowledge. (European Commission, 2014)

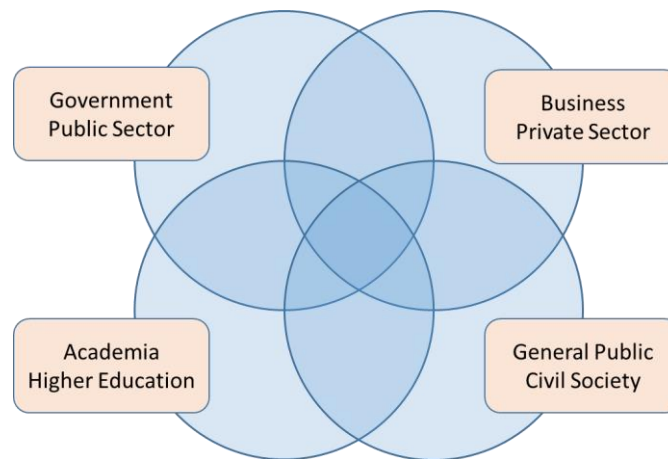
The concept of innovation that the *Dublin Declaration* (2013) and Horizon 2020 refer to relies on a cross-disciplinary, challenge-based approach to research and innovation, where the public sector represents one of the drivers for innovation and citizens, being also the end-users of innovation and its products, must be involved in the innovation process from its inception:

If we do not have the end-users involved in the process from the very beginning, we are developing products and services, at best, for existing markets. In that sense, by involving citizens in a **quadruple innovation helix** as active agents, we are moving to a win-win game instead of a win-lose game. (Salmelin, 2014)

*Dublin Declaration* and Horizon 2020

...a challenge-based approach to research and innovation, where...the citizens...must be involved in the innovation process from its inception.

The involvement of the end-users is also referred to as “the shift to the citizen” (Salmelin, 2014), and constitutes a core pillar of the Quadruple Helix Innovation Model, according to which ordinary people will be empowered to both innovate and steer the direction of innovation funding.



*Figure 3: The Quadruple Helix Innovation Model – Action no. 6 of the Dublin Declaration (2013): Government, Academia, Industry and Citizens collaborating together to drive structural changes far beyond the scope any one organization could achieve on its own.*

With the Horizon 2020 programme, the European Commission is addressing the priorities set at the top of the EU's innovation agenda: the support for Key Enabling Technologies (KETs), the Factories of the Future Public-Private Partnership,<sup>3</sup> and smart specialisation and synergies between European research funding and structural funds. In the current research and innovation framework programme, specifically, nearly €6bn of funding have been allocated to the KETs over the next seven years, given their potential impact on strengthening Europe's industrial and innovation capacity. This includes nearly €4bn for nanotechnology, advanced materials and advanced manufacturing and processing, and over €500m for biotechnology.

The relevance of KETs to the European strategy for regaining a leading position in the global market is not limited to their potential economic impact. They are expected to “underpin European value chains in strategic areas and accelerate innovation in our industrial base”, and so should play a fundamental role in addressing pressing societal challenges (High-Level Expert Group on Key Enabling Technologies, 2011).

KETs are a vital and central aspect of the EU's innovation strategy to enhance product competitiveness and impact. However, two sets of issues related to their development must be addressed: commercialization issues, and ethical and societal concerns.

The transition from ideas arising from basic research to the subsequent commercialization of competitive KET's production represents the weakest link in European KET enabled value chains, and it has been known as the “**valley of death**”. To cross the “valley of death”, Europe is implementing a strategy comprising three pillars that focus on key stages of the innovation chain:

- A pillar focused on technological research;
- A product demonstration pillar focused on product development and;
- A production pillar focused on world-class, advanced manufacturing.

<sup>3</sup> “The Factories of the Future Public-Private Partnership (PPP) initiative aims at helping EU manufacturing enterprises, in particular SMEs, to adapt to global competitive pressures by developing the necessary key enabling technologies across a broad range of sectors. It will help European industry to meet increasing global consumer demand for greener, more customised and higher quality products through the necessary transition to a demand-driven industry with less waste and a better use of resources” (European Commission, 2013).

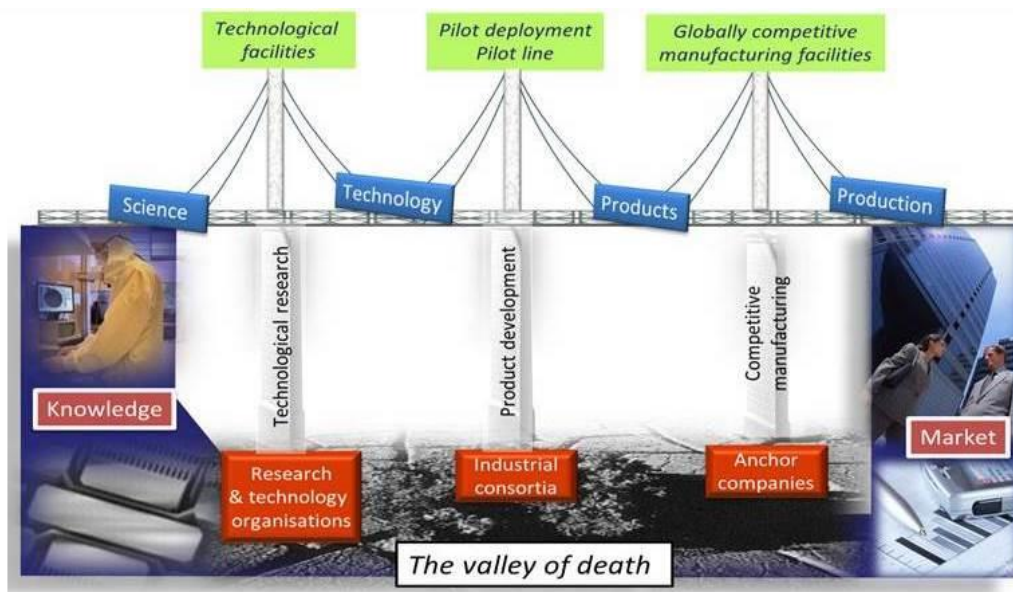


Figure 4: The “three pillars bridge” to pass across the “valley of death” from knowledge to market (from: High-Level Expert Group on Key Enabling Technologies, 2011).

Public Private Partnerships, experimental approaches and prototyping that will lead to fast identification and scale-up of promising ideas - the Quadruple Innovation Helix Model - all contribute to the creation of “a safety net” (Salmelin, 2014) that will help Europe’s innovation enterprise to cross the valley of death. Crucially, the strength of this safety net relies on the solution of the ethical and societal issues related to the different stages of the innovation chain of new and emerging fields of science and technologies. The Horizon 2020 *Science with and for Society* Programme (SwafS) is the European Commission’s answer to this challenge. Its primary objective is to create new “rigorous, comprehensive and transparent” governance and ethics principles for European R&I.

**Responsible Research and Innovation, RRI**, is — following one prominent definition, among several others — “a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products” (von Schomberg, 2013). It is a SwafS governance tool defined as a process that “fosters the creativity and innovativeness of European societies” (Science in Society Work Programme, Horizon 2020).

