

Support to Innovation and Innovation Systems within the Framework of Swedish Research Cooperation

– taking stock, lessons learned and the way ahead



Cover photo: Lindi van Niekerk, Social Innovation in Health Initiative, TDR
Dr Awor defended her thesis within the Sida-funded research cooperation, where she led a study on the feasibility and effectiveness of engaging private sector drug shop owners in the provision of care to children under five living in low-income areas in Uganda, particularly for treatment of malaria, diarrhoea and pneumonia. Through the “Social Innovation in Health Initiative” Makerere university has an increased role in social innovation in health, supporting promising innovative initiatives from an innovation hub where Dr Awor is the director. After leading the “Drug shop integrated management of childhood illness” project related to the study, she said the biggest lessons were “that solutions are available all around us and we can work with what is on the ground ... Particularly if we are able to do this at the grass root [level], we should be able to see the solutions.”

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1. SUMMARY

This position paper highlights the importance of innovation in development, and especially its relevance for sustainable development and achieving the goals of Agenda 2030 in low- and lower middle-income countries. The conclusions are drawn from the context of research cooperation supported by Sida. The paper provides a general description of Sida's support as well as recommendations for the future.

Sida's Research Cooperation focuses on research of relevance for development and the use of results, feeding into the initial steps of innovation and the achievement of societal impact. A systems-approach to innovations is promoted, focusing on the *creation of an enabling environment* for innovation.

Research institutions are key players in the innovation system as providers of human capital and scientifically validated knowledge through research. Universities are key catalysts in educating and shaping the next generation of a skilled workforce, including those who will be involved in innovation, such as innovators, private sector staff, and decision-makers. Research may generate important results to be used at various levels in society, such as evidence for policy, development of strategies, and new approaches to societal problems.

Many of the challenges faced by researchers involved in innovation are shared across countries and income-level, although there are some which are more specific for researchers in low- and lower middle-income countries (LLMICs). Primarily, innovation systems in LLMICs are usually weak. The necessary structures are either not in place or do not have the capacity to drive innovation. A main key to innovation is efficient interaction. In LLMICs, like in many other contexts, there is often a lack of systematically organized interaction between research institutions¹ and the stakeholders of the surrounding society (i.e. private and public sectors, civil society).

Sida Research Cooperation has supported innovation and innovation systems since 2003, promoting enabling environments for innovation, as opposed to the advancement of individual innovations. Facilitation of collaboration, co-creation across sectors and investing in locally-driven solutions have proven successful. Notably, working with systems change in a constantly changing environment, there is no model which fits all. Interventions must be context-specific, be based on strong local ownership, and contribute to a sustainable innovation system.

The following recommendations are a selection of possible interventions to be used depending on the local context:

Interaction and linkages

- An early interaction between researchers and stakeholders in society must be promoted, such as the private sector, public sector, and social actors including civil society organisations.
- A systematic approach to interaction between research institutions and the surrounding society should be developed, possibly through adapted policies related to innovation.
- Interaction and/or collaboration between actors from different disciplines and sectors through granting mechanisms should be promoted.
- Improved ways of engaging decision-makers can be further developed, possibly through enhanced experience-sharing amongst Sida-funded organizations.
- Embedded research and implementation research can be further promoted.
- An evaluation of factors influencing the development of triple-helix innovation clusters would support future cluster set-ups.
- Development of innovation hubs is crucial for increased innovation generated at the research institutions, as the hubs are a gateway between the university and the surrounding society, and provide the capacity to stimulate and drive innovation.

Capacity

- Institutional innovation capacity starts by training individuals, for example through the training of innovation managers. Increased training at the research institutions is key to a sustainable change. General innovation training of university leadership contributes to the understanding of innovation and is needed to institutionalise innovation efforts.
- A regional network of innovation managers would contribute to continuous training and experience sharing.
- Competence building in financing and monitoring of innovation projects shall be promoted at granting councils.

Financing structures

- Nationally or regionally based innovation funding agencies should be promoted.
- An analysis of regulatory limitations and the identification of actors responsible for scaling of a particular innovation should be done early on, possibly integrated as a requirement in Sida-funded projects.

¹ In this paper "research institutions" include research institutes as well as universities

Structures, policies and mechanisms

- Monitoring of innovation at national and regional levels is crucial for policy making, and support may be increased in this area, especially to improve the quality of the data.
- Incentives structures for researchers to engage in innovation and interaction with society should be developed.
- Innovation research focusing on the local context is necessary for policy making related to innovation and shall be encouraged.

Recommendations to Sida Research Advisors

- Research advisors should be able to build their individual capacity in innovation processes and the innovation system.
- Research advisors are encouraged to engage with other units at Sida and Embassies, as well as with other donor agencies, in particular to develop joint funding mechanisms and to provide input to new financing mechanisms.
- Research advisors are recommended to engage in dialogue with:
 - researchers and research institute leadership to promote interaction with society
 - leadership at research institutions to promote a systematic approach to innovation (research to use)
 - leadership at universities to promote the development of curricula for MSc and PhD programs where students are trained in the identification and solving of real-world problems
 - innovation funders to stress the importance to focus on transformative and sustainable solutions, and the need to enhance the interaction between the different actors of the innovation system
 - innovation funders to stress the importance to build nationally or regionally based structures for innovation funding

2. PURPOSE OF THIS POSITION PAPER

The purpose of this position paper is to guide Sida's Research Cooperation towards a holistic approach to strengthening innovation and innovation systems at the global, regional and bilateral levels. The paper reflects the changing nature of innovation and thus innovation support, based on knowledge and experiences gained by Sida staff and cooperation partners.

This paper focuses specifically on Sida's support to innovation within the framework of international

research cooperation, while being fully aware of the fact that other forms of innovation take place in society in the absence of research. The document starts with a description of how innovation is viewed, followed by a description of the importance of innovation, the challenges met in the special conditions of low- and lower middle-income countries and the role of research institutions in the innovation system. A description of Sida Research Cooperation's current support to innovation is followed by an analysis and recommendations.

Two appendices are provided: 1) references to recommended reading and guiding documents and 2) an overview of supported initiatives and how they address innovation.

3. INTRODUCTION

Innovation has gained increased attention in the past decades, and governments across the world are using innovation as a mean to boost economic growth and social development. Innovation is viewed as crucial for social, economic and political development in countries at all levels of income, and sets of incentives are developed at the state and regional levels to stimulate innovation.

It is easy to appreciate the importance of research and innovation in the attainment of the Sustainable Development Goals (United Nations Agenda 2030), as all the defined goals depend on new knowledge and new approaches.

Support to innovation within Sida's Research Cooperation is viewed as an important tool to contribute to the Research Cooperation Strategy's overarching goal of "poverty reduction and sustainable development". Sida views research cooperation and development of innovation capability as key and strategic to sustainable development, addressing environmental, social, and economic challenges in low- and lower middle-income countries and regions.

a) What do we mean by innovation in the context of Sida's Research Cooperation development support?

Innovation researchers struggle to provide an all-purpose definition of the term "innovation", and instead stress the importance of defining the term in relation to each specific context. In this position paper, innovation is defined in the context of international research cooperation.

In this position paper, **"innovation"** is defined as:
the use of knowledge – ideas, technologies and processes – into procedures, products and services that bring added value and are new in a specific context.

This definition takes into account that the idea, technology or process must be **used** and create **added value**. The procedure, product or service must also be **new**, not necessarily to the world but in the **specific context**. The definition further emphasizes **use of knowledge** as the starting point and hence academic environments, whose core activities are to generate, maintain and transfer knowledge, should have a central role to play. The wordings “**ideas, technologies and processes**” and “**procedures, products and services**” are meant to include everything, exclude nothing. The definition clearly shows that innovation is much more than products, and that innovation is more of a process than an end result.

The overall objective of Sida’s approach to innovation within Research Cooperation is to support the **use of research results** to attain **societal impact** which contributes to poverty reduction and sustainable development.

When compared to general development and slightly improved procedures, products or services, a “true” innovation should be a “leap”, something major. It can be difficult to determine if a certain procedure, product or service is an “innovation” or if it is part of incremental development, a slightly improved procedure, product or service, or if it is a totally new approach. Nevertheless, the main purpose of Sida’s Research Cooperation support to innovation is to promote the environment and conditions for innovation to take place. Many small steps may eventually lead to major change or a big leap which we can define as a “true” innovation, i.e. something that can contribute to transformation of societies, to address poverty, and to achieve social, economic and environmental sustainability.

In this paper we use the definition of Vinnova, Sweden’s Innovation Agency for “**social innovation**”.

“Social innovations aim at activating, promoting and exploiting the whole of society’s innovation potential, and through new social approaches addressing the needs of society better than has been done so far. There may be new goods, services, methods, business models or practices that through new ways of thinking contribute to an inclusive society. Those affected by a problem are involved in the formulation and solution of it. The primary intention is social benefit, it is not just a (positive) side effect.”
(freely translated from Swedish, Vinnova, 2017)

The primary intention of social innovation is social benefit, which does not exclude commercial benefit as a secondary intention. Through the experience of our collaboration partners, Sida Research Cooperation has

found it very important to involve the users, as well as actors from different sectors, different fields of policy and stakeholders of social innovation in the innovation process.

Transformative innovation is about empowerment and change in society, where innovation is viewed as a means to increase social sustainability and not to focus primarily on increased consumption or economic growth. Transformative innovation should broaden the flow of ideas, increase the diversity of innovators, and contribute to a more sustainable transformation to address current social challenges, meet global sustainability goals and obtain sustainable growth. **Inclusive innovation** refers to a development process where marginalized groups take part in and benefit from the process.

b) Innovation system approach as an opportunity for development

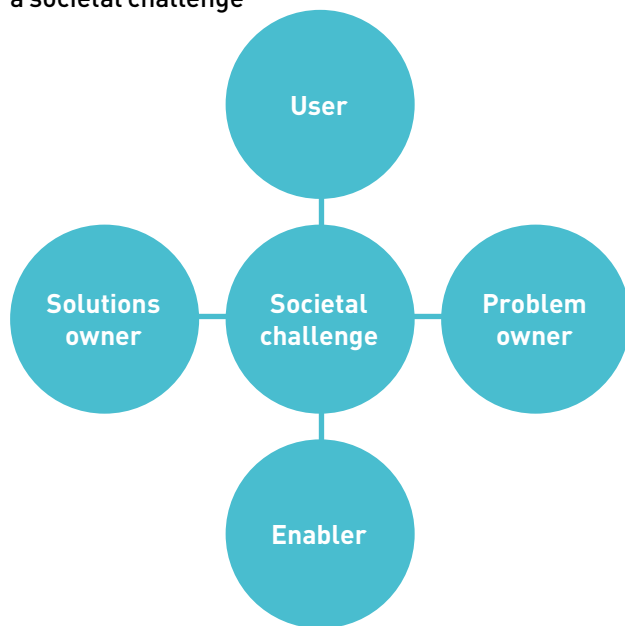
Innovation is increasingly viewed as a way forward to address major challenges in low-income countries such as poverty, health, productivity, competitiveness, economic diversification, food security, climate change and governance. Experience shows that stakeholders from different parts of society need to be involved to define viable solutions to these complex societal challenges. Innovation often takes place in the interplay between different sectors and competencies, where the actors can learn from each other and understand the complexity of the challenge. This means involving members from society, public sector, private sector and academia, i.e., actors from the innovation system². The actors can be divided into the following groups: the users of the innovation, the problem owner, the solution owner, and the potential enabler. As an example, an innovation addressing maternal health through antenatal care visits has the following stakeholders: the mothers (the users), the health provider (the problem owner), the innovator/s (the solutions owner), and the enabler (Ministry of Health, regulating care). The different groups and their level of involvement depends on the complexity of the challenge.

Involving these actors, especially in low-income settings, is not an easy task especially so as the demand sector cannot always convey their needs. In addition to this, the innovation enabling structures and mechanisms are in early stages of development. Networks and linkages

² The national innovation system is, according to some of the leading innovation researchers, an “open, evolving and complex system that encompasses relationships between and within organizations as well as institutions and socio-economic structures, which determines the rate and direction of innovation and competence building emanating from processes of science-based and experience-based learning” (Lundvall et al, 2009). Increasingly, the term “innovation ecosystem” is being used, reflecting the view of a constantly evolving and inter-dependent system where one component will affect the others.

between different actors such as private sector, university, society and government often need to be strengthened and trust to be built. Through increased interaction of the actors, feedback mechanisms can be strengthened where ideas and solutions are identified, tested and analysed, step by step. This is crucial for developing the innovation system and create sustainable impact.

