Background paper prepared for the Technology Executive Committee
United Nations Framework Convention on Climate Change (UNFCCC)

South-South Cooperation in Technologies for Adaptation for Water and Agriculture

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Content

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I. Introduction

Water and agriculture are essential for poverty reduction, sustainable development and human well being. Over 800 million people worldwide live in extreme poverty (UN, 2015), most of which live in rural areas and depend partly or completely on agriculture for their livelihoods (FAO 2016). It is estimated that 500 million smallholder farms in the developing world are supporting almost 2 billion people (IFAD, 2011).Agriculture also accounts for 70 percent of total global freshwater withdrawals, making it the largest user of water along the entire agri-food supply chain (FAO 2011a).These links will be exacerbated in the near future under the pressure of population growth and mobility, economic development, international trade, urbanization and climate change (Hoff 2011).

Rising temperatures and modified weather patterns have started to impact the extent and productivity of both irrigated and rain fed agriculture across the globe. Reductions in yield, river runoff and aquifer recharge are expected worldwide, affecting water availability in regions that are already water-stressed. Large contiguous areas of irrigated land that rely on snowmelt and high mountain glaciers for water are already being affected by changes in runoff patterns, while highly populated deltas are at risk from a combination of reduced inflows, increased salinity and rising sea levels. Estimates indicate that 60 percent more food will need to be produced in order to feed the world population in 2050 and subsequent total global water withdrawals for irrigation are projected to increase by 10 percent in the same period (FAO 2011a).

A. The 'Water-Food-Climate Nexus'

Water, agriculture and climate change are closely intertwined[2]. The 'Water-Food-Climate Nexus' has emerged as a useful concept to describe and address the complex and interrelated nature of global resource systems. Nexus interactions are complex and dynamic, and sectoral issues cannot be looked at in isolation one from another. Adaptation measures that respond to climate variability and build upon improved agricultural and water management practices have the potential to create resilience to climate change.[3] Most of these **adaptation measures involve some form of technology, which includes not just materials or equipment but also diverse forms of knowledge. These technologies can be in "hard" forms** (e.g. new irrigation systems, drought-resistant seeds), **"soft" technologies** (e.g. insurance schemes, crop rotation patterns), **or a combination of the two – 'orgware'** (e.g. early warning systems that combine hard measuring devices with soft knowledge and skills that can raise awareness and stimulate appropriate action).

B. SSC in technologies for adaptation and key actors

South-South Cooperation (SSC) goes beyond financial transfers. It can foster adaptation measures through the replicability of experiences and technologies that countries accumulate in their own development processes to other similar environments. SSC is based on the premise that developing countries are better positioned to mutually contribute to the solution of their development challenges for often having similar factor endowments. Technologies and expertise in developing countries are therefore more likely to be attuned to similar geoclimatic conditions, scaled down to

[2] This nexus is even broader and has strong connections to energy as well. This underlines the need for an integrated responses to development challenges as cooperation approaches that do not consider all necessary aspects would not solve problems but may create new ones.

[3]Outcomes of the 2013 Third Synthesis Report of the technology needs assessment (TNA) of non-Annex 1 Parties: For adaptation, the most commonly prioritized sectors were agriculture[3] (84% of the Parties) and water resources (77%). Parties identified more than 320 different technology options and more than 150 different technologies were prioritized.

levels appropriate to the size of their markets, and adaptable to the reality of low-income consumers. Also, as technological protectionism and intellectual property rights are strengthened, acquiring advanced technologies can become more difficult for some countries (UNIDO, 2006; Srinivas, 2009).[4]An essential alternative for developing countries is thus to step up cooperation in more cost-effective technologies for adaptation amongst themselves.[5]