Still considered by some authors (e.g. Stilgoe, 2014) as work-in-progress, RRI is “an ambitious challenge for the creation of a Research and Innovation policy driven by the needs of society and engaging all societal actors via inclusive participatory approaches” (The Directorate-General for Research and Innovation of the European Commission, 2012), and KETs are considered to be one of the “primary candidates” for the implementation of RRI;

*In general terms, [RRI] implies anticipating and assessing potential implications and societal expectations with regard to research and innovation. In practice, RRI consists of designing and implementing R&I policy that will a) engage society more broadly in its research and innovation activities, b) increase the access to scientific results, c) ensure gender equality in both the research process and research content, d) take account of the ethics dimension, and e) promote formal and informal science education. (Science in Society Work Programme, Horizon 2020)*

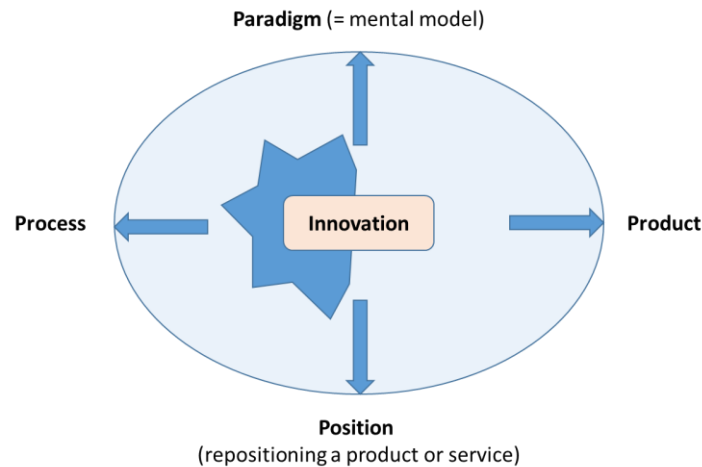


Figure 5: Locating RRI (dark blue area) within the innovation space (light blue); modified after Owen (2014).

In order to move from word to deed, the RRI framework for EU innovation has been articulated in six key action points, the first of which is the ‘upstream’, inclusive, and transparent **engagement** of all societal actors, researchers, industry, policy-makers and civil society in science governance decision-making. In this context, it is interesting to stress the difference between being *engaged* and *involved* in the innovation process. If engagement is defined as “a mutually beneficial interaction that results in participants feeling valued for their unique contribution, [...] the distinction between engagement and involvement seems to be grounded in the act of reciprocity or mutual benefit” (MacLeod, 2014).

### End-user involvement and engagement in Industry

End-user engagement and consideration is a core principle for achieving RRI in commercial and non-commercial research and innovation processes. An exploration, from the end-user’s perspective, of the six key action points as enumerated by an earlier EC publication, is as follows:

- 1) **Engagement:** Unintended negative consequences of innovation can only be avoided by understanding the context of use and bringing in the end-user’s perspective. Further, by bringing in end-users into the innovation process, research that fits and uplifts their culture is more likely to result.
- 2) **Gender Equality:** Addresses the underrepresentation of women, indicating that human resources management must be modernized and that the gender dimension should be integrated in the research and innovation content.
- 3) **Science Education:** Faces the challenge to better equip future researchers and other societal actors with the necessary knowledge and tools to understand and participate in the direction of the research agenda.
- 4) **Open Access:** the result of RRI activities must be both transparent and accessible to the end-user. Access should be given to the results of publicly funded research (publications and data).



- 5) *Ethics*: The crafting and exposition of ethics guidelines, the prerequisite to engaging in ethical research, can be guided by unconscious assumptions of the researcher, thus the end-user's input is critical from the start.
- 6) *Governance*: Addresses the responsibility of policymakers to prevent harmful or unethical developments in research and innovation.

(The Directorate-General for Research and Innovation of the European Commission, 2012)

By embracing these six points, industry would ensure that the innovative products and systems that were generated would both be adoptable and financially profitable.

### User-led and demand-driven innovation and societally desirable innovation

Innovation in practical terms means adoption, which in turn means that end-users accept and value the results of the research and innovation process. From this perspective one can see end-user involvement to be passive (demand-driven innovation) or active (user-driven innovation). RRI explicitly demands bringing end-users into the process as early as possible, but does not exclude market analysis as a valid planning tool for innovation.

The provision of information through market research falls short of what end-user engagement in industrial innovation should be. According to Miles (2010), "market research essentially places the user in a rather passive role: the firm is the active agent in seeking innovation intelligence from users." There are several design activities that involve users, e.g. through "usability testing" when testing product prototypes to improve the design or to improve user-friendliness of the products and user manuals. Miles states that suppliers could also collaborate with users at earlier stages in product development and that moreover product development can be initiated by or even partly or extensively undertaken by users.

Wise and Høgenhaven (2008) list some factors that are new to '*user-driven innovation*': the increased ability for users to take part in innovation processes, thereby allowing users to get their demands heard and addressed, which correlates with a greater acceptance of '*open innovation*' processes in a number of companies:

- Companies' desire to more systematically capture knowledge and inspiration from outside of the company;
- companies' understanding of more sophisticated consumer demand and increased focus on developing products/services that address unmet consumer needs or solve problems in new ways;
- the increased frequency of companies' employment of consumer insights and user involvement in their innovation processes. Wise and Høgenhaven (2008)

The right part of the blue rectangle in Figure 6 comprises activities that identify opportunities, collect data, apply pattern recognition and generate concept ideas. The *observation of users* is an indirect involvement applying e.g. ethnographic methods, such as shadowing, user self-observations, or guided tours in users' homes. Users can directly be involved in the process, but

without being part of the innovation team, by means of their participation in *experiments*, which may include, for example, personal interviews, role-playing and Living Labs.<sup>4</sup>

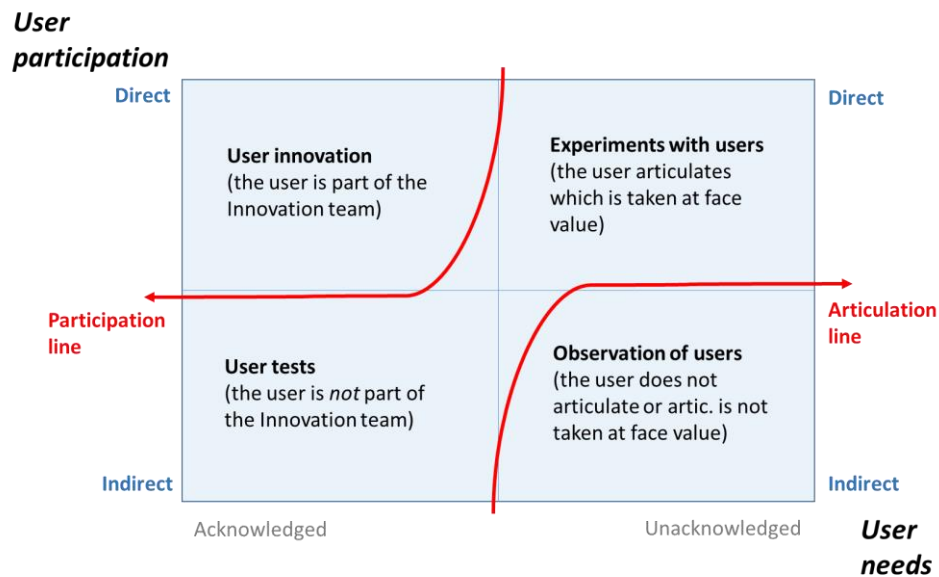


Figure 6: Modes of user-led innovation (modified after Wise and Høgenhaven, 2008).

Activities of conceptualization, prototyping, testing and implementation are represented in the left part of the diagram. *User innovation* means that users are company innovators or participate as members of the company's innovation team, while they are not members of the innovation team in the *user test* activities, which include focus groups.

In the region above the participation line in the diagram, users are directly involved as innovators for the company or as a part of the company's innovation team, while in the remaining three quadrants, companies access user knowledge by asking, observing or experimenting with users.

The concepts of demand-led and user-driven innovation have some features in common with RRI, but societal desirability is not explicit in the former two cases, in contrast to RRI, where it is a key criterion.<sup>5</sup>

<sup>4</sup> "A **Living Lab** is a real-life test and experimentation environment where users and producers co-create innovations. Living Labs have been characterised by the European Commission as Public-Private-People Partnerships (PPPP) for user-driven open innovation. A Living Lab employs four main activities: 1) Co-Creation: co-design by users and producers; 2) Exploration: discovering emerging usages, behaviours and market opportunities; 3) Experimentation: implementing live scenarios within communities of users; 4) Evaluation: assessment of concepts, products and services according to socio-ergonomic, socio-cognitive and socio-economic criteria" (ENoLL project consortium, 2010).