Figure 1. Different kinds of stakeholders in solving a societal challenge



c) Specific challenges related to innovation and innovation systems in low- and lower middle-income countries

This position paper specifically considers opportunities and challenges of innovation in the context of international research cooperation, particularly of low- and lower middle-income countries. Looking at the low number of patents, innovation capacity may seem low in many low- and lower middle-income countries (LLMICs), but innovation can and does occur in all countries regardless of income-level. It also occurs within countries in all social strata. Therefore, adopting innovation strategies and supporting the development of innovation systems may generate real and lasting prosperity based on the structures and mechanisms leading to the use of new approaches and addressing societal impact without being based on patents.

Innovation systems in LLMICs are generally underdeveloped, and a large proportion of innovation takes place in the informal sector where **economic and social activities are largely outside the purview of the**

government and legislation. Quite remarkably, innovations are happening within pockets of excellence in a larger environment that is restrictive and in situations of extreme unpredictability. One can only imagine the potential if there were a stronger innovation system with the necessary capacity and structures in place.

The challenges in the innovation system of LLMICs tend to differ from those in technologically leading countries. In LLMICs i) the interaction and linkages between innovation actors in the society may be weak and trust and understanding lacking, leading to weak networks and feedback mechanisms between users and producers of innovation ; ii) there may be limited qualified human capital at all levels of society leading to low innovation capacity; iii) capacity and structures for financing innovation may be insufficient; and iv) structures, policies and mechanisms to support innovation are weak.

Challenges in emerging innovation systems where international development cooperation may play a role:

i) Interaction and linkages between actors in society

Innovation often takes place in the interplay between different sectors and competencies. Often, it is interesting to connect members from society, public sector, private sector and academia to get their different experiences from dealing with a certain problem. One way to increase the potential to innovate in such a diverse group is to promote an interaction built on trust.

Identification of effective ways to increase linkages between users and producers could be one way to stimulate the knowledge request in the demand sector. Co-production, where the users are involved in the innovation process, has been one way to tackle the limitations of feed-back mechanisms from the users of knowledge to the producers and is used in e.g. triple-helix clusters³.

Linking different actors is often not enough and it is necessary with an intermediary to “translate” between the actors to match supply and demand; the culture of business, civil society organisations (CSOs), government and academia. The actors are, and shall be, different. Innovation intermediaries are considered to play an important role in innovation systems. One such intermediary can be a civil society organization (CSO), a cluster organisation, university teachers or researchers, as long as they are trained and experienced in mediating between

3 The “triple-helix model” involves universities (knowledge institutions), industry (private sector) and society/government (any level). Depending on the context other actors may be involved, creating “multi-helix” models. In this position paper we do not specify each helix but choose to refer to “triple-helix” for simplicity.

different interests and brokering with partners. Building of trust and understanding must be given time.

Triple-helix and other multiple-helix innovation clusters play an important role in emerging innovation systems. The mobilisation of human and financial resources in clusters have proven to be a successful way to develop and strengthen innovation systems in low- and middle-income countries where these systems are still weak. When a cluster works well, it has the ability to offer a neutral space for cluster members to exchange ideas, experiences and develop new solutions. By combining stakeholders' respective perspectives and building mutual trust, innovations can be developed. The innovation process is characterised by interactive experience sharing and development of learning among diverse agents, which is one of the reasons for the success of triple-helix initiatives, where stakeholders interact and work jointly towards the same goal.

ii) Capacity

Innovation in knowledge-based sectors strongly depends on skilled human capital, and there is a continuous demand for a qualified workforce in society (such as teachers, health practitioners, CSOs), in governments/public sector, in the private sector as well as at universities. Educated and skilled human resources are a central pillar for development, growth and innovation. Furthermore, it is of critical importance to target relevant training in the early stages of higher education. These adequately skilled individuals are needed in all parts of society. Therefore, there is a great concern to offer quality-assured higher education in all countries.

In LLMICs the limited investment in skilled workforce is seen particularly in the private sector, where only few domestic companies have their own research and development capacity. Companies that produce or introduce new innovations to the markets are scarce or often too small to

be able to effectively scale. Furthermore, the companies that are innovative tend to use experience-based instead of science-based knowledge, and mostly use imported technology.

Micro-, small- and medium-sized enterprise (MSME) mainly import new technologies and their absorption capacity (e.g. the ability to use, adapt and improve knowledge and competence to local conditions) is low. In LLMICs the major part of research and development takes place at research institutions. Therefore, collaborations between research institutions and MSMEs are of particular importance.

iii) Financing structures

In LLMICs there are limited public resources to invest in research and innovation, and the capacity of the financial system to support domestic investment in innovation and new enterprise is weak. Little is invested in a skilled workforce, leading to weak human capital at all levels. This limits even successful innovations to be scaled.

International development agencies have supported the upscaling of innovation where the market purchasing power is low. One example, to which Sida contributes, is the volume guarantee to contraceptives. Another example is the scaling out of climate-smart seeds to small-scale farmers to promote local markets. Meanwhile, the risk of doing harm to the private sector needs to be considered carefully before aid agencies go in and finance scaling of innovations.

The low financing capacity in LLMICs is also reflected in the relatively small investments in infrastructure, such as roads, electricity and telecommunication. Inadequate and unreliable infrastructure leads to high costs of doing business and makes it difficult to be innovative. It also leads to higher indirect costs, thus reducing net productivity, compared to competitors in the rest of the world.

Figure 2. Actors of the innovation system

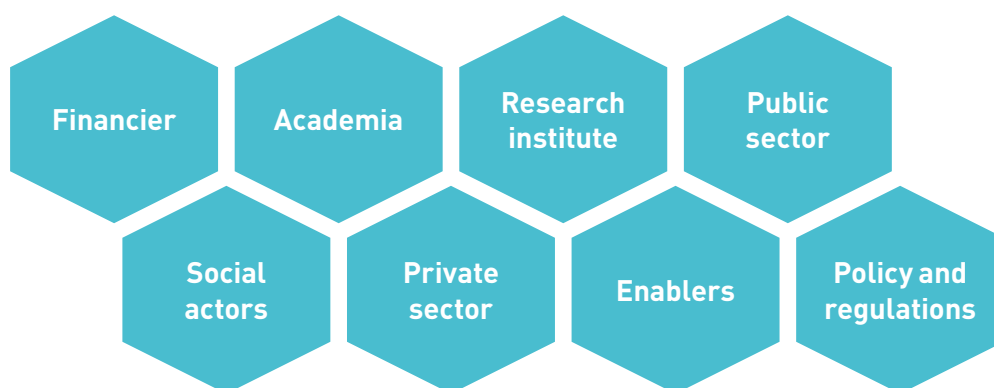
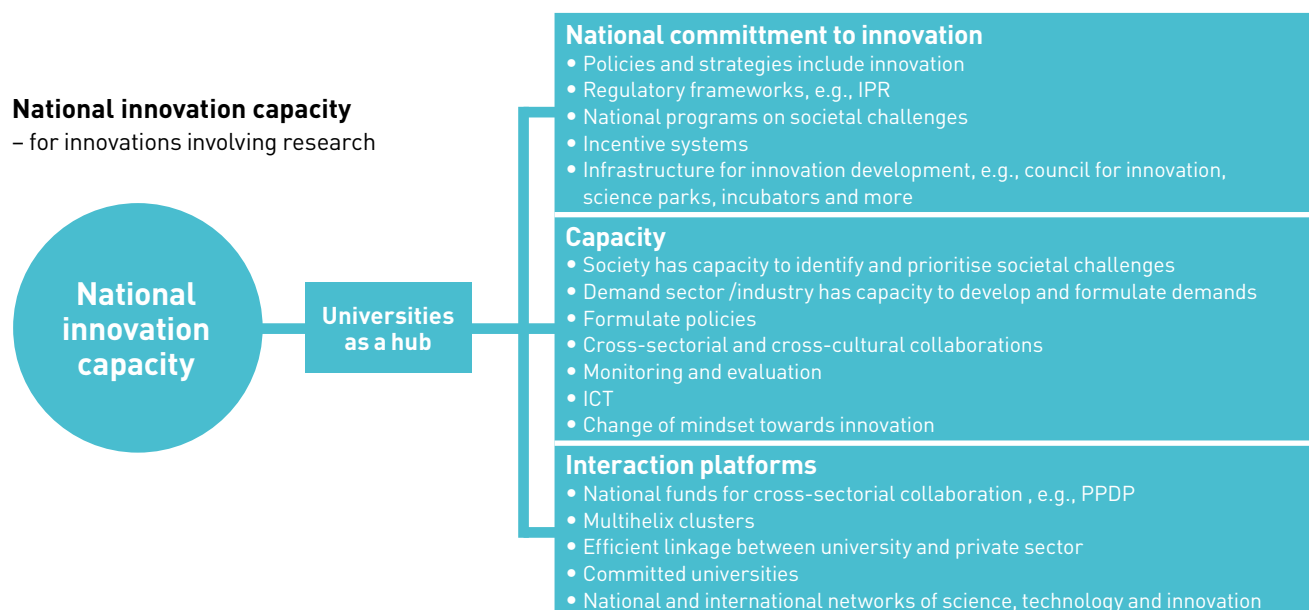


Figure 3. A description of what national innovation capacity may mean. Input from Sida's bilateral research cooperation partners from six countries (from the Sida-organised workshop "Capacity to innovate" in Nairobi, 2017)



iv) Structures, policies and mechanisms

The development of innovations involves adding value to an original idea through a series of development processes; from new ideas to commercial scale-up. This process needs a repeated interaction with the end users to reach a useful result. The traditional linear approach to innovation⁴ is criticised for its lack of sufficient feedback mechanisms, which are crucial to the innovation process. Structures are hence needed to promote the non-linear process of innovation.

Evidence-informed policies need to be in place, as well as structures and mechanisms, such as appropriate systems for intellectual property rights (IPR), regulatory agencies, resources, formal structures for interaction and other crucial parts of the innovation system. Efforts must be made to develop an environment stimulating knowledge creation and absorption by enterprises to enhance competitiveness, to exploit synergies between enterprises and other centers of knowledge, as well as to provide incentives and support for innovation.

Informed policy needs relevant evidence

While many LLMIC settings share the same constraints, a good understanding of what drives and hinders innovation in the particular context is the starting point of policy

making. Research for innovation, studying the best way to reach societal impact and develop innovation systems, is therefore important to inform the development or adaptation of policies and for developing adequate structures. For example, research on innovation systems in LLMICs has found that the nature of innovative outputs is mostly informal; most of the innovations take place in informal settings and through informal interactions, which have until recently been largely absent from the research agenda on innovation systems.

A study on the dynamics, challenges and opportunities of developing innovation systems in low resource settings with focus on Uganda, emphasises the need for greater interaction and learning among actors in the emerging innovation systems in Uganda and eastern Africa⁵. Another study, in Bolivia emphasises the importance of inclusive innovation, where the collaboration between university and society is a way to stimulate and drive this process⁶.

The level of innovation over time must also be measured and evaluated. This can be done by building on the African Science, Technology and Innovation

⁴ The linear approach refers to a one-way process which begins with basic research that flows into applied research, development and diffusion.

⁵ Julius Ecuru "Unlocking Potentials of Innovation Systems in Low Resource Settings", 2013 (Dec 2018 from www.bth.se/eng/technoscience/documents-papers/)

⁶ Carlos Acevedo "Developing Inclusive Innovation Processes and Co-Evolutionary University-Society Approaches in Bolivia", 2018 (Dec 2018 from www.bth.se/eng/technoscience/documents-papers/)

Indicator initiative of AU/NEPAD (now Africa Union Development Agency, AUDA) and other initiatives that will support the measuring of innovation in Africa, e.g., the African Innovation Outlook. This requires commitment, funding and collaboration by African countries, as well as concerted efforts to invest in data and information gathering and a commitment to evidence-informed policymaking.

Scaling

Before taking innovations to scale, it is important to consider what the “right” scale is in the particular case. For example, some innovations shall be available only in certain circumstances, such as provision of clean water in humanitarian settings, while other innovations are to be spread across continents. Hence, it is necessary to define what one wants to achieve at an early stage, as well as which actors have to be brought in. One needs to identify the problem owner, the solution owner, the user and the potential enabler. For this purpose, the stakeholders who can bring it to the right scale need to be present in the discussions from early stages; for example, the Ministry of Health needs to be present in the case of a social innovation targeting neonatal health, so that they can demand the right data to prove effectiveness. In the case of a new crop, it may be useful to bring in potential commercial actors early in the process.

Achieving impact at scale involves moving from pilot testing to meaningful and sustainable positive changes at large scale. Partnerships are essential for scaling innovations; no research organization can act alone or lead scaling up of innovations in an effective way. Business firms, service providers, not-for-profit organizations and inves-

tors are key partners that can make the process effective. Civil society as well as public sector organizations may also be included in scaling up partnerships to achieve lasting, meaningful changes at scale.

d) The role of academic institutions in the innovation system

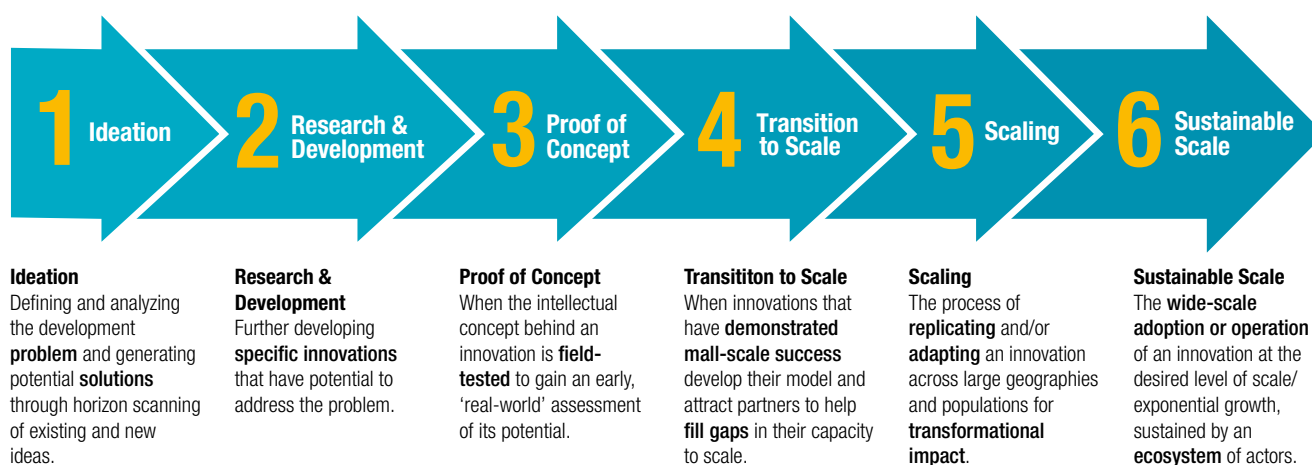
Academic institutions are key players in the innovation process as providers of 1) human capital with adequate training, 2) scientifically validated knowledge through research, 3) relatively neutral platforms for interaction between researchers and the surrounding society.

Linking universities closer to users of new knowledge is fundamental for the universities’ role for societal, environmental and economic development. The linkage may influence both universities, public and private sectors in different ways. It has for example been shown that hiring of well-trained graduates has an impact on the innovativeness of firms. The recruitment of adequately skilled staff may especially be important in low-income countries where the absorptive capacity (the ability to use and transform knowledge and competence that has been developed and is owned by other actors) in relation to new technologies and processes is a major bottleneck.

Providers of human capital with adequate training

Knowledge in all its forms is one of the most important factors for individual fulfilment and success in society. Education and research play a decisive role in the creation, dissemination and use of knowledge. They form an important foundation for innovation at all levels, which in turn drives the economic, social and cultural development of a country.

Figure 4: Six stages of Scaling Innovation. Source: IDIA Insights on Scaling Innovation, June 2019



Universities are key catalysts in educating and shaping the next generation of a skilled workforce, including those who will be involved in innovation, such as innovators, private sector staff, and decision-makers. There is also the strongly held view that higher education should respond in and through all three core function areas of a university; teaching, research and community engagement. This can be done through the development of new curricula and qualifications to address new education and training needs, through developing appropriate research themes to address new knowledge needs, and through forging new partnerships and joint ventures with private and public sectors, government and society.

To develop universities' curricula relevant to society, interaction with the surrounding society is necessary. An upgrading and modernising of the education of experts and researchers in relevant fields is hence essential.

In addition to adequate disciplinary training addressing the needs of society, the formation of graduates with good problem-solving skills is essential. One way to address this issue is to promote challenge-based education where teaching is based on addressing specific problems in the local context, and where the students need to interact directly with different stakeholders in society in solving their specific problems. Such education leads to the provision of individuals capable of taking on societal challenges.

Providers of scientifically validated knowledge through research

Research may generate important results that can be used in society, but the link between the researchers and the implementing partners may be weak or even non-existent. As innovation is not a linear process, structures for constant and timely feed-back mechanisms are necessary.

Multidisciplinary research usually leads to the most robust results, and when addressing societal challenges, the inclusion of social sciences and humanities is of particular importance. There are many good examples where researchers from a number of disciplines work together to solve problems in society. Collaborations involving stakeholders from different sectors are equally important when taking on complex challenges. Implementation research is very useful, especially for putting results to scale. Engaging stakeholders, such as policy makers or implementers, through embedded research, has proven successful and is increasingly being used.

Research on innovation and innovation systems has proven successful in creating an understanding of the interplay between the different stakeholders and promoting evidence-informed policy-making.

Platform for interaction between researchers and the surrounding society

The role of a research institution may be to identify and define societal challenges as well as the strategies to generate the knowledge that enables impact. The researchers may generate research results adding to the solution. Importantly, there is a need for co-creation and systematic collaboration between the different actors of the innovation process, including society at different levels and from different sectors. The importance of involving and collaborating with the end users and the producers has been increasingly emphasized, and multidisciplinary approaches have shown to be important to achieve sustainable results. Merely providing solutions to a challenge is not efficient, unless the uptake and upscaling are considered.

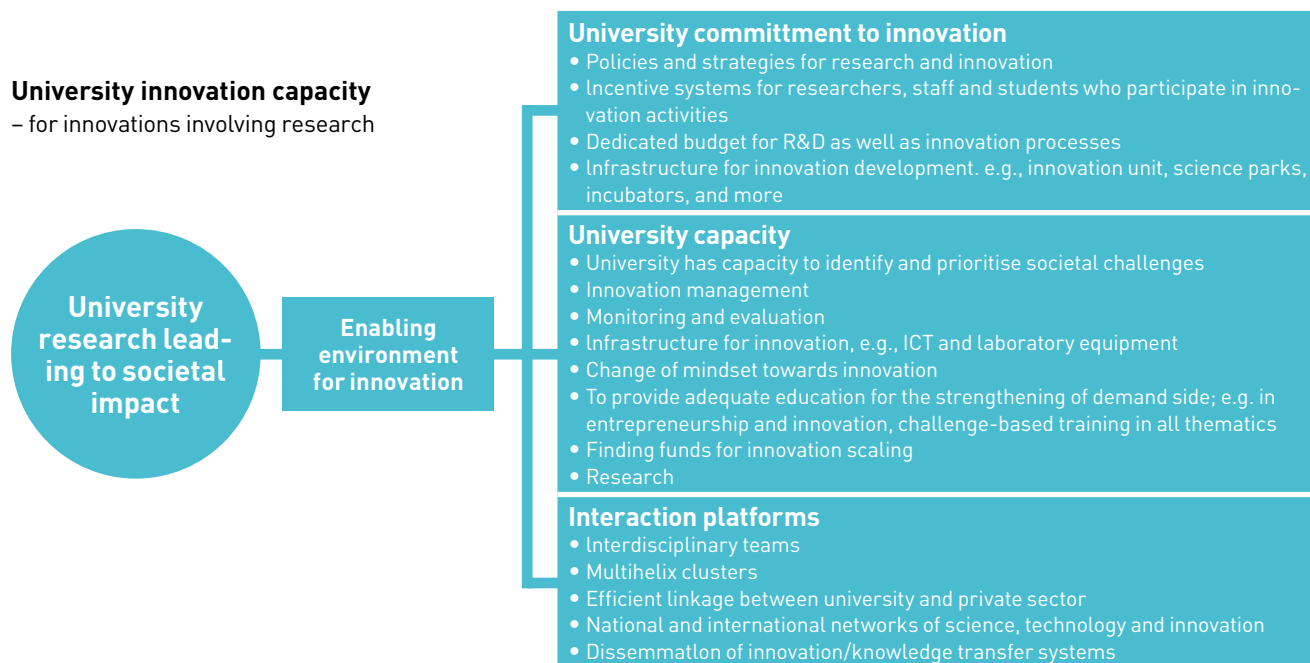
The collaboration between academia and the surrounding society is important to achieve intended changes and there are many ways to do so. Although this interaction usually takes place sporadically at all research institutions, a more structured approach has the potential to be much more efficient and lead to increased societal impact.

Transfer of knowledge in its various forms from the research institution to different actors in society can be referred to as "knowledge transfer". In the past, it was more common to focus on the transfer of technologies why the term "technology transfer" is still a dominant concept. These practices thus can be understood as a linear paradigm. Historically, knowledge and technologies are produced at universities and research institutions and transferred to society or other end user in a linear fashion. With limited or non-existent feedback mechanisms, the impact of these knowledge and technology transfers may be limited.

Instead, new kinds of structures are evolving, adapting to local conditions. For example, there has been an increase of persons trained as "scientific liaison officers", who follow researchers closely in order to find results which can be interesting to take forward. Furthermore, "innovation offices" or "innovation hubs" have been developed at universities to facilitate the development of new ideas from academia. So-called "innovation managers", many times employed at the innovation office, act as brokers between the researchers and the surrounding society, facilitating interaction and development of new ideas.

Innovation managers need to have a deep understanding of the innovation process and the different stakeholders, such as the needs of the end users as well as the possibilities of the researchers to meet their demands. They may need competence in relationship building, regulations, agreement writing and IPR. The interaction is preferably both ways; supporting researchers and students to

Figure 5. A description of what university innovation capacity may mean. Input from Sida's bilateral research cooperation partners from six countries (from the Sida-organised workshop "Capacity to innovate" in Nairobi, 2017).



reach out, and supporting the surrounding society to reach in. An innovation hub should preferably be a neutral platform for interaction.

In low-income settings the universities' interactions with the surrounding society is often weakly developed, and many universities do not have a structured interaction with society at large. However, there are pockets of individual initiatives and these demonstrate the potential of a more structured approach.

The research institution's role in the innovation system

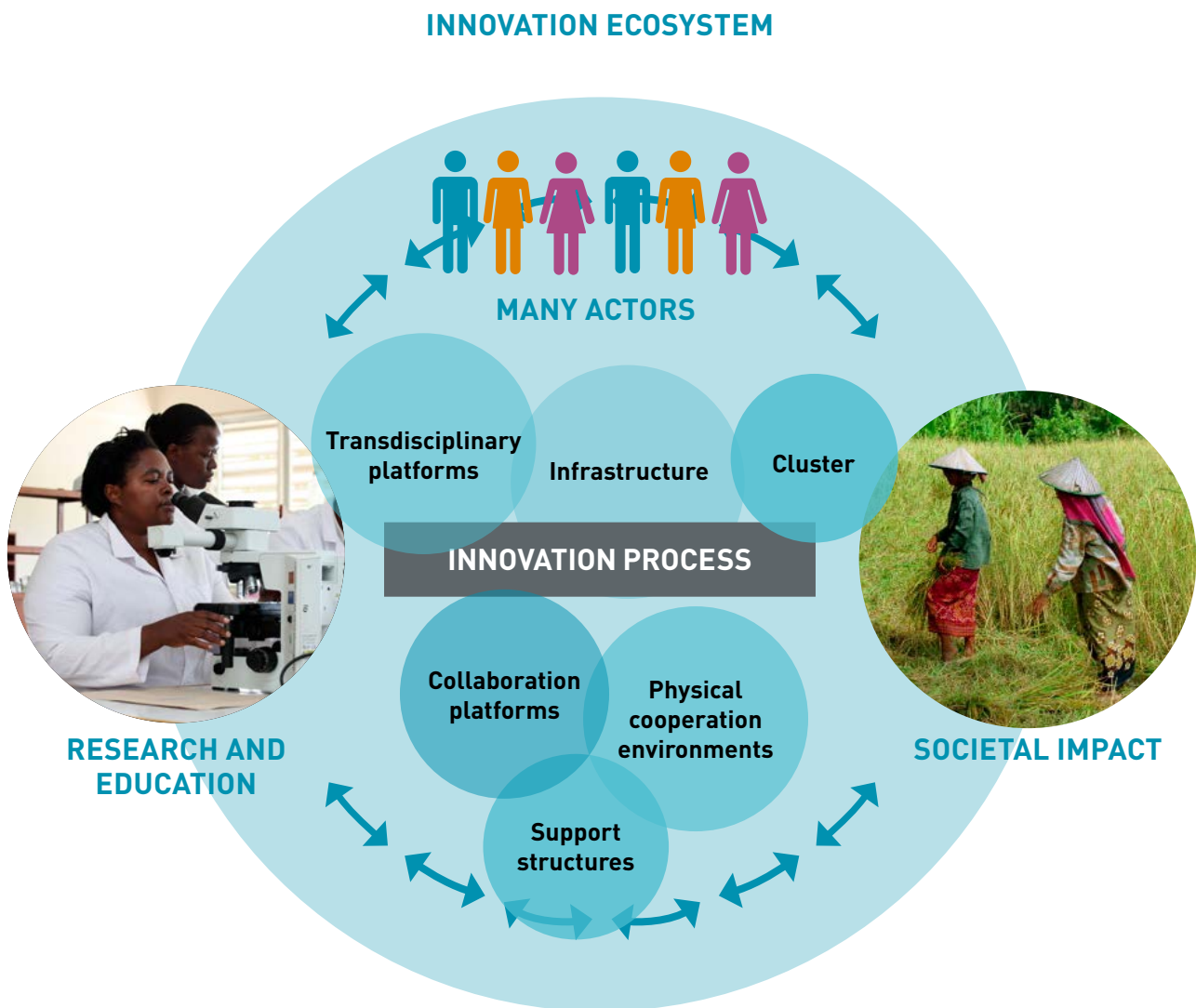
Figure 6 shows one way to present the innovation ecosystem⁷ involving academic institutions. When a need/problem is defined in society, the researchers and/or students at the academic institution explore how it can be addressed. The researchers and/or students develop potential solutions. The innovation process from idea all the way to impact, i.e. solving the problem, is anything but linear, and an iterated feedback mechanism must be integrated in the process. The process can be long, 10–20 years when it comes to complex challenges.