<sup>5</sup> Among recently started actions to define and apply RRI in industrial contexts, is the **Responsible-Industry** project (February 2014 – June 2017). This EU-funded FP7 project explores how private corporations can conduct their research and innovation activities responsibly. The aim consists in designing an Exemplar Implementation Plan of RRI in Industry to demonstrate how industry can work productively together with societal actors and integrate principles and methodologies of RRI into research and innovation processes. The implementation plan will focus on the grand challenge of health, demographic change and wellbeing and the role of research and innovation in ICT in addressing this challenge (Responsible-Industry Consortium, 2014).

## End-user engagement in RRI

Active participation of citizens in the dialogue between science and society is a key point of the European science and innovation strategy. Already proclaimed in the provision of the *Lisbon Treaty* (2009), and restated in the following 2012 Communication: “a more systematic, broader and structured consultation of relevant stakeholders in the ERA as well as the necessity to better communicate the aims, benefits and achievements of ERA and its Vision 2020 to the broader public and relevant category of stakeholders” (Council of the EU, 2009: Paragraph 6) are essential to the policy mechanism through which the EU research and strategy agenda obtains its legitimacy. It is also stressed that:

if citizens and civil society are to become partners in the debate on science, technology and innovation in general and on the creation of the European Research Area in particular, it is not enough to simply keep them informed. They must also be given the opportunity to express their views in the appropriate bodies. (European Commission, 2002: 17)

In order to fulfil these requirements, a series of initiatives were proposed and enacted. These initiatives can broadly be divided into a) initiatives aimed at improving the **communication** of research activities and results through outreach programmes, including the promotion of science events and contests, and b) **public engagement** initiatives in which citizens and scientists work together to achieve the inclusion of the public voice in science and research.

According to Ryan (2014), communication and public engagement are the two dimensions through which the European Commission is ensuring an “inclusive ERA policy development”, and are at the base of a radical transformation of the citizen’s role in the policy making process: citizens are now “*scientific citizens*”, moving from “public understanding of science” to “public engagement with science”, from science *and* society to science *in* society (Elam and Bertilsson 2003, cited in Ryan 2014).

Guidance and formal mechanisms for effective public engagement exist and can be retrieved in the *Stakeholder Engagement Standard* (AA1000SES, see AccountAbility, 2011), the *UN Global Compact*, the *UN Global Reporting Initiative* and the recently revised *OECD Guidelines for Multinational Enterprises* (Sutcliffe, 2013). However, it is through an RRI framework and its focus on societal desirability and social acceptability of innovation that public engagement acquires a fundamental role in the generation process of future innovation.

For the *Science With and For Society* programme (SwafS), public engagement needs “to become part of the routine practice of good science.” As such, for this to become a decision mechanism it needs to be performative, not only propositional, and “to generate new approaches to governance ethics and public participation that can learn from past mistakes, cope more readily with complexity and uncertainty, and harness the drivers of scientific and technological progress for the common good” (European Commission, 2007).

A number of consultations and conferences have taken place to date as required through commitments on public engagement made by the European Commission. For example, citizens have been consulted in the development of ERA, in a Consultation on the Framework Directive for the European Research Area conducted by the European Commission in 2012, where 12% of the total number of respondents identified themselves as ‘citizens’ (Ryan, 2014).

Another example of the EU commitment to a more systematic engagement of the public is the EU-funded project VOICES (Views, Opinions and Ideas of Citizens in Europe on Science). VOICES is a pilot project on citizen consultations and public engagement initiatives aimed at inspiring Horizon 2020 research priorities. The project has been implemented by Ecsite, the European network of

science centres and museums, and its methodology consisted of holding pan-European participatory and inclusive face-to-face workshops. So far VOICES has held 99 participatory workshops in 33 locations in 27 European countries,<sup>6</sup> and in 23 languages. Around 1,000 people participated in the focus groups of the workshops (VOICES Project Consortium, 2013).

Consultation is one way through which citizens can participate in the science policy decision process, ensuring that decision-makers account for their actions and that solutions to the Grand Challenges are set as priorities of the EU research and innovation agenda. However, citizens can also take part in the scientific process, through the *open access* SwafS key action point, defined as unrestricted, online access to publicly funded peer-reviewed, scholarly research papers for reading and productive re-use (The Directorate-General for Research and Innovation of the European Commission, 2012; Science Europe, 2013: 2; Ryan, 2014). It is worth noting that, as highlighted by Hilary Sutcliffe, empowering citizens through such a participatory model does not imply that public engagement is a “substitute for taking responsibility”,



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. (Sutcliffe, 2013)

The possibility for citizens to take part in the scientific process opens up new ways for innovation too. Citizens are no longer considered passive recipients of scientific teachings and outputs, and through participatory learning and training they are becoming innovators, *co-creators* of innovation (Sutcliffe, 2013), and “*makers of knowledge*” instead of mere users of received knowledge (MacMillan and Benton, 2014). This radical change of perspective is highlighted by the recently launched European Innovation Partnership for agricultural productivity and sustainability. Following a series of reforms to the *Common Agricultural Policy*, and through the Horizon 2020 research programme, the European Innovation Partnership aims to promote bottom-up approaches in the research and innovation process by linking farmers, researchers, businesses and other stakeholders into groups charged with finding solutions to shared problems. Thanks to this approach, farmers are now “essential players in any agricultural innovation system” (MacMillan and Benton, 2014).

Engaging citizens and the public at large in deciding about the EU research and innovation strategy cannot happen without the involvement and fundamental role of a third actor: civil society organizations (CSOs) and non-governmental organizations (NGOs).

<sup>6</sup> The 27 VOICES country reports can be retrieved here: [http://www.voicesforinnovation.eu/phase\\_9\\_new.html](http://www.voicesforinnovation.eu/phase_9_new.html)

As stated in the document Europe 2020 (COM 2010-2020), “all stakeholders need to work together *with civil society* to achieve five measurable targets,” these targets being related to, 1) employment, 2) research and innovation, 3) climate change and energy, 4) education, and 5) combating poverty. Furthermore, it is also stressed that “all stakeholders must work together to address the Grand Challenges as included in the *Lund Declaration* (2009).”

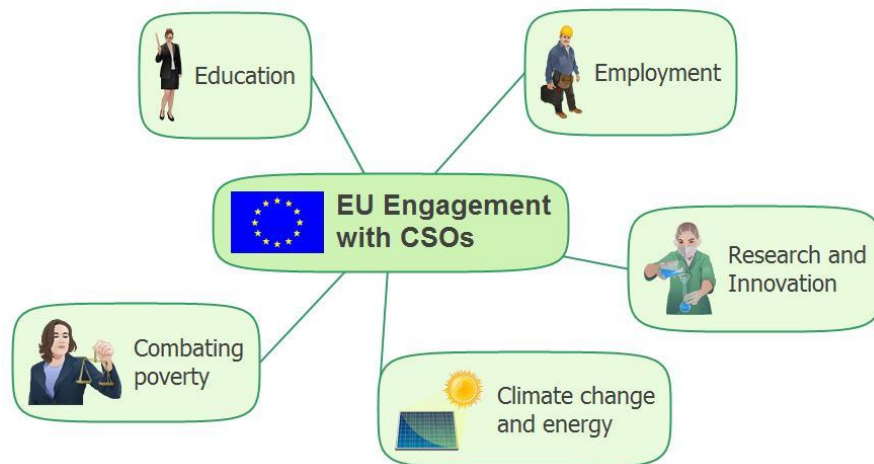


Figure 7: Topics for EU Engagement.