There are many actors involved, and the role of the academic institution lies primarily in the first part of the innovation process. However, academic institutions may be involved throughout the process to refine and adapt the original ideas.

A research institution cannot possibly achieve impact on its own but is one actor amongst many in the innovation ecosystem. The role of a research institution can be to support the identification and definition of desirable societal challenges, and to generate knowledge that enables impact. Researchers may generate research results for solutions and train people to acquire the adequate skills. Co-creation and systematic collaboration between the different actors along the innovation process are fundamental for the uptake of the knowledge produced by researchers. The involvement of users and producers as well as multidisciplinary approaches have shown to be key to achieve the desired change and sustainable results.

⁷ The term "innovation ecosystem" reflects the nature of a constantly evolving and interdependent system where one component will affect the others.

Figure 6. A presentation of the innovation ecosystem involving academic institutions: Transdisciplinary platforms for interaction between different disciplines, collaboration platforms for interaction between different sectors and actors, infrastructure, innovation clusters, environments for physical cooperation such as incubators and science parks, and support structures such as innovation hubs or regulatory agencies.



4. CURRENT SUPPORT

Sida's Research Cooperation initiated its support to innovation in 2003. The national innovation systems in Sida's partner countries and regions were described as fragmented and in need of improvement but also with a clear potential to transfer results from the supported research programs to use. Since then, the support has evolved organically, and innovation actors have matured both through different kinds of support and a general development process. This means that actions which were not possible earlier may now take place naturally or are at a stage where a more strategic approach is possible.

Currently, the Research Cooperation at Sida channels support to innovation through the bilateral, regional and international systems to research and innovation institutions, research and innovation councils, ministries and international research organisations. Sida views research cooperation and development of innovation capability as key and strategic to sustainable development objectives, addressing environmental, social, and economic challenges in developing countries and regions. The Sustainable Development Goals of Agenda 2030 are addressed throughout the portfolio.

The "Strategy for Research Cooperation and Research in Development Cooperation 2015–2021" guides Sida's Research Cooperation support to innovation and the 3rd results area with its three subgoals is most relevant to highlight in this paper:

"Strengthened research of high quality and of relevance to poverty reduction and sustainable development, focusing on the promotion of research that, through innovation, can contribute to poverty reduction and sustainable development;

- 3.1 *More interfaces, networks and cooperation established between actors from research institutions on the one hand, and the business sector, public authorities and civil society on the other,*
- 3.2 *Improved conditions for researchers to develop innovative ideas with the potential to contribute to the emergence of new products and services that contribute to poverty reduction and a sustainable society, and*
- 3.3 *Reinforcement of the role of universities and their contribution to innovation processes and systems."*

Other documents guiding the support are found in appendix 1.

The support below is described according to this Strategy result. Although supported interventions typically contribute to more than one of the sub-goals, they are divided below to highlight certain aspects of the intervention. A snap-shot of ongoing Sida-funded interventions and what they target is found in appendix 2.

Objective 3.1: More interfaces, networks and cooperation established between actors from research institutions on the one hand, and the business sector, public authorities and civil society on the other

As seen in the previous chapters, innovation depends on interaction and linkages between different actors affected by the challenge. This is especially true when it comes to complex societal challenges, where multiple actors from different parts of the society need to jointly define viable solutions. There are many ways to promote and enhance this interaction, and through Sida Research Cooperation major efforts are addressing this critical issue.

Innovation clusters, involving stakeholders from academia, public authorities, society and the private sector

One of the first collaborations targeting innovation by Sida Research Cooperation was the support to innovation cluster initiatives in Tanzania, Uganda and Mozambique in 2006 and later Rwanda and Bolivia. Co-creation processes were taken into consideration from the start. Some institutions were more mature to embrace this support than others. In the external evaluation of these programs (Rath, 2012) the "innovation system" concept was found to provide a useful framework for Sida's support within research cooperation, and the support to "innovative clusters" was a natural extension of research capacity building at the universities to create impact in society. An important part of the cluster development is the training of cluster managers, who act as "facilitators" between the different actors⁸.

The support to innovative clusters in Tanzania started off at University of Dar es Salaam in 2006 and eight clusters were initiated. In 2010 the management of the cluster support was taken over by COSTECH⁹ which has the role of linking researchers to other actors in society. The programme trained facilitators and cluster firms to develop business models and offered competitive seed funding and more than 40 clusters were trained. Since 2015 a pilot for a more systemic approach has been developed aiming at developing a national model for support to micro, small and middle-sized enterprise (MSME). This is a collaborative effort between Sweden, COSTECH and Small Industries Development Organization (SIDO) which includes a research-cluster model for knowledge transfer and co-creation.

⁸ Sida previously supported the Pan-African Competitiveness Forum (PACF) in coordinating cluster development in Africa by applying a systematically designed process intended to accelerate the pace of establishment of cluster initiatives as foundations for innovation and knowledge based economic development on the continent.

⁹ Tanzanian Commission for Science and Technology, www.costech.or.tz

Zanzibar Seaweed Cluster Initiative

In 2006 researchers at the Institute of Marine Sciences (IMS), University of Dar es Salaam, started to link the knowledge they had generated through applied research to the practices of small seaweed farmers in Zanzibar. By using this knowledge, the seaweed farmers have succeeded to increase their yield and income in an environmentally sustainable way and make a better life for themselves. The seaweed cluster involves researchers from the Institute of Marine Science, the Ministry of Agriculture, local and district governments, the Commission for Science and Technology (COSTECH), and small family businesses – they started with 20 members from one village in 2006 and increased to 3 000 members from eleven villages in 2013. The results include both product and process innovation, which has led to economic and social development with the main beneficiaries being women. The production of seaweed increased by 150% in three years.

Using the theoretical terms introduced in the previous chapter, “producer of knowledge” is the researcher and the “user of knowledge” is the farmer in this example, and they are involved in co-production.

The IMS is supporting various business clusters in Tanzania in the area of marine resource-based production such as seaweed and fish farming clusters, pearl fishing clusters etc. The results are an outcome of “The Innovative Cluster Programme” that was introduced and funded by Sweden since 2006 in collaboration between the University of Dar es Salaam (UDSM) and Scandinavian Institute for Competitiveness and Development (SICD). To date more than 40 business clusters have been supported and the programme is currently managed by the Tanzanian Commission for Science and Technology (COSTECH).

Institute of Marine Sciences (IMS) are also experimenting with adapting a local species of freshwater fish to salt water. Increased production of farmed fish is a response to deep-sea fish catches decreasing along the Tanzanian coast due to increased water temperature, dynamite fishing, as well as salt water intrusion into the ground-water limiting the ability to cultivate freshwater fish. The researchers at IMS also provides extensive support for local fish farming clusters to develop skills in salt water fish farming.

Sida’s research support to triple-helix innovation clusters looks different in different countries; e.g. in Mozambique there was a competitive call to set up the clusters by the national research fund (Fundo Nacional de Investigacao, FNI¹⁰) resulting in a large number of initiated clusters, while in Bolivia the two cluster initiatives are operated directly from the Bolivian university UMSS¹¹.

The support to innovation clusters has proven to have positive secondary effects. At the same time as the cluster is developing, a local innovation system may evolve. The clusters at UMSS, for instance, were developed through a bottom-up process, and in a parallel process the emerging innovation system is engaging at both regional and national levels.

Innovation hubs at universities

Supporting the development of innovation hubs at research institutions aims to facilitate the interaction between researchers and the surrounding society. Three such initiatives have been supported so far. One of them is at UMSS, Bolivia, where a technology transfer hub was developed. Innovation managers were trained, and a network of researchers connected to innovation was formed. The hub had started to develop naturally, and stepwise it has expanded its function at the university and now gathers researchers from all faculties who are interested in innovation for networking, capacity building in innovation and for contacts with society. The aim in the long run is to be the university’s gateway to the surrounding society.

The second hub initiative is supported through the program “Social Innovation in Health Initiative” (SIHI) run by TDR¹², where innovation hubs were established in 2017 for social innovation at four universities in the global South. The hubs have identified successful initiatives in social innovation and by studying them, they are gaining understanding of what works and what doesn’t work in this context. Although still under development, a proposed role of the hubs is to work as facilitators, connecting partners for research, monitoring and evaluation, as well as with those who need to be involved in potential upscaling (such as the Ministry of Health).

The third example is at the Makerere University in Uganda, where Grants Offices have been established at six colleges to facilitate and promote innovation and transfer of knowledge. The Grants offices have been mandated with the responsibility of accelerating research uptake in accordance with the University Research and Innovations Strategy.

10 www.fni.gov.mz

11 Universidad Mayor de San Simón, UMSS, www.umss.edu.bo

12 The Special Programme for Research and Training in Tropical Diseases, TDR, www.who.int/tdr

Cooperation between researchers and the private sector

New knowledge generated through applied research has a great innovative potential and application in society. BioInnovate Africa¹³, *icipe*¹⁴, EDCTP¹⁵ and CGIAR¹⁶ are good examples of how research can generate innovative applications. Many of the innovations for agriculture, environment, health and process industry that have been funded in the region have been adopted and used by their stakeholders, as the crucial feedback mechanisms are taken into consideration from the start of the process. Within the BioInnovate programme, there are several public-private development partnership (PPDP) which is an efficient way of getting results to the market/society.

Interaction between researchers and other stakeholders can be incentivized using different funding mechanisms. One example is competitive calls to encourage collaboration on specified challenges. This has been tested through different initiatives, e.g., in 2018 a call at COSTECH in Tanzania was launched with a specific window open for joint applications from academia, public sector, entrepreneurs and/or actors from civil society.

Smart Ayllu

In some places the cooperation between different groups can be challenging, based on preconceptions or previous bad experiences from interaction. In Bolivia, for instance, there is a reluctance of the Aymara people to collaborate with researchers, but after many years of building trust through regular contacts and feedback on research results the trust has increased, and the community has engaged in a platform for collaboration called Smart Ayllu (translates as “smart community” in a broad sense). People tell the researchers what their challenges are, and the researchers try to find solutions together with them. Sida supports this initiative through the research programme at the university UMSA, La Paz, Bolivia.

CGIAR weather index insurance

Extreme events erode farmers’ livelihoods through loss of productive assets, while the uncertainty associated with climate variability is a disincentive to investing in agricultural innovation. The impacts of climate-related risk contribute to poverty traps that lock many farmers in climate-vulnerable livelihoods, impeding the kinds of transformation that smallholder agriculture needs in order to adapt to climate change. Traditional indemnity-based insurance, sometimes referred to as Multi-Peril Crop Insurance, often requires farm visits to verify loss claims. Although it has been effective for large-scale farms, this type of insurance generally unfeasible to implement at scale for smallholder farmers.

CGIAR has in collaboration with both farmers and the private sector developed an index-based insurance, which triggers pay-outs based on an index that is correlated with agricultural losses, rather than actual losses. Indexes include rainfall during a defined period, yields sampled over a larger region, and remote sensing of vegetation conditions or flood extent. Index insurance seeks to cover specific threats that can be captured by the selected index, generally at aggregate scales rather than at the level of individual farms.

It is a tool that allows smallholder farmers to better manage climate risk, enabling investment and growth in the agricultural sector. Index insurance is not designed to cover every risk or a farmer’s entire livelihood, but instead protecting them from a clearly defined hazard. This again leads to more affordable premiums because the insurance company is able to quantify more accurately the probabilities of payout and is covering less risk. These factors have led many to suggest that index insurance might allow smallholder farmers access to the insurance market and that it could become a key tool in the fight against poverty.

Cooperation between researchers and society

The previously mentioned “Social Innovation in Health Initiative¹⁷” run by TDR has taken an approach to social innovation with special attention to involving the target group as partners and not, as some do, as “subjects” in a study. The programme which was launched in 2014 is still developing and providing evidence which can be used in other such initiatives.

¹³ <https://bioinnovate-africa.org/>

¹⁴ International Centre of Insect Physiology and Ecology, *icipe*, www.icipe.org

¹⁵ The European & Developing Countries Clinical Trials Partnership (EDCTP), www.edctp.org

¹⁶ Consultative Group on International Agricultural Research (CGIAR), www.cgiar.org

¹⁷ Social Innovation in Health Initiative, <https://socialinnovationinhealth.org/>

In the BecA-ILRI¹⁸ hub programme new crops are evaluated for the specific conditions of Eastern and Central Africa. Farmers and their organisations have been involved since the start, both in the identification of demands and in the testing of different crops. This way the researchers can have their grains and crops tested in small scale all along the development and finally achieve a sustainable result.

The LIRA-program

LIRA¹⁹ is a call for collaborative, inter- and transdisciplinary research programs for researchers that should include two African countries. Research questions should be co-designed with key stakeholders and these should also participate in the research process. The first call focused on disaster risk reduction and the two last calls focus on different aspects of challenges for a sustainable development of urban areas. The investigators are invited to training events in transdisciplinary science and an annual research forum, aiming to foster collaboration between LIRA researchers, relevant stakeholders and other related projects and actors e.g. Future Earth.

In many cases CSOs are collaboration partners, and sometimes the interaction takes place directly at the individual level. In the cases mentioned in this section, the interaction has been at the community level with village chiefs, small farmer organisations, and/or including CSOs.

Cooperation between research and public sector

Reaching decision-makers with new evidence and include evidence in policy can many times be challenging. Our partners are using different approaches, for example The Latin American Council of Social Sciences (CLACSO)²⁰ launched a call in 2017 to explore the processes generating discrimination, inequalities and gender injustices in its various manifestations such as femicides, segregation and other forms of violence against women. The call aims to tighten the collaboration between research institutions and civil society and to impact policy makers.

Another approach is to include decision-makers as board members, such as in the case of the International Vaccine Institute (IVI)²¹ where the Board includes a representative from WHO. Icddr,b²² is another, where UNICEF and Bangladesh Ministry of Health are included as Board members. This considerably shortens the way from results to policy, and relevant evidence for decision-makers can be communicated directly. In addition, both organisations have close contact with WHO, GAVI, UNICEF and UNFPA to communicate policy-relevant evidence.

Spreading innovations South-South

A recently initiated project funded by Sida is the trials of an innovation developed at icddr,b called bubble CPAP, which is a system used to increase survival of small children with severe pneumonia. The existing WHO guidelines are good, but can, according to icddr,b evidence, be better through the use of this low-cost innovation. Having been tested extensively in the controlled conditions at icddr,b, WHO demands evidence from other countries. The innovation is now being tested in Ethiopia on demand of their Ministry of Health and through the Sida-supported health institute AHRI²³. With this additional evidence, if successful, WHO will be able to revise their guidelines.

Using the terminology described in the previous chapter, in this example the “problem owner” are the families/ children (or in another way of seeing it, the Ministry of Health), the “users” are the clinicians, the “solution owner” are the researchers, and the “enabler” is WHO who will provide the updated guidelines as well as the various Ministries of Health who will implement the guidelines.

IVI is, in addition to developing vaccines, supporting vaccine manufacturers in getting evidence for approval by national regulatory agencies. They support manufacturers in clinical and field trials, perform socioeconomical analysis and provide necessary evidence in collaboration with manufacturers so that the necessary vaccines reach the poor; e.g. cholera, typhoid, dengue.

The Alliance for Health Policy and Systems Research²⁴ (the “Alliance”) is using different innovative ways to shorten the path between research and decision-making.

18 Biosciences eastern and central Africa – International Livestock Research Institute (BecA – ILRI) Hub, <https://hub.africabiosciences.org>

19 LIRA programme, <https://council.science/what-we-do/funding-programmes/leading-integrated-research-for-agenda-2030-in-africa>; https://www.sei.org/featured/living-with-smoke/?utm_content=buffer6025d&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer.SEIresearch

20 The Latin American Council of Social Sciences (CLACSO), www.clacso.org.ar

21 International Vaccine Institute (IVI), www.ivi.int

22 International Centre for Diarrhoeal Disease Research, Bangladesh (Icddr,b), www.icddr.org

23 Armauer Hansen Research Institute (AHRI), <https://ahri.gov.et/>

24 Alliance for Health Policy and Systems Research, AHPSR, www.who.int/alliance-hpsr/en/

In partnership with UNICEF and Gavi in the “Decision-Maker Led Implementation Research Initiative” to support fourteen embedded research projects led by decision-makers with researcher counterparts to improve the implementation of immunization programmes in low- and middle-income countries. This work produced context-specific evidence to inform decision making and action and strengthened capacity in implementation research.

Improving the use of research results among decision-makers

At the University of Rwanda²⁵, a seminar was held in 2017 to bridge the gap between researchers and policy makers to improve the use of research. A handbook in Rwandan Social and Economic Policy was launched in 2018, and agreements were made with Rwandan institutions to supply the university with their research priorities aiming to improve policy relevance of their research. Through the regular production of policy briefs and the improved relationship between the community of researchers and the community of policy makes the uptake of research findings in the policy making process is expected to be improved. Training of researchers in the writing of policy briefs has been part of the process.

Objective 3.2: Improved conditions for researchers to develop innovative ideas with the potential to contribute to the emergence of new products and services that contribute to poverty reduction and a sustainable society.

The outcome of this objective regards the existence of mechanisms and structures for innovation, creating an environment where research findings can efficiently be transferred to society. There needs to be strategies and policies supporting innovation processes, regulatory frameworks, appropriate resourcing for the long-term investments and engagement as well as for the up-scaling of innovations. Structures, such as agencies for quality assurance, standardization and IPR are necessary parts of the innovation system. In addition, there is a need to monitor the level of innovation as well as the implementation and resourcing of innovation activities, especially as a source of information for policy making and development of strategies. For this purpose, research on innovation and innovation systems is important.

²⁵ University of Rwanda, www.ur.ac.rw

Monitoring of innovation

In order to guide policy, there is a need to include measurements and indicators of innovation²⁶, such as those included in the African Innovation Outlook²⁷. Sida has supported and is supporting the AU/NEPAD (now Africa Union Development Agency, AUDA) initiative ASTII (African Science, Technology and innovation Indicators) that in 2010 launched the first ever African Innovation Outlook and its second edition in 2014. The African Innovation Outlook has proven to be a great tool to understand the development in Africa. It has been used by African countries to put in place policies aimed at developing science, technology and innovation. A third version is due in 2019.

Innovation research

Sida Research Cooperation has funded four PhDs thesis on innovation systems; two in Uganda and one in Bolivia; and another thesis is to be defended in 2019 in Bolivia. The research done by these four individuals is of particular interest to their own countries and inform the development of the respective innovation systems.

Sida has recently supported research on innovation systems through Globelics²⁸, a global network of scholars who apply the concept of “Learning, Innovation, and Competence Building System” as their analytical framework. The network is especially dedicated to the strengthening of research capacity in innovations research, as well as strengthening the learning, innovation and competence systems in the South. Globelics produce thematic reviews which are useful for informing decision-makers and other stakeholders in the development of an environment for innovation. Sida’s support to Globelics is mainly dedicated to allowing scholars from low- and lower middle-income countries to attend Globelics conferences and academics.

Sida also provides support to Africalics²⁹, which gathers researchers working on innovation from the African continent and provides decision-makers with evidence related to innovation. As such, they contribute to developing a national and regional environment fostering innovation from across actors and sectors. Africalics organises conferences, PhD academies, visiting fellows programme for PhD students and post-doctoral researchers and dedicated online networking platforms.

²⁶ Sida has supported UNESCO Natural Sciences sub-program Go-Spin, which focuses on science, technology and innovation indicators

²⁷ African Innovation Outlook, www.nepad.org/publication/african-innovation-outlook-ii

²⁸ Global Network for Economics of Learning Innovation and Competence Building System, www.globelics.org

²⁹ African Network for Economics of Learning, Innovation and Competence Building Systems, www.africalics.org

Increased capability to strengthen the innovation system

In 2017 Sida organised a one-week course and networking event in Nairobi, “Capacity to innovate”. The six countries where Sida had ongoing bilateral research cooperation³⁰ participated with representatives of innovation from the Sida-funded universities. Representatives from either the ministry or council/commission responsible for research and/or innovation were present from four of the African countries. The event took place at *icipe*, known for its innovation-enabling environment. Being in this environment inspired the participants. In addition to sharing experiences and lessons learned, the participants from each country got the opportunity to get to know each other and discuss the particular challenges in their country. The workshop was led by a Swedish innovation expert who has experience from low-income countries and included interactive components as well as lectures. It became obvious to the participants that there is a great need for capacity strengthening both amongst themselves and at the level of leadership of their respective organisations, as well as at the country level. The potential of Sida to use its convening power to create an area for interaction between different stakeholders was also highlighted.

Other instruments at Sida can be useful for stimulating innovation and improving innovation systems, such as the International Training Programs (ITP) on IPR in cooperation with the Swedish patent and registration office (Patent- och registreringsverket, PRV). An adapted version is presently being supported by Sida Research Cooperation, where PRV has a directed on-site course at the research institutions and is targeting the researchers’ IPR challenges in particular. Another example is an innovation management course organised by the International Development Innovation Alliance³¹ (IDIA), a group of development actors with a focus on innovation, where Sida is involved.

Innovation networks

Sida Research Cooperation supports capacity building through network activities such as conferences where innovation is in focus, e.g. the African Innovation Summit in June 2018, and the Africalics conferences. In these cases, Sida finances travel costs, allowing researchers from low-income countries to participate in the events. Hereby the participants get the opportunity to stay updated in the field, build their networks and raise their voices in an international environment.

Both physical and virtual networks are supported through additional components of the Africalics cooperation.

30 Ethiopia, Uganda, Rwanda, Mozambique, Tanzania, Bolivia

31 www.idiainnovation.org/

Pathways to scale innovation

Sida Research Cooperation has limited experience from supporting business incubators, science/business parks and similar structures, as this lies outside of our mandate. However, capacity to run and develop such structures can be developed through participation in structures earlier in the innovation pathway and participation in clusters. One example is the set-up of a leather incubator in Bolivia. The set-up was not supported by Sida but is based on the work done by the leather cluster. In addition to this, a regional innovation agency is being planned in Cochabamba.

Although innovation funding from Sida Research Cooperation is targeted for the early stages, an initial analysis of the desired scaling of the potentially successful innovation must be done as well as the identification of the actors who will take the innovation to scale. Depending on the innovation, it may be private sector, and it may be ministries. This will influence the scaling models and the potential financing pathways.

Chipatala Cha Pa Foni

Chipatala Cha Pa Foni (CCPF) is a health hotline in Malawi staffed by trained health workers who provide Ministry of Health-verified information and referrals over the phone on all health topics including reproductive, maternal and child health, nutrition, and HIV. Through CCPF, women and caregivers can also sign up to receive personal text or voice reminders on maternal and child health topics specific to their month of pregnancy or their child’s age. The initiative has proven very successful and is now being scaled throughout the country, and possibly to Uganda. One of the important success factors is the early involvement of the Ministry of Health, who could provide input on the kinds of data needed for them to be able to scale.

CCPF is one of the initiatives studied within the TDR-funded program “Social Innovation in Health Initiative”.

Innovation financing mechanisms

Innovation processes are complex, and financing needs to evolve with the different stages of the innovation. Whilst the entire innovation process needs to be considered; from new ideas, proof of concept, technology development, application development, pilot testing to commercial scale-up, the Research Cooperation frame can only finance the development of innovations in the early stages.

In Tanzania, COSTECH has recently launched a national innovation fund with the aim of financing the

first steps of innovative ideas. Different kinds of support are included in the grants, including complementary components such as expositions, and platforms for bringing the different innovators from private and public sectors, academia and civil society actors together.

Recently, Sida initiated support to Grand Challenges Africa³², based at the African Academy of Science/Alliance for Accelerating Excellence in Science in Africa (AESA). This programme targets African researchers based at African research institutions, to allow them to develop solutions to Africa's development challenges. Researchers respond to calls with predefined topics and can in a first phase get funding for proof-of-concept studies. Successful studies with potential for scaling will be invited to apply for phase-two support (closed calls).