The Grand Challenges, in addition to the five measurable targets in the Europe 2020 documents, are global challenges, the resolution of which require *global governance* based on the concerted action of multiple countries and multiple stakeholders, as well as the involvement of non-state actors in all functions and stages of science governance. Civil societies and non-governmental organizations then, have become essential actors, without which the idea of global governance that Europe 2020 is promoting cannot succeed. This is so because the function they are carrying out is not only to raise awareness and encourage debate about the products and processes of science; they are also entrusted with the task of representing societal goals and conveying local differences and values towards which science governance should be steered (European Commission, 2009).

The European FP7 research project CONSIDER is currently leading a network of more than 100 CSOs with the aim of establishing a model of CSO participation in research. This will be achieved by collecting data about the role and motivation of CSO's in research projects in Europe (CONSIDER Project Consortium, 2012). The development and improvement of public engagement tools and instruments “for dynamic governance in the field of Science in Society (SiS)” is the primary goal of another EU funded project: PE2020 Public Engagement Innovations for Horizon 2020 (1 February 2014 – 31 January 2017; PE2020 Project Consortium, 2014).

A practical example of CSO involvement in research activity, COMENSUS (Community Engagement Service User Support), is a service user and carer-led initiative, based at the University of Central Lancashire, UK (UCLan). In the last 10 years COMENSUS has represented the service users' and carers' needs within health and social care research. COMENSUS assists in planning their involvement in the research and academic activities of UCLan's Schools, and ensures that the diverse backgrounds and wide variety of health and social care experiences of its individual members are taken into account. The COMENSUS Community Involvement Team leads the user involvement



activities, and coordinates the representation of multiple stakeholders from the local community (Comensus & SUCAG, 2014)<sup>7</sup>.

Around the world, CSOs and NGOs are primarily performing the fundamental task of **engaging with** citizens, community, and multiple stakeholders, making sure their requests and needs as end-users of the products of innovation are heard. At the same time, these organizations act as engagement channels so that citizen and community knowledge can feed back into better governance models for science, technology and innovation. As highlighted in the ProGReSS newsletter interview with Professor Steven Yearley, public engagement does not mean moving engagement upstream to avoid having innovation rejected after big public investment, it does not mean using supermarket strategies to convince people to choose some products over others either, and *it definitely does not mean replacing the scientists with ordinary people* (Yearley, 2014). **Public engagement is necessary to science and technology studies because it provides scientists and policy makers with complementary knowledge they would not have access to otherwise.** The knowledge that scientists, innovators, and policy makers can obtain through public engagement is an extended knowledge of something the citizens have a stake or a strong interest in. Building upon this extended knowledge, research and innovation becomes responsible and societally desirable research and innovation. To link public engagement into industrial and commercial innovation processes requires an insight into business models for innovation.

## Inclusive Business Models that enable sustainable development at the Bottom of the Pyramid

### Business Model Innovation and Value Creation

A **business model** is a conceptual tool to help understand how a firm does business, and can be used for analysis, comparison and performance assessment, management, and innovation (Osterwalder and Pigneur, 2005). The essence of a business model is in defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit. It thus reflects management's hypothesis about what customers want, how they want it, and how the enterprise can organize to meet those needs, get paid for doing so, and thereby remain profitable (Teece, 2010).

Innovation in business models is more than just changing the product and service offerings for the customer; it involves changing "the way you do business", rather than "what you do" and hence must go beyond process and products (Amit and Zott, 2012). The level of ambition of **business model innovations** needs to be high, and focused on maximising societal and environmental benefits, rather than economic gain only. Accordingly, most of the research aimed at determining the relationship between corporate social performance and financial performance shows a positive correlation between social and financial performance (Orlitzky *et al.*, 2003). Therefore, innovations need to introduce change at the core of the business model to tackle unsustainability at its source rather than as an add-on to counteract negative outcomes of business (Bocken *et al.*, 2014).

Porter and Kramer (2011) take this much further. They argue for a more overarching framework where businesses not only act responsibly, but in the very process of **doing good for society**, they

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<sup>7</sup> A full description of COMENSUS will be made available in early 2015 on the ProGReSS website.



create more value for themselves. They state that in recent years, business has increasingly been viewed as a major cause of social, environmental, and economic problems, and that companies are widely perceived to be prospering at the expense of the broader community. Therefore, according to the authors, the purpose of the corporation must be to create shared value, not just profit *per se*, which will bring an expansion of both social and economic value. For instance, they state that while Fair Trade can increase farmers' incomes by about 20%, the concept of **shared value** can increase it by 300%. This may require initial investments and better procurement and management practices, but these pay for themselves in the long run.

Forward looking companies create frameworks that use societal value and human values as decision-making criteria. They believe that corporations have a purpose and meet stakeholders' needs in many ways: by producing goods and services that improve the lives of users; by providing jobs and enhancing workers' quality of life; by developing a strong network of suppliers and business partners; and by ensuring financial viability, which provides resources for improvements, innovations, and returns to investors (Kanter, 2011).

The main problem in the context of societal desirability within business is that currently there is a lack of agreement about what constitutes **social value** in a globalized society and economy. A survey reported in the *Financial Times* in June 2005, found that, "to Chinese consumers, the hallmark of a socially responsible company is safe, high-quality products. For Germans, it is secure employment. In South Africa what mattered most is a company's contribution to social needs such as healthcare and education."

To resolve this challenge, value will be not created by firms acting autonomously, but by firms acting together with parties external to the firm through **informal arrangements or formal alliances** (Beattie and Smith, 2013). Thus, collaboration between firms and other key stakeholders is becoming more important (Lowitt, 2013) due to the mutual dependency that business and society have on each other and the mutual benefits to be gained from establishing corporate relations that are based on trust and respect. Here therefore, we find the link between business profitability and end-user engagement. This does not necessarily mean always seeing eye-to-eye, but it does require that debate is based on facts and that respect is accorded to the different beliefs and values, as well as the different roles played by each party (Fitzgerald and Cormack, 2006).

For instance, large companies have the potential to make a contribution to **poverty alleviation** through the following four areas of business action:

- Core business operations and value chains;
- Corporate social investment and strategic philanthropy;
- Hybrid models that combine social and commercial capital and/or public and private resources;
- Public advocacy, policy dialogue and institution building.

(Nelson, 2006)

## Inclusive Business Models targeting the Bottom of the Pyramid

In low and middle income countries, core business operations and value chains can directly integrate low-income people as entrepreneurs, suppliers, distributors, retailers and employees, through the creation of so-called **Inclusive Business Models**. These go beyond philanthropy and corporate social responsibility to promote business solutions for a sustainable future for the poorest people living at the "**Bottom of the Pyramid**" (BoP). The BoP is the bottom segment of

citizens, when the global population is classified per capita income adjusted for purchasing power parity<sup>8</sup> (PPP). London and Hart (2004) suggest a refined definition of the BoP as the low-income socioeconomic segment that is not well integrated into the formal economy. This perspective aligns with the BoP literature on venture capability-building, which addresses the challenge of business development in the absence of a “Westernized” market environment that is characterized by legally recognized boundaries, enforceable contracts, and property rights protection (London and Hart, 2004).

According to London and Hart (2010), it is important to note that the poor operate in an essentially extra-legal environment, in which property rights are not officially recorded, and contracts and other agreements lack legally enforceable mechanisms. In many low and middle income countries, the informal economy, most of it perfectly legal, accounts for a substantial portion of the current economic activity. Furthermore, the BoP segment has the following characteristics:

- It is heterogeneous across multiple dimensions;
- It includes the portion of the world’s population with the least amount of income;
- It contains local enterprises that generally are not well-integrated with the formal capitalist economy;
- It constitutes the majority of humanity.

(London & Hart, 2010)

Inclusive Business models, or commercially viable business models that incorporate poor people into their value chains, open up new growth opportunities for businesses, while simultaneously promoting *sustainable development*. A growing number of large corporations are proactively engaging in such approaches with the aim of achieving *core business benefits*—such as greater competitiveness, increased market share and improved risk management—while also contributing to the achievement of international development goals (Nelson *et al.*, 2009). The International Finance Corporation (IFC) states that the working poor are not often prized as a market segment, but their voices are beginning to be heard (Ishikawa & Ribeiro, 2012).