In addition to research cooperation support, "Challenge Funds"³³ are being financed from other Sida sources. These funds are open to innovators from across the globe for early funding for development of their innovations in defined areas. The "Global Health Investment Fund"³⁴ is another mechanism supported by Sida through the Guarantee instrument, encouraging innovation and product development. The Fund has provided opportunities for the development of orphan drugs/interventions. The "Global Innovation Fund"³⁵, where Sida is one of the financiers, provides funding schemes at three consecutive stages of development. In some countries Sida provides financing and support for market introduction, and for companies there are possibilities to use the guarantee instrument as a means to grow.

Funding of clinical trials

Sida provides support to the European Union and Member States programme, European & Developing Countries Clinical Trials Partnership (EDCTP), which funds clinical research to accelerate the development of new or improved drugs, vaccines, microbicides and diagnostics against HIV/AIDS, tuberculosis and malaria as well as other poverty-related infectious diseases in sub-Saharan Africa, with a focus on phase II and III clinical trials.

Sweden provides funding to the Private Agriculture Sector Support (PASS), a trust fund in Tanzania, which provide credit guarantees to banks to help farmers and businesses to obtain formal commercial loans which

they otherwise would not access. The average loan is 4,500 USD. PASS was invited to a meeting with COSTECH and SIDO for exchange of information about each other's work. PASS was highly impressed by the innovation capacity in Tanzania and said that they would consider supporting start-ups with new innovations that had been assessed and supported through the national innovation fund.

Testing the system by providing support to innovations

An opportunity to test the conditions for researchers to develop innovative ideas locally is by supporting specific initiatives. As the innovation process takes place, the bottle-necks of the system will be identified and possibly addressed.

Swebol Biotech

The start-up company Swebol Biotech develops quinoa-based products as milk-based alternatives. The products are based on research done at the university UMSA in La Paz, Bolivia, together with Lund University in Sweden. The innovation team is going through various challenges, such as weak intellectual property regulatory systems, weak possibilities in setting up financial schemes, and lacking capacity of marketing specialists. The same has occurred in the Bio-innovate program, where challenges on both national and regional levels were identified.

The International Vaccine Institute (IVI), which develops vaccines of diseases disproportionately affecting people living in poverty, are constantly participating in global structures of innovation, such as WHO prequalification and regulatory frameworks at national level, as well as IP rights globally. As such IVI takes part in improving global and national systems for innovation.

Objective 3.3: Reinforcement of the role of universities and their contribution to innovation processes and systems.

In countries with weak innovation systems the research institutions play an important role in the innovation system, i.e. interaction with society and stakeholders and for the actors to participate at regional and national level in discussions how to bring about development. Therefore, dialogue can be an important tool to bring up issues related to the research institutions' role in the innovation system even when Sida does not provide direct support to innovation-related activities at the research institution.

³² www.aasciences.ac.ke/aesa/programmes/grand-challenges-africa/funding-opportunities/

³³ <https://www.sida.se/English/partners/resources-for-all-partners/Challenge-Funds/>

³⁴ <http://www.ghif.com/>

³⁵ <https://globalinnovation.fund/>

Higher education contributing to the innovation system

Universities have a broad role in innovation, including education as such. An innovative society depends on education which provides relevant curricula, training in critical and analytical thinking, and training in addressing real-world challenges. In Bolivia, innovation and entrepreneurship were brought into under- and post-graduate education at the university UMSS, by involving students in challenges identified by industry within the cluster work. In Tanzania a similar approach is taken in the work of COSTECH by involving MSc and PhD students in the cluster programme.

The research cooperation with various low-income countries has generated thousands of researchers through the years in many disciplines, including economics where research on innovation systems are most common. Despite this, few doctoral students in economics or other academic areas have selected innovation as a topic. However, through the global and regional support to Globelics and Africalics, PhD students have had the opportunity to receive curricular innovation modules as part of their training as well as short competences enhancing workshops and courses through the annual PhD academies.

Master program on innovation

A master program on innovation and innovation management has recently been developed at Universidad Mayor de San Simón (UMSS) in Bolivia, where participants from all national universities are invited to participate, and hence the capacity to manage innovation will potentially spread across the country. As part of their studies some participants will go through their own university's innovation efforts and set up a plan for future development.

Research as a source for innovation

A main role of the research institutions is to produce research, which in many ways may serve society. Support to the development of innovations is included in most bilateral research cooperation. Research projects are defined by the partners and mostly concerns issues of high relevance for development within areas such as agriculture, health, energy and habitat. It is worth noting that research in the basic science subjects such as mathematics, physics and chemistry is also supported. For applied research, multidisciplinary and multisectoral teams have shown to be successful. At some research institutions the main part of the projects brings in researchers from different disciplines and when suitable, from various sectors (such as private and public sectors).

Fruit Fly Bait Production facility

A public private sector partnership between icipe and Kenya Biologics Ltd resulted in the "Fruit Fly Protein Bait facility". Research at icipe showed that an industrial by-product extract from East Africa Breweries Ltd, is capable of controlling fruit flies to levels comparable to commercially available protein baits in the Kenyan market. They have used this extract to develop Fruitfly Mania™, which has been tested in farmers' fields across Africa and found to be effective, leading to its commercialization.

Fruit flies are devastating pests of fruits and vegetables and are estimated to cause losses amounting to millions of dollars through direct damage to produce, and indirectly due to loss of market opportunities, as the presence of these pests leads to the rejection of horticultural products from Africa in export markets. Fruitfly Mania™ is used for the control of fruit flies

Innovation capacity building at research institutions

As mentioned under 3.2, Sida Research Cooperation has given some limited support to the setting up of innovation hubs at the research institutions as well as provided capacity building programmes on IPR and innovation systems. During these capacity building events, the innovation managers are involved as well as the leadership and other stakeholders, in order to get a broad common understanding of the concepts at the research institution.

Support to triple helix innovation clusters has also been mentioned, and on occasions this has been an important mechanism to strengthen the university's role in the innovation system.

Research infrastructure stimulating innovative projects

At Universidad Mayor de San Andrés (UMSA) in La Paz, Bolivia, an asymmetrical flow field-flow fractionation (AF4) equipment was purchased, which opened up for several new collaborations; both with international companies and with other institutions. It has been instrumental in the progress of the Bolivian-Swedish company Swebol Biotech where the researchers are involved. Income from delivering service using the equipment is reinvested in the research group and provides an increasing independence of external funding.

Establishment of the first centre of Excellence in Waste Management in Uganda 2017.

Waste accumulation in urban areas is a large environmental issue and creates socioeconomic, health and pollution problems. Most of the waste is not collected and is normally burnt or dumped in unauthorized sites. Realizing the importance of waste management, the Centre was formed with the main objective of utilizing biowaste through innovative research and technology development. By applying methods using bacteria, nutrition recycling and bio-energy generation, organic waste can be turned into biogas, animal feed and soil replenishment. The centre was established with support from Sida, African Union, European Union, Bank of Uganda and Makerere University. Through Sida's long-term collaboration with Makerere the Centre is now equipped with 8 PhD level and over 10 senior scientists.

The Centre builds on 15 years of research in utilization of domestic organic waste and sustainable agricultural production systems through waste management among others. The ten biggest markets in Kampala city generate 1800 tons of waste every month, where organic waste from crops constitutes 87% of the total amount. Their research found that the Kampala Capital City Authority would save 19 million shillings (47 000 SEK) monthly if the waste was separated, composted and reused. The organic fraction of domestic waste can also provide an opportunity to improve livelihoods and incomes through fertilizer and energy production. This has also resulted in a growing market for crop waste, where vendors are selling the waste to increase their income

Research infrastructure can facilitate innovation

Equipment for research is not only vital to conduct studies, but also attracts attention globally and facilitates international cooperation. With more international cooperation and raised capacity within the research institution there is a possibility to create an environment for innovation. Within Sida Research Cooperation there are a couple of projects where the establishment of such facilities is supported. One example is the establishment of a high-throughput sequencing and bioinformatics facility at the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr;b). Sequencing of nucleic acids and analysis of large quantity of sequence data have become an integral part of research programs in contemporary biomedical research. This has opened up for innovative research in the region and attracts both international collaborations and interaction with industry.

5. ANALYSIS AND RECOMMENDATIONS

Sida Research Cooperation is one of the pioneers amongst development cooperation actors working with innovation systems in low-income countries. Having supported and initiated initiatives to strengthen the innovation systems in low-income countries since 2003, there is now ample experience to develop a strategic approach.

There are many ideas and innovations in LLMICs, including at Sida's partner institutions. As an example, when COSTECH launched its call for innovations, with only three weeks to develop a proposal, as many as 180 applications came in. The ideas are there, but many times the systematic approach for innovations to develop efficiently is not. To strengthen the innovation system where innovations can develop efficiently, and to further strengthen the systems' capacity to transform their societies, is considered a strategic approach due to the large amount of innovations in low- and lower middle-income countries.

The reason for Research Cooperation to engage in innovation is to achieve sustainable societal impact, to contribute to poverty reduction and to sustainable development. As described in the previous chapters, research institutions play a crucial role in the innovation system; a role which can be enhanced and promoted in the countries with Sida collaboration. This section provides an analysis of the current state of support, and areas where more can be done. Importantly, working with systems change and a constantly changing environment, there is no model which fits all. Interventions must be context-specific and with a strong ownership, building a sustainable system.

Multidisciplinary as well as multisectoral approaches should be promoted in order to reach sustainable social impact. The perception that innovation mainly concerns technology-intense processes is still common, but it is increasingly understood that innovation is much broader. In fact, purely technological solutions rarely solve complex challenges on their own but can be powerful as part of a system where multidisciplinary and multisectoral approaches are necessary for sustainable impact. For example, health research will more efficiently provide sustainable results if combining medicine, statistics, sociology and economics. The same is true for energy provision where economic alternatives, environmental issues and technological solutions need to be addressed. In addition to this, actors from different sectors need to be included; the *users*, the *owners of the challenge*, *enablers* and *problem solvers*. This usually means citizens, public authorities, industry, researchers and civil society.

The two first Research Cooperation Strategy objectives, “*capacity-building for research*” and “*global, regional and national research of relevance*”, contribute to innovation, since research capacity and research results of relevance are important components of an innovation system. It must, however, be pointed out that the aim of supporting research capacity building is not to find “quick fixes” to societal problems, but rather to stimulate intellectual knowledge using scientific methods which may, in both a short- and long-term perspective, contribute to the accumulative knowledge base addressing societal needs. It is thus the responsibility of the policy makers and others to make use of that knowledge.

Since many things around us are based on knowledge that has emerged from research, it is easy to implicitly assume that research makes its way to society on its own. But, it is not that simple and especially not in low income settings. It is important to focus both on what is needed on the researcher and the innovator side, and on what is needed on the uptake side.

The following analysis will centre around areas known to be of importance in emerging innovation system:

- a) **Interaction and linkages** – interfaces, networks and cooperation to achieve mutual understanding, to develop new ideas, to promote effective co-evolving processes including feedback mechanisms and to test innovations in suitable environment;
- b) **Capacity** – to produce new knowledge, to manage innovative ideas, to manage innovative business, and to bring in new ideas into business and the public sector at all levels. **Education and training** of skilled professionals and support to managers of innovations, such as context-sensitive knowledge transfer, experts along the innovation development stages;
- c) **Financing structures** – different kinds of financing for research, the pilot stage, the introduction into the market and for up-scaling;
- d) **Structures, policies and mechanisms** – to facilitate, enable and stimulate innovation and entrepreneurship, standardization, IPR, regulatory frameworks.

a) Interaction and linkages

A major part in the current portfolio, shall continue to be support related to the creation of conditions for interaction and linkages between the different stakeholders in the innovation system.

For many years Sida supported universities in low-income countries to generate relevant and fact-based knowledge which should address as well as improve the living conditions for the most vulnerable and those affected by poverty. These universities have later been able to offer, not only undergraduate education, but also research training, expert knowledge and advisory services,

thus becoming potentially powerful vehicles for development. Local and national development could be accelerated if universities, private sector, governmental institutions and civil society are encouraged to work actively together. Yet, in many countries the links between universities and society are still weak, and even if some links exist, they need to be **systematically organized** in order to stimulate collaboration.

Previous assessment of research has shown that many research results produced by universities were directly relevant for society but often underutilized. The market for creating local trademarks and patents has not yet developed and most trademarks and patents used were imported. There were several reasons for this situation. One important reason was that the processes in the universities were not sufficiently well developed and organized to support collaborations with private sector and society. Another reason has been the sceptical attitude by entrepreneurs towards the universities. Moreover, local companies have little understanding of what the universities have to offer, while universities in their turn have little knowledge and understanding of the need of research entrepreneurs have. It was concluded that universities need to develop **new kinds of policies to meet these needs** and **explore how society can make better use of research results**. Where trust between the different actors is lacking, an efficient interaction is prevented. Hence, it may be **necessary to bring in facilitation** to enable the interaction. This is especially important in the early stages of interaction. Therefore, there is need for experts on different parts of the innovation processes, as well as incentives to promote innovation and interaction, and research institutions need systematic communication of the opportunities of collaborating with their researchers.

Structures for interaction involving research institutions

Generally, research institutions lack structures and modalities for collaboration with actors outside the universities to increase their impact in society. Sida's support to innovative *triple-helix clusters* is assessed as a successful way to promote innovation systems. The model that Sida has used has been open-ended and the countries being supported have taken different routes adapting to local circumstances. The success has mainly been based on anecdotal evidence and not systematic follow up and data. Often the links between academia and cluster firms have been missing. For example, only 30 % of the clusters in Tanzania had links to academia. To take into consideration the actors' different roles and contribution to the collaboration using the cluster model, there is an obvious need for a more structured approach that also can serve as a set-up for baseline and monitoring system to verify its success and impact. It is necessary to assess if the innovation contributes to the expected change as well as determining how platforms for such collaboration can be established. It would be interesting to **evaluate which clusters have become sustainable as well as the factors influencing the development** (both successful and less so). One of the drawbacks of this support has been that it lacked **mechanisms for monitoring the development of the cluster firms**.

Cluster support has recently decreased as part of the bilateral research cooperation, and an analysis would be helpful in reconsidering this important component. In addition, **closer links to other parts of Sida is necessary** to increase this kind of support, especially as it includes different actor groups as beneficiaries and structures that fall outside the mandate of research cooperation.

In Sida's previous research cooperation with Nicaragua, an action-learning approach was used where ten public universities in Nicaragua, through the National University Council (CNU), in collaboration with Chalmers University, aimed to strengthen their role in the national innovation system in partnership with other stakeholders. It improved the structure, functions and processes to support an innovative orientation at the universities. Units for linking the universities to society were operationalized and innovations managers were trained at MSc level to head the innovation units. The training was considered an "eye opener" by the universities and other participating stakeholders who were not fully aware of the knowledge, capacity and support that the universities could offer.

Universities can be supported to develop capacity for knowledge transfer to public and private sectors as well as directly to society. The creation of *Innovation hubs at univer-*



Photo: FAO/Carlos Zaparolli

sities and research institutions with regular staff specifically trained as innovation managers (or similar functions, depending on the local conditions and identified needs) would make it possible to offer in-house expertise in areas such as national legislation, IPR, agreement conditions and business plans, which would complement the researchers' skills. The hubs can broker connections to other stakeholders, knowing what is needed at each stage of the innovation process, and find scaling partners early on, as well as advise on competences needed, follow initiatives all the way, and build experience. Innovation hubs at the universities and research institutions, aim in the long run to be the gateway between the university to the surrounding society. These existing **hubs need to be strengthened and the development of innovation structures should be considered at other Sida-funded universities and research institutions.** There is a strong need for institutional capacity for innovation. The building of such capacity should start at the individual level and leadership level with those who understand the potential of a structured approach to innovation. All universities involved in the bilateral research collaboration need to take part in such an initiative to build innovation capacity.

Cooperation between researchers and the private sector

As knowledge from research is transferred to users outside the academic institutions, one major challenge is the weak backward couplings from the users of knowledge to the producers of knowledge. This means that the producers of knowledge at research institutions do not get enough feedback from the users to feed back into their research. As a consequence, the resulting innovation may be sub-optimal or not applied or adopted. **This needs to be continuously addressed** through increased interaction and guiding of innovation managers or facilitators.

Some funders use so-called "innovation voucher schemes", which has been used extensively in Europe. The voucher offers a company the possibility to get a development work done at a research institution and enhances the collaboration between two sectors. COSTECH offers "commissioned research grants" instrument, where a public-sector institution or private company can make a request for research that they may need. The instrument could be developed, e.g. specific grants, which could be offered to students or postdocs for doing research at or for a public institution or private company, possibly with co-funding. **These kinds of schemes** may be considered in future interventions.

There are good experiences from **private-public development partnership** within research cooperation, such as Bio-innovate, and such initiatives can be further



Photo: IITA

explored. A focus on micro, small and medium-sized enterprises (MSME) shall be continued, with representation from both formal and informal sector depending on needs and local context. Larger companies are under some circumstances also important to collaborate with, especially in large scale endeavors such as in pharma and agribusiness.

Cooperation between researchers and society

Research collaboration with CSOs is limited, although there are many trade unions, popular organizations and other interest groups whose area of operations may benefit from knowledge development and co-creation with the universities. Support to **joint initiatives with CSOs** could be explored further.

There is growing experience from collaboration with CSOs and society in the TDR-led "Social Innovation for Health Initiative" where social actors such as village chiefs in rural areas have played a major role in reaching the most vulnerable, both through formal and informal structures. Lessons from these initiatives, such as **interaction with different social actors**, can be explored further.

Cooperation between researchers and the public sector

Linkages between universities and public-sector institutions in Sida's Research Cooperation are frequent, but thus far is not clearly communicated to Sida research advisors in the reporting. Many of the Sida supported universities influence policy and regulations across many areas, but still, little is known whether this leads to any innovative transformations. What has become clear, however, is that knowledge on how to effectively communicate innovative ideas to **attract interest of and collaboration with policy makers** is a limiting factor. This can be studied, and **best practice can be shared** amongst Sida collaboration partners. In Tanzania, COSTECH has made various efforts to sensitize and train policy makers



on how to access and use evidence, but without success. The limited response from the policy makers was mainly due to their busy schedules which did not permit them to participate in lengthy workshops. Therefore, the best ways for researchers to reach and communicate with policy makers for increased impact and potential collaboration remains to be explored. Moreover, to assess if different approaches are needed for local and national levels.

Embedded research is an example which can be used more to engage decision makers, such as in the case of Alliance for Health Policy and Research.

Dialogue

Dialogue is a powerful tool in development cooperation, and there is a strong potential in using it to stimulate innovation. In dialogue with ***science and innovation councils as well as innovation funders***, Sida research advisors can stress the importance to focus on transformative and sustainable solutions, and the need to ***enhance the interaction between the different actors of the innovation system***. Sida should emphasise the two-way premise for dialogue and for learning. Innovation funders could be encouraged to make calls that require collaboration between actors. This could be reinforced through funding mechanisms operating through national, regional and global institutions and organizations. Dialogue could also be used with ***researchers and research institute leadership*** to promote the interaction with society. Sida could support the ***inclusion of innovation into national, regional and/or university research policies/strategies***.

Another possibility is to ***join forces with Swedish or international actors where multisector approaches are used***. Discussions with the Swedish innovation agency Vinnova are ongoing regarding a possible joint call between selected low-income countries and Sweden, and/or to set up calls addressing stakeholders in specific countries.

b) Capacity

Capacity is needed at many levels of the innovation system, among management as well as staff. To support innovation, there is need for capacity to interact with different actors and to fund, monitor and scale innovation.

Capacity to support innovation at the research institutions

At the network meeting with innovation managers in Nairobi in 2017 “Capacity to innovate” there was an outcry of the poor understanding of innovation among university leadership and policy makers in their country. Most institutions had poor or no support to researchers with innovative ideas, nor an understanding of transformative and social innovation. Presently, to address this request by partners, Sida is currently supporting an 18-month pilot initiative where the university leadership, researchers and national financiers in five African countries will be jointly trained and mentored by a Swedish expert on innovation. A ***regional network*** of innovation managers is planned, which may be followed by connecting it to the global network. This training of innovation managers may be followed by more intense networking and capacity building. To sustain such efforts, there needs to be a commitment at the institutional level.

Learning from others with similar challenges is an approach that has been encouraged by Sida’s partners. The workshop in Nairobi was an attempt to initiate such learning and is being addressed in the 18-month pilot initiative. Similar workshops as the one in Nairobi can be initiated in the future if deemed necessary.

The other pilot initiative, related to IPR, is a collaboration with the Swedish patent and registration office (Patent- och registreringsverket, PRV) who train staff and researchers in IPR at universities and research institutes on site, one in Bolivia and one at icddr,b in Bangladesh. If successful, the ***training course will be offered to other partners*** and possibly be developed into a train-the-trainers set-up.

Scientific programs on innovation studies can be further promoted in the bilateral programmes. Capacity in innovation also needs to spread across faculties and universities, and a scientific innovation programme could be offered across universities. More collaboration to spread capacity is encouraged. Sida as well as Granting Councils already have a role here, e.g. by ***only funding scientific programs where several public universities collaborate***.

Knowledge and capacity of actors in the innovation system

Capacity strengthening of professionals in the public sector in innovation systems, business management and

financial systems, including policy as well as at grass root level (cluster managers, SMEs, Knowledge Transfer officers) could greatly enhance the innovation capacity of Sida's partner countries. A strong recommendation is to **build capacity among persons involved in the national and regional innovation systems**, including those involved in cluster activities. This could be an extension of the ongoing pilots described above, as well as through an **enhanced cooperation with Swedish actors** such as Vinnova and universities who have an interest in and experience from innovation-related collaboration in development cooperation. This should also involve persons at the local level who have been trained within Sida-funded programmes, such as innovation researchers, those running innovation projects and cluster managers.

In addition to increased capacity at the research institutions for innovation among researchers and leadership, it is important to build an **understanding of how innovation can lead to societal impact and transformative change**. Those who have fully understood the concept and the great potential could be involved in engaging key stakeholders, such as university leadership, ministries, and agencies. This shall be explored further together with Sida-funded partners.

The strengthening of innovation capacity at the university, including training courses integrated in the curricula, is another responsibility that a formal innovation structure at the university can have, e.g., the university innovation hub.

There is a great potential to boost the innovation capacity by connecting people involved in the different attempts nationally, regionally and globally, and thereby for Sida to support the use of research for increased societal impact. For this purpose, Sida can **promote and finance meetings, seminars and conferences**; by organising these events and providing possibilities for participation at other events, e.g., through travel funds.

Capacity to interact

Capacity both for **presenting evidence in a way that can be useful for decision-makers**, as well as for the decision-makers to understand the potential of using evidence needs to be built. The way researchers and the surrounding society interact has its own dynamics, especially when it comes to communication. This far we have seen good progress when decision-makers are actively involved in the process early on, so that evidence and initiatives can be developed together. This helps researchers to identify the real challenge, and further to present results in a relevant manner.



Photo: Ylva Sahlinstrand/Sida



Photo: Sida

In a similar way, research institutions need to be able to interact in an efficient way with civil society as well as the private and public sectors.

In university education, Sida can increasingly enter in dialogue with and encourage partners to **develop curricula for MSc and PhD programs**, possibly even undergraduate level, to include teaching modules that focus on challenges faced by society, including industry. This has been done in the IGrid programme at UDSM in Tanzania. At UMSS in Bolivia and their innovative cluster programme where both researchers and undergraduates participated in solving specific problems jointly with small firms. In Tanzania COSTECH and SIDO are developing a “research cluster model” entering into agreement with universities for “problem-solving” support by MSc- and PhD-students to MSMEs in their cluster programme. Training in social entrepreneurship and management should also be available for both students and academic staff.

Competence to fund and monitor innovation projects

Funding of innovation is different from funding of research, and competence for both is lacking at the national level. This competence needs to be developed, including how to set-up project calls, evaluations and assessments, and the monitoring of innovation projects. In part, this is targeted together in a newly co-funded initiative with IDRC (The Science Granting Council Initiative³⁶). However, **more needs to be done in this area, including building competence to monitor innovation projects**. Lessons can be learned from COSTECH in Tanzania, FNI in Mozambique, Bio-innovate and Grand Challenges Africa.

³⁶ <https://sgciafrica.org/en-za>

c) Financing structures

Funding from Sida Research Cooperation must be connected to research, and there are several ways that innovation financing capacity and structures can be addressed; e.g. through dialogue, through funding of initiatives where research is an integral part, through the building of capacity in innovation financing, and supporting the first steps of innovation emerging from the academic environment. The later stages of innovation financing, however, must be found through other mechanisms, of which some are available at Sida, e.g., challenge funds and guarantees. There are still gaps in the innovation funding landscape though, with several stages where financing is very difficult to get.

Financing and monitoring of innovation

To achieve sustainable funding mechanisms, preferably **nationally or regionally based funding agencies should be promoted**. National initiatives for funding exist, although the amounts of funding and the capacity to fund is limited. The newly initiated support to the program Grand Challenges Africa, based at the African Academy of Science/Alliance for Accelerating Excellence in Science in Africa (AESA) is a regional approach. To achieve a sustainable impact, focus shall be on building the structures and mechanisms for innovation funding, so that the system and capacity is in place when international development support is no longer available. In the meantime, funding of innovation is a necessary means to build this capacity and these structures. With global innovation financing, there might be interesting innovations in place which impacts society in the desired ways, but no sustainable system will be in place when international funding is directed elsewhere. Again, it is stressed that it is very important that innovation finance initiatives have local ownership and that the necessary actors are involved to achieve sustainable impact. Through dialogue with **innovation financiers nationally, regionally and globally this may be promoted**.