It is important to *make markets work for the poor*, and there is a need for those in poverty to contribute to this process. A study conducted with the IFC to understand the size and aggregate purchasing power of the BoP identified nearly 4 billion people at the BoP across Africa, Asia, Eastern Europe, Latin America and the Caribbean (Hammond, 2007). Using data from household consumption surveys, the report estimates total annual household income of those at the BoP at \$5 trillion PPP (or US\$1.3 trillion) (Hammond, 2007).

Most companies trying to do business with the 4 billion people who make up the world’s poor offer products at extremely low prices and margins, and hope to generate decent profits by selling enormous quantities of them. However, selling products to customers in rural villages and in slums near urban centres is difficult (Simanis, 2012). Research shows that any business that starts off needing a 30% or higher penetration rate is built on a shaky foundation, because consumers at the bottom of the pyramid are not accustomed to using and experimenting with products and thus sales and marketing require expensive proposition (Simanis, 2012).

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<sup>8</sup> A measure that equates the price of a basket of identically traded goods and services across countries, providing a standardized comparison of real prices.

At the same time, a business model analysis is not only required to map the current business model, but also to capture the changes that occurred over time, and the reasons for those changes (Sinkovics *et al.*, 2014). London and Hart (2010) suggest that the best way to create mutual value when entering BoP markets is to concentrate first on achieving a deep understanding of the constraints BoP consumers, producers, and entrepreneurs face. In this context, Sinkovics *et al.* (2014) distinguish two sets of constraints: (1) binding macro constraints, which are mostly institutional in nature, and (2) firm-level constraints, which have more direct impact on the sustainability of a business. The binding macro constraints characterise a government's inability to address market failures (Olson, 1996) and constitute weaknesses in the formal and informal institutional frame within which market participants set their actions. Sinkovics *et al.* (2014) identified three studies within the international business and management literature with a deliberate focus on constraints, compare Table 2.

*Table 2: Overview of the constraint dimensions (Sinkovics et al., 2014)*

<b>Chowdhury, M.S. (2007)</b>	<b>London et al. (2010)</b>	<b>Dahan et al. (2010)</b>
<ul style="list-style-type: none"> <li>▪ Poor transportation facilities</li> <li>▪ Lack of entrepreneurship education and training</li> <li>▪ Lack of financial assistance</li> <li>▪ Haratal (strikes)</li> <li>▪ Law and order situation</li> <li>▪ Bureaucracy</li> <li>▪ Lack of control of corruption</li> <li>▪ Lack of adequate investment</li> <li>▪ Lack of government support and assistance</li> <li>▪ Lack of research and development</li> <li>▪ Inadequate information</li> <li>▪ Inability to forecast demand</li> <li>▪ Frequent power failure</li> <li>▪ Inadequate telecomm. services</li> <li>▪ Fear of failure</li> <li>▪ Lack of technology</li> </ul>	<p><b>Productivity (value creation constraints)</b></p> <ul style="list-style-type: none"> <li>▪ Raw material resources (lack of access to high quality input material, low quality local material)</li> <li>▪ Financial resources (lack of working and investment capital, exploitation by extra-legal lenders, no access to insurance)</li> <li>▪ Production resources (inadequate or lacking technology/equipment/infrastructure, storage space)</li> </ul> <p><b>Transaction (value capture constraints)</b></p> <ul style="list-style-type: none"> <li>▪ Market access (poor infrastructure, lack of awareness of market expectations, inability to meet market expectations)</li> <li>▪ Market power (lack of capacity to link directly with buyers, lack of direct access to end markets, exploitation by middlemen)</li> <li>▪ Market security (lack of consistent buyers, price fluctuation)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lack of knowledge</li> <li>▪ Information asymmetries</li> <li>▪ Lack of entrepreneurship education and training</li> <li>▪ Lack of appropriately prices and designed products</li> <li>▪ Lack of financing</li> <li>▪ Underdeveloped human capital</li> <li>▪ Bureaucracy: Access to local networks and supply chain</li> <li>▪ Lack of control of corruption</li> <li>▪ Lack of knowledge surrounding distribution and use of water</li> <li>▪ Lack of adequate investment</li> <li>▪ No product solution to a problem/need</li> </ul>

In order to create a BoP market, firms should focus on a proposition of mutual value creation: The greater the ability of the enterprise to meet the needs of the poor, the greater the return to the partners involved (Antúnez de Mayolo, 2012). In more detail, strategies that merge business and societal agendas can be summarised as follows:

- Short-term returns must be balanced with long-term goals. Profitable inclusive business models take time to develop and often involve up-front investment.
- A local focus helps inclusive business models develop. The understanding of the local realities of those living on low incomes is crucial. Companies should be based in the same countries where the targeted BoP live, in order to gain intimate knowledge of local conditions, needs and capabilities.
- Good relationships are key to success. Inclusive business models rely heavily on good relationships with various partners, many of them non-traditional, based in remote areas, or in the informal sector. These business relationships are based on trust built over the years. (Ishikawa & Ribeiro, 2012)

The World Business Council for Sustainable Development (WBCSD, 2014) identified three further essential factors for companies that wish to implement inclusive business projects. First, a company should focus on its core competencies and strengths in order to ensure consistency among its portfolio. Second, *partnering with government agencies, civil society groups and development organisations with on-the ground expertise helps in addressing a multitude of needs in a holistic approach*. And last, tapping into local networks is a key resource for gaining insights into regional markets of low and middle income nations.

The willingness of a company to open up and engage with other social groups, some of whom may be profoundly critical, is a real challenge for each organisation. But there are advantages to be gained, apart from resolving social problems, particularly in strengthening relations with society, partners and employees. Inside the company, many members of staff have a strong desire to find meaning in their work, beyond the need to earn a living (Fitzgerald & Cormack, 2006). Actively and explicitly managing the company's role in the community and wider society can contribute to this sense of purpose, resulting in a non-financial benefit to individuals, and to the company, that is hugely satisfying. The impact can be felt on culture and behaviour, in a spirit of generosity where individuals are willing and happy to give of themselves, and the company to reciprocate (Fitzgerald & Cormack, 2006).

The willingness of a company to open up and engage with other social groups, some of whom may be profoundly critical, is a real challenge for each organisation.

### The Access to Nutrition Index (ATNI) Initiative

Based on an initiative created by responsible investors, the case reported in this section shows how the opinion of consumers (the end-users), can influence the innovation strategy of industry, in this case the food and beverage industry.

The Access to Nutrition Index (ATNI), supported by the Global Alliance for Improved Nutrition (GAIN), the Bill & Melinda Gates Foundation, and the Wellcome Trust, is an initiative that aims to stimulate substantial improvement in consumers' access to good nutrition worldwide. ATNI evaluates food and beverage manufacturers on their policies, practices, and performance related to

obesity and under-nutrition. By providing companies with a tool for benchmarking their nutrition practices and serving as an impartial source of information for interested stakeholders, ATNI aims to encourage companies to increase consumer access to nutritious products and responsibly exercise their influence on consumer choice and behaviour.

ATNI was launched in 2013:

at a critical moment when both obesity and undernutrition [were] among the world's most pressing public health concerns. Rapidly rising rates of obesity and related chronic and non-communicable diseases have reached the levels of a global epidemic, according to the World Health Organization. At the same time, undernutrition remains one of the world's most serious health problems and is a major risk factor for diseases that have an impact on the poorest people in the world. (Access to Nutrition Foundation, 2013a)



Figure 8: Homepage of the website of ATNI (Access to Nutrition Foundation, 2013b).

The ATNI is highly ambitious in its goals for stakeholder involvement. For instance, “in addition to ATNF’s in-person consultations and webinars, an on-line consultation tool” was launched to “give all our stakeholders worldwide the chance to share their views on the methodology of the Access to Nutrition Index 2015”.<sup>9</sup> In the next section, we will look at even more ambitious efforts at stakeholder involvement in an attempt to synthesise the above concepts of human rights, shared value, innovation for and with the bottom of the pyramid, societal desirability and end-user engagement.

<sup>9</sup> <http://www.accesstonutrition.org/media/atni-2015-line-consultation-survey-launched>



## ProGReSS and the SASI case

The South African San Institute (SASI), part of the growing indigenous rights movement, was established in 1996 to assist the San population of South Africa. The San peoples, in common with other indigenous or ‘first peoples’ worldwide, experience persistent forms of marginalisation from the advantages of modern society, and are best served by supportive organisations dedicated to facilitating their progress and addressing their particular situations and needs.

As confirmed by a number of scholars, the San require dedicated assistance to address the challenges facing a recent hunter-gatherer society within a modern state (Hitchcock, 2002). SASI first assisted the !Khomani as well as the !Xun and Khwe San in the late 1990s with legal support, successfully prosecuting claims for the land that they now inhabit. Simultaneously, support programs were expanded to assist the indigenous leadership in pursuing their various legal, social and economic rights, and to assist the communities in addressing their persistent state of poverty. San community members are not only strongly represented on the SASI management, but are also employed as community workers. The San hunter-gatherer culture, which is characterized through a deep affinity with and knowledge of nature, has proved to be an enduring source of stability and self-esteem for the San in times of rapid change, as well as a valuable contribution towards modern innovation.

By supporting negotiations with industry related to traditional knowledge, as described below, SASI has facilitated the recognition by the San that their knowledge of the medicinal properties of plants is a potential source of value to the modern world, as well as of livelihoods for themselves.

### The San

The San are the indigenous population of Southern Africa. Their hunter-gatherer culture stretches back over 20,000 years, and their genetic origins reach back over one million years. They are generally regarded as having lived longer continuously in one location than any other human population (Stephenson, 2003: 21; Lee *et al.*, 2002). At about the time European settlers were landing at the Cape in South Africa, the San occupied an area stretching from the Congo Zambezi watershed in Central Africa to the Cape, and numbered about 300,000 (Lee, 1976: 5). The San today number approximately 100,000, and live mainly in Botswana, Namibia and South Africa, with scatterings of populations in Angola, Zimbabwe and Zambia. San NGOs estimate the populations as follows: Botswana, 55,000; Namibia, 35,000; South Africa, 8,500; Angola, 3,000; Zimbabwe and Zambia, unknown (KFO, 2006). After centuries of genocide and marginalization, leading to loss of land and consequently large-scale loss of culture and identity, they occupy an unchallenged niche as the poorest of the poor in these countries (Suzman, 2001).

The San are the aboriginal people of South Africa who, after centuries of genocide and marginalization leading to loss of land and consequently large-scale loss of culture and identity, occupy an unchallenged niche as the poorest of the poor in these countries.

### Innovating for the poor

The ProGReSS project examines the societal desirability of innovation and how funding and innovation policies can drive science and technology towards tackling major challenges. Innovating for the poor aligns to tackling one of the major global challenges: extreme poverty. “[O]ne in every three of us alive today does not have access to the most basic needs for a decent life—food, edu-



cation, medical care, a safe environment” (The Rules, 2014). As deliverable D4.1 of this project, ProGReSS, has shown, it is possible for industry to combine innovating for the poor with producing marketable products. Importantly, this picks up a concept that has been debated globally for over a decade, namely “inclusive innovation.”

The Global Research Alliance (GRA), an “international network promoting the application of science and technology to solve large scale issues facing low and middle income countries,” defines inclusive innovation as follows:

‘Inclusive Innovation’ refers to the knowledge creation, acquisition, absorption and distribution efforts targeted directly at meeting the needs of the low-income or the base-of-the-pyramid (BoP) population. The focus of Inclusive Innovation is on delivering high performance products and services or high experience at ultra-low cost to the people whose needs are generally not addressed. (Global Research Alliance, 2014)

It is possible to conceive of different ways in which “inclusivity” could operate:<sup>10</sup>

- A. In the definition of the problems to be addressed through innovation being relevant to the poor;
- B. In the process of innovation itself where the poor are actively engaged in some manner in the development and application of innovative solutions to their problems;
- C. In the adoption and assimilation of innovative solutions whereby the poor acquire the capacities to identify and absorb innovative solutions to their problems;
- D. In the impact of innovation such that the innovation outputs enhance the consumption and/or incomes of the poor. (Foster and Heeks, 2013)

If the problems of the poor are defined by outsiders, one can speak of innovation *for* the poor (A). All other possibilities (B, C, and D) could be described as innovating *with* the poor.

## Innovating *with* the poor

The South African San Institute represents a community which has, over centuries, preserved its valuable traditional knowledge. This traditional knowledge has been used by corporate giants such as Pfizer and Unilever to try and produce new, innovative products.

As the collaboration between the San community and pharmaceutical and other innovators is relatively new, only one product has reached the market to date, namely **Zembrin**<sup>®</sup>, a natural remedy used against anxiety and depression. The product is based on traditional plant knowledge of the *Sceletium* plant originating from the San community. Table 3 shows a time-line of the innovation process.

A range of other collaborations using traditional plant knowledge of the San are ongoing and cannot be detailed in this report because of confidentiality clauses. However, it is noteworthy that the ProGReSS project will produce a short film later in 2014 documenting the collaboration of the San with a natural remedy company using the buchu plant (*Agathosma sp.*).

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<sup>10</sup> Thanks to David Kaplan for contributing a glossary entry on “inclusive innovation” to the ProGReSS project.

Table 3: Milestones in innovation based on San traditional knowledge.

Year	Event
1986	Research by medical doctor/botanist begins based on literature on <i>Sceletium</i> plant
1995	Social science research involving community elders to exclude addictive properties
1996	Active component identified, patent obtained
2005	First standardised extract
2006	Halls Investment joins as a venture capitalist
2007	Contact made with San community for benefit sharing according to the Convention on Biological Diversity (1992)
2008	Benefit sharing contract concluded
Since 2007	Clinical studies
2010	Approval of the first product by South African Ministry (trade name - Zembrin)
2012	Zembrin enters the South African market
2013	Zembrin enters the U.S. market

## Collaborating with Traditional Knowledge Holders - Good Practice

As part of the ProGReSS project, SASI has elaborated a *nine-point statement* on what is important for the San when *engaging with industry*. The plan is based on 13 years of learning lessons, good and bad, since the San first realised in 2001 that their traditional knowledge is valuable.<sup>11</sup> Here is what the San expect from research institutions or pharmaceutical or nutraceutical companies whose research is based on San traditional knowledge.

The San expect to form a longer term partnership with the community and negotiate a benefit sharing agreement.

1. Acknowledge the San as Traditional Knowledge holders. This may take a variety of forms, from formal acknowledgement of the San traditional knowledge, to the awarding of contractual rights to patents and other products.
2. Respect San community structures and protocols. In practice this means filling in the WIMSA Media and Research Contract prior to engaging with the community (for instance, through interviews).

<sup>11</sup> For a book-length description and analysis of the Hoodia case, a succulent with anti-appetite properties, see Wynberg, Schroeder and Chennells, 2009. For a short description, see below.

3. Form a longer term partnership with the community and negotiate a benefit sharing agreement to reflect all components of the partnership.
4. Ensure that San representatives are part of the entire research and innovation process.
5. Provide annual progress reports on existing collaborations.
6. When commercial benefits are derived from the commercial collaboration, the benefit sharing agreement must be followed in all respects.
7. There should be transfer of technology and skills development in communities and these benefits must be anticipated in funding proposals. This could include higher education, including at PhD level, for community members.
8. Provide any output (e.g. publication) on completion of the research to the community. If a community and/or an individual assisted with the research, they must be acknowledged, including as co-authors.
9. In addition to the commercial benefits flowing from the collaboration, further non-monetary benefits such as education, training, livelihood and job creation, community health and other such projects should be shared, where appropriate.