Taking innovation to scale

There are many examples of promising innovations which do not reach the desired scale. After identifying the desired scale, it is necessary to investigate the potential bottlenecks for taking it all the way and determine who will take it to scale, and if there are any regulatory limitations. As an example, researchers at icddr,b (Bangladesh) developed the “Q-mat”, a low-cost mat which provides a solution useful in low-resource settings where home-birthing is the norm. This mat is placed under a woman immediately after the delivery of a baby and soaks the blood that is coming out from the mother, giving a visual depiction of the amount of blood lost during delivery.

The mat can retain the amount of blood which is normal at delivery, and when the mat is saturated this signals that the woman is hemorrhaging and requires immediate referral for medical treatment. This innovation is now being scaled in rural Bangladesh where home-birthing is common and is of interest also to other countries where this is the case. A thorough analysis of scaling innovations in health from icddr,b (Bangladesh) to Ethiopia resulted in realizing that the innovation the researchers had identified, the Q-mat, would not meet the demands from the Ministry of Health in Ethiopia. The reason is that the Q-mat facilitates home-birthing, which is against Ethiopian policy. Hence, there was no point in transferring the innovation in its current form to Ethiopia. In collaboration with the Ministry an adapted version is considered instead. This shows the importance of involving the “enabler” (the Ministry, in this case) already from start in order to achieve scaled impact. ***This kind of analysis needs to be performed at an early stage in all innovation funding*** and can be built into the set-up when Sida funds innovations.

The need to analyse how to scale became evident in the first version of the Bio-innovate programme and is included in the set-up of the present programme. Early interaction between the different actors that form part of the innovation process is also key. This became clear from studying social innovation in the TDR-run SIHI, where successful initiatives had brought in the stakeholder responsible for scaling early on.

Sida Research Cooperation funding of innovations is limited to the early stages of research-coupled innovation, and although Sida and other donors offer different funding options for later stage innovations (e.g. Challenge Funds and Global Health Investment Fund, GHIF) these are difficult to obtain for researchers and MSMEs in low-income countries. Therefore, ***new set-ups are necessary in order to finance innovations*** in Sida’s partner countries and regions. Research advisors are

encouraged to engage with other units at Sida to set up adapted structures, e.g. with Embassies and the unit of Loans and Guarantees for enhanced dialogue with the bank sector, and with other units setting up competitive funds. ***Closer dialogue with other international funders is also encouraged.***

Hence, there is a need for a systematic view of innovation funding and of mobilising innovation funding, where the entire innovation process needs to be considered; from new ideas, proof of concept, technology development, application development, pilot testing to commercial scale-up. Sida needs to ***investigate its own innovation funding and develop financing schemes that are adapted to needs***, e.g. crowd funding and innovation vouchers.

There is a need for an improved understanding of the existing funding mechanisms of innovation, especially at the local level. ***Joint Swedish funding from different strategies could be used more***, as has been done in the co-funding from the country frame and the Research Cooperation frame for the innovation fund at COSTECH in Tanzania. This initiative could be of interest to other countries and Sida could assist its transfer.

One possible funding scheme could include so called “revolving funds”, where small innovative companies can borrow money to realise their ideas and repay the loan when the product has been developed and provides income. Guarantees is another mechanism to be explored further, especially at the local level as the PASS trust fund in Tanzania described earlier.

Sida may engage other financiers, such as private investors, banks, government, crowd funding mechanisms, challenge funds, innovation funding agencies. A risk that was recently highlighted to us, is that local systems are sometimes oversaturated with international funding, which may hinder the natural development of local financiers. This must be taken into consideration when developing or financing new programmes. What role can foreign funding play to address bottlenecks, without distorting the local financial mechanisms?

d) Structures, policies and mechanisms

Even though innovation takes place within many research institutions supported by Sida, most institutions do not take a systematic approach to promote and support this process. One can only imagine the potential outcomes in terms of innovation with a more systematic approach, in a system with functioning structures, policies and mechanisms.

Research can be source for innovation in at least two ways; providing knowledge about innovation, and as a source of innovation. Research on innovation in low-income settings continues to be underfunded and is, just like the monitoring of innovation, crucial for informed



Photo: Ylva Sahlin/Sida

policy making connected to innovation. Both areas need further strengthening. Research can be used to a much larger extent in investigating local conditions and systems for innovation. Sida is encouraged to keep supporting the **next African Innovation Outlooks**, but the data quality needs to be improved at the national level. Potentially, an intervention targeting the **capacity building of national data collection is necessary**, possibly within the research councils or statistics agencies. The SGCI is currently strengthening this capacity within research councils in 15 countries.

It is important that Sida's officials continue to discuss with authorities involved in the different aspects of innovation in partner countries and regions, e.g. research and innovation councils and ministries, to **stimulate and catalyse the development and implementation of policies for innovation**, or policies including innovation. These authorities may also be interested to contribute to the development of innovation financing structures and capacity. Depending on the local context, one might need to start at the university, at the regional level, the national level, or combinations.

The university strategies many times take in national and regional needs and hence encourages research leading to societal benefit if taken into use. However, incentives for undertaking innovative activities are lacking both generally and at the research institutions. **Incentives structures can be supported through research cooperation in the short term**, either through funding or promoting it through dialogue. Incentives can be anything from financial support to an innovation prize to a qualification for the research career.

Dialogue

As research cooperation is limited to the early stages of innovation, there is no support to business incubators or science parks. However, as mentioned above, building the capacity for these structures can be a role of the university and be brought up in dialogue with university man-

agement. Support to earlier structures, such as **innovation hubs or centres, is recommended**. They may be useful structures for interaction, giving innovation support to researchers, providing a way into the university for other stakeholders as well as a way out for researchers to reach the surrounding society. Although this has in part been initiated, as mentioned for SIHI and UMSS, Bolivia, much more can be done in developing these hubs.

Much of the research results from the Research Cooperation portfolio does not reach its intended users, and new ways of interaction between universities and decision-makers can be elaborated. Best practice can be further identified and spread.

At the university there should be a **structure for identifying funding opportunities for innovation**. This structure or function could be connected to a potential science grant office as well as to the potential innovation hub.

An innovative mechanism to get access to good ideas is **crowd sourcing**, where an audience is invited to suggest ideas to solve different challenges. This was recently used by TDR to find ways to engage more female scientists from low- and lower-middle income countries. This is a great source for new ideas and potential innovations and can be introduced as an alternative to our partners in a variety of issues.

Supporting innovations through its upscaling is an interesting way to find out how the system works, and when bottle-necks are identified it can provide important input to future interventions.

e) Recommendations to the Sida Research Cooperation innovation group

In addition to all the above, it is recommended that research advisors build their capacity in understanding innovation processes and the innovation system. This is especially important, as we need to increasingly include innovation aspects in dialogue with our cooperation partners. Sida Research Cooperation innovation group is responsible for this capacity building. Moreover, it is also important to engage with other parts of Sida, as well as with other donor agencies.

A mapping of how other donors work and what they support may also be informative for Sida. There is already interaction with Grand Challenges Canada, Canadian IDRC and DFID. A Sida representative is active in International Development Innovation Alliance³⁷ (IDIA), a group of development actors with a focus on innovation.

Research advisors are encouraged to engage in dialogue with partner organizations in issues connected to innovation, some which have been stated in the recommendations above.



Photo: Ylva Sahstrand/Sida

37 www.idiainnovation.org/



Photo: Nyokabi Kahura

APPENDIX 1 – Guiding documents and Recommended reading

Guiding documents

The following documents are adopted by the Swedish Government and guide the support to innovation:

- Sweden's policy for global development (Sweden's policy for global development, 2003), specifically as related to economic growth which is fundamental to development, and the fight against poverty, to which knowledge systems and innovation is mentioned in relation to the goal of ensuring poor peoples' access to sustainable health systems and basic medicine.
- The Sustainable Development Goals (Agenda 2030).

There are national, continental and international policies and strategies that are also of interest for guidance in support to innovation. For example, the African Union defined the ten-year Strategy "Science, Technology and Innovation Strategy for Africa (STISA) 2024" and has succeeded the Africa's Science and Technology Consolidated Plan of Action (CPA). It highlights the need of transforming Africa into a knowledge-based and innovation-led society. Two priorities are the eradication of hunger and achieving food security, and the prevention and control of diseases. Science, technology and innovation is stated as an important tool.

First version on Sida's Position paper: Support to Innovation and Innovation Systems within the Framework of Swedish Research Cooperation, September 1st, 2015: <https://www.sida.se/contentassets/a53e93122caf4fb-9b5a6022182bf9e64/18279.pdf>

Recommended reading

On innovation in general

Etzkowitz, H. (2005): Trippelhelix – den nya innovationsmodellen (Stockholm: SNS Förlag)

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Global Innovation Index: www.globalinnovationindex.org

Lundvall, B.-Å., Johnson, B., Andersen, E.S. and Dalm, B. (2002): National systems of production, innovation and competence building, Research Policy, No. 2, pp. 213–231.

Lundvall, B.-Å., (ed.) (2010): National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning. London, Anthem.

Lundvall B.-Å., Joseph K.J., Chaminade C, and Vang J, (2009): Handbook of Innovation Systems and Developing

Countries, Building Domestic Capabilities in a Global Setting, Edward Elgar Publishing Limited

OECD Innovation Strategy: Getting a head start on tomorrow, OECD 2010

OECD (2014): National Intellectual Property Systems, Innovation and Economic Development: Perspectives on Colombia and Indonesia. OECD Publishing, Paris

OECD (2015): The Innovation Imperative, contributing to productivity, growth and well-being. OECD Publishing, Paris

Oslo Manual; Innovation in science, technology and industry, OECD, www.oecd.org/sti/inn/oslomannual-guidelinesforcollectingandinterpretinginnovationdata-3rdedition.htm (2015-01-12)

Roper, S., Du, J. and Love, J.H. (2008). Modelling the Innovation Value Chain. Research Policy 37, 961-977

Sölvell, Ö. (2009): Clusters: Balancing evolutionary and constructive forces (Stockholm: Ivory Towers Publishing)

On innovation in low-income settings

Acevedo Pena, C. G., (2018): Developing Inclusive Innovation Processes and Co-Evolutionary University-Society Approaches in Bolivia; Blekinge Institute of Technology Doctoral Dissertation Series No 2018:07. (download from <https://www.bth.se/eng/technoscience/documents-papers/>)

Albuquerque, E., Suzigan, W., Kruss, G., and Lee, K (editors), (2015): Developing National Systems of Innovation, University-Industry Interactions in the Global South; Elgar. ISBN 978 1 78471 19 2.

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APPENDIX 2 – Draft overview of contributions including a clear innovation-related objective

Modality	Objective 3.1					Objective 3.2		
	Innovation clusters	Innovation Hubs for interaction with society	Research collaboration with private sector	Research collaboration with society	Research collaboration with decision-makers	Strengthening capacity of actors in the innovation system	Innovation networks	Funding of innovation
Contributions								
Africalics							X	
AHPSR					X			
AUDA/Innovation Outlook								
BecA Hub/ILRI								
Bio-Innovate			X	X	X			X
CGIAR			X	X	X			
EDCTP			X	X	X			X
Grand Challenges Africa			X	X	X			X
HRP			X	X	X			
icddr,b			X	X	X			
icipe			X	X	X			
ISC				X				
IVI			X		X			
Pilot PRV Bolivia						X		
Pilot KTH Global Dvp Hub						X	X	
SGCI						X		
TDR		X		X	X		X	
Bolivia – UMSA	X		X	X	X			
Bolivia – UMSS	X	X	X	X	X			
Etiopien – AAU		X	X	X	X			
Etiopien – AHRI		X	X	X	X			X
Mocambique – UEM			X	X	X			
Moçambique – FNI								X
Rwanda – UR	X		X	X	X			
Tanzania – UDSM		X	X	X	X			
Tanzania – AHRDI			X	X	X			
Tanzania – MUHAS			X	X	X			
Tanzania – COSTECH	X							X
Uganda – Makerere		X	X	X	X			

ive 3.2			Objective 3.3					
Structures to enable innovation	Monitoring of innovation	Innovation research	PhD training in innovation	MSc training in innovation	Innovation Hubs to increase university's role	Involving students in innovation activities	Specific research infrastructures to stimulate innovation	Supporting research-based innovations
		X	X					
	X							
X								
X								X
								X
								X
						X	X	X
		X						X
		X			X			
					X	X	X	
			X	X	X	X		
					X			
				X				
					X			
						X		X
					X			

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