Leana Snyders (top) and Andries Steenkamp (bottom) speaking at the Beijing meeting of the ProGReSS project consortium.

By including, in fact basing, the allocations of benefits and the assignment of marks of status in alignment with the traditional ethos of indigenous people, innovation becomes empowering instead of disruptive. Lesions of the disasters of cultural collision in the eighteenth and nineteenth centuries, spanning the Americas and Asia (especially India and China), when taken to heart and used as leverage points, can both support and grow quality of life across all manifestations of truly human culture.

## RRI in the Kalahari

The collaboration of traditional knowledge holders with pharmaceutical and other industries is an excellent example to illustrate the necessity and feasibility of RRI in low and middle income countries, as it touches on all three RRI elements (when following von Schomberg's definition).

...the sharing of benefits from research is legally required.

Research has to be *ethically acceptable*, which means in the context of traditional knowledge that community consent about access to knowledge, plants, animals and micro-organisms has to be obtained and that a benefit sharing agreement has to be concluded. As the *Convention on Biological Diversity* (CBD, 1992) requires the sharing of benefits from research involving traditional knowledge, an internationally valid legal requirement exists. It is therefore not only unethical, but also illegal not to share benefits.

At the same time, the ethical collaboration between traditional knowledge holders and industry is directly linked to *sustainability* goals. The CBD has three main objectives, namely:

1. The conservation of biological diversity;
2. The sustainable use of its components;

3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources. (Secretariat of the Convention on Biological Diversity, 2014)

It is the linking of conservation with benefit sharing (the grand bargain), which is meant to protect biodiversity for future generations. Only if the guardians of traditional knowledge and associated resources can benefit from their responsibility, will continued conservation be feasible. Hence, in the context of traditional knowledge and associated resources, an international convention has already linked the first two RRI elements.

In terms of *societal desirability* (seen as addressing grand challenges of humankind), one cannot make broad claims for the outputs of collaborations between industry and the San population (yet). Theoretically, outputs could materialize at two levels. First, livelihood opportunities could be created for the San associated with their sharing of traditional knowledge. This could tackle the grand challenge of extreme poverty at the local level. However, to date, only very small-scale opportunities have emerged. For example, following a small support program in the Kalahari by the Council for Scientific and Industrial Research (CSIR) as part of its recognition of the San role in development of medicines, emerging entrepreneurs such as 'oom' Jan van der Westhuizen, a traditional healer in the !Khomani San community, supplement their income by selling an array of teas, lotions and cosmetics based upon known medicinal plants. As these products, extracted from plants such as aloe, *Sceletium*, tsamma melon, buchu and *Hoodia* are increasingly proven and sold in the mainstream economy, so do tourists increase their purchases from the original knowledge holders such as oom Jan.

Second, some of the products that might emerge from collaborations between traditional knowledge holders and industry might contribute to tackling grand challenges of humankind. Whilst this might seem an unlikely prospect, the potential for such a success story was almost within reach for the San/Pfizer and San/Unilever collaboration involving the *Hoodia* plant (see *The San Hoodia Benefit Sharing Case* below). In the past year, the San have begun collaborating with the CSIR regarding at least two new exciting products based upon traditional knowledge, which are currently still confidential, and which when patented and commercialised should follow the trajectory of *Sceletium*.

As recent research shows (Tickell & Buell, 2011), over the last ten years R&D expenditure in biopharmaceutical industry has increased dramatically, whilst new medicine approvals have decreased and the mix of product approvals has shifted towards speciality drugs, many with lower commercial potential than earlier blockbusters. This has led to a "productivity drought" and the lack of trust of investors that the current R&D strategies of the industry can provide a sustainable and increasing return. Simultaneously, over time, decision-making has gradually passed from the physician to the payer – a shift that has taken place in both Europe and the US. Thus, the definition of innovation, having passed from industry to payers, could become much more aligned with what payers want, what prescribers want and what industry scientists want: to make a difference with a new medicine.

Another significant trend in the biopharmaceutical industry is the increasing demand for herbal products (Global Industry Analysts, 2013). The global herbal supplements and remedies market exhibited robust growth over the last decade, with little or no significant decline on account of the recent economic recession. According to a new report from Global Industry Analysts (2013), the market is forecast to reach \$107 billion by the year 2017, spurred by a growing aging population and increasing consumer awareness about general health and wellbeing.

At the same time, the World Health Organization estimates (2002) that about 80% of Africans rely on traditional medicine, a great proportion of which is herbal, to meet their health needs. This suggests that there is a tremendous potential for the future design and development of Inclusive Business Models in the biopharmaceutical industry that depend upon the indigenous herbal knowledge of the BoP African Society.

Recent studies concluded that **Zembrin**<sup>®</sup> significantly improved positive effects on wellbeing, cognitive flexibility and executive function, suggesting that the extract may also have therapeutic potential in cognitive ageing (HG&H Pharmaceuticals, 2013).

In March 2013, Zembrin<sup>®</sup> was recognised as the “most sustainable ingredient” at the annual Natural Products Expo West held in Anaheim, USA, and was also noted as one of the leading ingredients pioneering the foundation for a new generation of natural products (HG&H Pharmaceuticals, 2013).

### The San *Hoodia* Benefit Sharing Case

The best known benefit sharing case to date is the San *Hoodia* case (Wynberg & Chennells, 2009). In 1963, a South African research institute, the Council for Industrial and Scientific Research (CSIR) developed an interest in the *Hoodia* plant, which had previously been researched by botanists following leads from the San community in the 19th century. Allegedly, the plant had appetite suppressing properties, and it was used by the San in times of hunting or water shortage.

Initially, the CSIR were unable to analyse the plant’s molecular structure until the mid-1980s when they acquired high-field nuclear magnetic resonance spectroscopy equipment. In 1995, after successfully isolating the appetite suppressant properties, the CSIR filed for a patent. In the same year, South Africa became a Party to the *Convention on Biological Diversity*. This meant that those using the traditional knowledge needed to obtain consent from the holders of such knowledge and negotiate a benefit sharing agreement with them.

Yet, the CSIR never made contact with the San. Instead, they sub-licensed their discovery to firms in Europe and the United States for significant fees. A local NGO eventually informed San leaders that their traditional knowledge had been used in a patent application and that they could either challenge the patent or demand a benefit sharing agreement. They chose the latter option.

In March 2003, the San and the CSIR signed an historic agreement which provided the San 6% of all CSIR royalties received from licence-holders and 8% of all milestone payments. Milestone payments have already been received. However, Pfizer and Unilever, two high-profile sub-licensees, have both dropped their *Hoodia* product development for reasons related to their commercial priorities, as well as to (in Unilever’s case) concerns about possible toxicity at high dosages. The CSIR and the San are currently strategizing the further development of the *Hoodia* patent, which retains the potential for providing an effective and organic appetite suppressant for western markets.

The importance of SASI in the ProGRESS project is in illustrating the link between this case study and the concept of innovation proper of the definition of RRI. The villagers’ input on what plants to use, doses, and participation in the addiction study were pivotal to the initial research and development on Zembrin<sup>®</sup>. Appropriately, the Zembrin<sup>®</sup> founders, HG&H Pharmaceuticals Ltd, signed Africa’s first “prior informed consent benefit-sharing agreement” with the San indigenous community. In terms of this agreement they will share 6% of all income from Zembrin<sup>®</sup> with the San Council which will allocate 50% of their share with the communities of Paulshoek and Nourivier (HG&H Pharmaceuticals, 2013).

The San example shows how vitally important, both in specific actions and as an example, the biopharmaceutical industry can be to indigenous society as well as fitting well in empowered end-users commerce models. As a result all stakeholders, especially the biopharmaceutical industry, as well as patients, regulators, and the health industry have in RRI a model to reframe their relationships and create inclusive business models that fairly redistribute benefits, costs and risks to enable sustainable development.

To complete the report and show the global nature of efforts at inclusive innovation and end-user involvement from the bottom of the pyramid, the last section will report on Indian efforts.

## Grassroots Innovations in India

This section describes how poor end-users of technological inventions and developments are engaged in successful and societally desirable, ethical and sustainable innovation in India at the grassroots level.

**Grassroots innovations** are, according to Smith and Seyfang (2014), community-led solutions for sustainability. *Grassroots initiatives* are innovative networks of activists and organisations that lead bottom-up solutions for sustainable development, which respond to the local situation and the interests and values of the communities involved. In contrast to conventional, incremental green reforms, grassroots initiatives seek to practice deeper, alternative forms of sustainable development.

Being the seventh-largest country in the world by area, India has the second-biggest population with over 1.2 billion people. The Indian economy is the world's tenth-largest by nominal GDP, and the third-largest by purchasing power parity (PPP). During several of the past decades, India has been one of the fastest-growing major economies (International Monetary Fund, 2013).

A Division for Science for Equity, Empowerment and Development (SEED) has been set up under the Department of Science and Technology (Ministry of Science & Technology – S&T) with the broad objective of working towards technological empowerment and sustainable livelihoods at the grass roots level (DST, 2013). The Department has played a pivotal role in improving the quality of life at the grassroots level through supporting science-based NGOs and institutions. Departmental activities with regard to societal uplift have been, amongst others:

- Adaptation of already available technologies to the social context (e.g. requirement of the region and the local residents) in which these technologies are needed;
- Active promotion of knowledge-based and technology-driven entrepreneurship through the establishment of S&T Entrepreneurship Parks and Technology Business Incubators, attracting and nurturing young talents to science for societal development (DST, 2013).

The **objectives and mandate of SEED** are as follows:

- Support S&T-based NGOs, and S&T institutions, colleges, and universities throughout the country to take up innovative grant-in-aid projects at the grassroots level with various schemes targeted at different sections of society to address location specific problems;



- Catalyse and support research, development and adaptation of relevant and appropriate technologies for empowering and improving the quality of life of artisans, labourers, women, and disadvantaged sections of society, particularly in rural areas;
- Preserve and upgrade the skills of traditional artisans as “natural carriers” of S&T knowledge, and enable their transition to S&T-based production organizations;
- Support need-based, location specific and appropriate S&T interventions for economically viable, ecologically sustainable and socially acceptable development;
- Support bottom-up rather than top-down programme planning with full community involvement;
- Evolve and demonstrate replicable models of S&T-based development for the benefit of disadvantaged sections of society, and
- Catalyse linkages with Developmental Agencies/ Departments and Financial Institutions so as to promote integration of these models within wider developmental processes.

The following schemes under SEED are operational for action oriented, *innovative and field-based technology generation* for specific target groups:

A. Beneficiary oriented schemes:

- S&T for Women
- Tribal Sub-Plan: Technological Interventions for Tribal Empowerment (TITE)
- Scheduled Caste Sub Plan (SCSP)

B. Technology Development related schemes:

- Technological Advancement for Rural Areas (TARA)
- Technological Intervention for addressing Societal Needs (TIASN)
- Scheme for Young Scientists & Technologist (SYST)

The following will give a more detailed insight into one of the above schemes, namely TARA.

### Technological Advancement for Rural Areas (TARA)

This scheme from the SEED programmes provides long term core support to science-based voluntary organizations/field institutions to promote and nurture them as *S&T Incubators* and *Active Field Laboratories* in rural and other disadvantaged areas. Their aim is to provide technological solutions and effective delivery of technologies for livelihood generation and societal benefits.

Under TARA, around 60 technologies have been developed in categories such as housing, machinery and tools, energy, lighting and fuel, agriculture and animal husbandry, food processing, leather and animal products and ICT-based technologies.

The following two TARA examples exemplify the (implicit) intersection of the RRI initiative's focus on societal desirability and end-user involvement and India's science policy.

1. The **TARA Fly Ash Technology Package** turned a local/regional problem into an opportunity. The resulting appropriate scaled technology not only solves the problem but also provides an income stream for those suffering from the consequences of pollution. With the production of approximately 200 million tons of fly ash every year in India, its disposal is a serious source of soil and water pollution. The TARA Fly Ash Technology solution transforms the pollution into building bricks. The system spanned the creation of machinery appropriate to the area; training support for material selection and creating optimum mix; as well as supplying customized machinery and accessories. The typical hydraulically operated machine produces four bricks per cycle and 1,000 bricks per hour. Auxiliary equipment of the package consists of two pan mixers, a hydraulic pallet truck and four batching trolleys for raw material. This package was fostered by Development Alternatives - Technology and Action for Rural Advancement and is currently commercially available for dissemination. The technology package has been transferred to a commercial entity (SEED, 2014b).



*Tara bricks (SEED, 2014b).*



*Aditya Home Light development (SEED, 2014a).*

## RRI principles in SEED projects

How do the Indian examples reflect RRI principles, especially with respect to involving end-users in the RRI process? The following is a discussion of each of the six basic RRI principles and how the two examples above relate to them.

1. **Engagement:** Both the building brick and light examples reflect local concerns, both of a financial nature and about the quality of life. By designing systems with the end-

users, specific needs were addressed, such as supporting the studies of school-age children after dark, once the shared living tasks of the whole family unit are completed. This principle of engagement was also the basis for turning the pollution problem into a solution for locally available building materials.

2. **Gender Equality:** By designing the lighting rental system to be operated by women, a small step was taken to redress the financial and power inequality between men and women in India. Furthermore, by providing lighting so that children could study after dark, it was no longer such a serious problem that most poor children have to contribute to their mothers' work during part of the day.
3. **Science Education:** Both of the systems emphasized training and basic understanding of the systems that were developed. As a result, the users were - at least partly - freed from being only passive recipients of technology.
4. **Open Access:** The technologies developed are open access in the sense that they can be freely used by others.
5. **Ethics:** By designing into the system benefits going to the users, the ethical imperative of fair benefits is adhered to.
6. **Governance:** The organizations leading the creation of the systems described above explicitly endeavour to bring local end-users into the process, from deciding on what is needed, to how to share the benefits justly.

The SEED department along with TARA's projects are therefore good examples to show the potential global application of the RRI model.

The SEED department along with TARA's projects are therefore good examples that show the potential global application of the RRI model.

## Conclusions

While ethical acceptability and sustainability can be enforced through specific regulatory measures and supported by governmental directives, it is through citizens' engagement and participation in science governance and innovation processes that societal desirability of innovation can succeed.

By means of public engagement, citizens can actively contribute to the science policy decision-making process and thereby contribute to a research and innovation strategy that meets the societal desirability criterion. In this process, non-governmental organizations and civil society organizations fulfil a fundamental role as intermediaries and advocates at the same time.

Innovation that is responsive and societally desirable allows for the engagement and participation of the most marginalized groups in society, and gives them an opportunity to become innovators *and* beneficiaries of the products they contribute to with their knowledge and resources, as the San example has shown.

Transparency, trust, fundamental values, shared benefits are key concepts in the relation between Industry and society, and these are at the foundation of societal desirability in RRI.

***The involvement and, moreover, the engagement of end-users in particular, and the society in general (meaning the public and civil society stakeholders) is a necessary path towards the implementation of RRI, making innovation with and for end-users and society more effective, ethical and societally desirable.***

We come to three reflections:

- Reflection 1:** Societally desirable research and innovation is inclusive innovation based on a participatory approach to research and innovation governance.
- Reflection 2:** Innovation by users and through end-user engagement is one of the sources of innovation that has long been pursued by researchers and industry across the world. Evolving from this pre-existing knowledge can help RRI to address Grand Challenges globally.
- Reflection 3:** Inclusive innovation that allows poor and marginalised groups to be both recipients and co-creators of innovation can open up new markets for industry, enhance its profitability, and generate more business value; "using business as a force for good is also good for business" (Honeyman, R., 2014).

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