According to the Framework of Operational Guidelines on the United Nations Support to South-South and Triangular Cooperation, SSC is 'a process whereby two or more developing countries pursue their individual and/or shared national capacity development objectives through exchanges of knowledge, skills, resources and technical know-how, and through regional and interregional collective actions, including partnerships involving governments, regional organizations, civil society, academia and the private sector, for their individual and/or mutual benefit within and across regions.'[6]As such, SSC contribute to increasing countries' adaptive capacity, by building capacities and enhancing abilities to respond successfully to climate change. Triangular Cooperation (TrC) is further defined as a typically Southern-driven initiative that might include an element of SSC supported by a developed country, multilateral organization or any other third party.[7]In line with the principles of national sovereignty and ownership, developing countries themselves initiate, organize and manage SSC and TrC. Developed countries and international organizations play a facilitation role and do not take the lead in executing South-South operational activities, which remain solely the domain of developing countries themselves.[8]

Yet, the potential for SSC in technologies for adaptation remains largely untapped. In addition to limited awareness of where this knowledge and technology are available, other challenges like lack of or inadequate access to financial resources; inadequate legal and regulatory frameworks; and insufficient organizational and technical capacity limit the transfer of technologies for adaptation among developing countries. **Global institutions like the Technology Executive Committee[9] (TEC) and the Climate Technology Centre and Network[10] (CTCN) have the potential to catalyze SSC**

[4]Research indicates that stronger IPR protection is only found to benefit the South when R&D is highly productive, thus resulting in significant cost reductions, and when the South comprises a large share of the overall market of the product. (UNIDO, 2006)

[5]Agarwal, Aradhna (2011) South-South cooperation in technology transfer and the clean development mechanism Some explorations.

[6] The Framework of operational guidelines on the United Nations support to South-South and triangular cooperation is a tool and reference manual on ways to mainstream South-South and triangular cooperation in the development planning and programming of United Nations funds, programs, specialized agencies and regional commissions at the global, regional and country levels. It also suggests sectoral, cross-border thematic areas where the benefits of South-South interventions could be optimized" (SSC/17/3 2012).

[7]TrC can take different forms (OECD 2013, p. 14-15): i) a SSC can be the starting point and a third party supports this initiative; ii) bilateral cooperation with one country can expand through a partnership with a third beneficiary country; and iii) a triangular agreement acts as the starting point with the cooperation being set up jointly by three partners from the outset.

[8] HLC-SSC, May 2012

[9] The TEC is the policy component of the Technology Mechanism. It was established in 2010 to facilitate enhanced action on climate technology development and transfer. Read about the TEC's mandate, functions, modalities and rules of procedure.

[10] Established by COP 16, the CTCN facilitates the transfer of technologies through three core services: i) technical assistance at the request of developing countries to accelerate the transfer of climate technologies, ii) access to information and knowledge on climate technologies, iii) collaboration among climate technology stakeholders via the Centre's network of regional and sectoral experts from academia, the private sector, and public and research institutions.

for technologies for adaptation through the promotion of the use of local knowledge and technology, the promotion of capacity development and the replication and up-scaling of successful initiatives. The TEC can further work with **the Adaptation Committee[11] in encouraging countries' to commit to SSC initiatives for technologies for adaptation.** Similarly, the operating entities of the UNFCCC's **Financial Mechanism, the Global Environmental Facility[12] (GEF) and the Green Climate Fund[13] (GCF) may have the potential to play a larger role in financing SSC for technology.** Other international organizations and financial institutions with a tradition in SSC and knowledge exchange, like the United Nations Office for South-South Cooperation (UNOSSC)[14], the World Bank[15], the New Development Bank, and other global, regional and emerging organizations and financial institutions can further support this process.

The relationship between climate change technologies for adaptation, South-South Cooperation and global institutions and mechanisms is illustrated in Figure 1.

[11] The Adaptation Committee is the overall advisory body on adaptation under the UNFCCC. It seeks to raise the profile of adaptation and to promote greater coherence in the way that adaptation is addressed, including through i) technical support and guidance to the Parties, ii) relevant information, knowledge, experience and good practices, ii) engagement with national, regional and international organizations, centres and networks, iv) information and recommendations for consideration by the COP when providing guidance on means to incentivize the implementation of adaptation actions, including finance, technology and capacity-building, v) information communicated by Parties on their monitoring and review of adaptation actions, support provided and received.

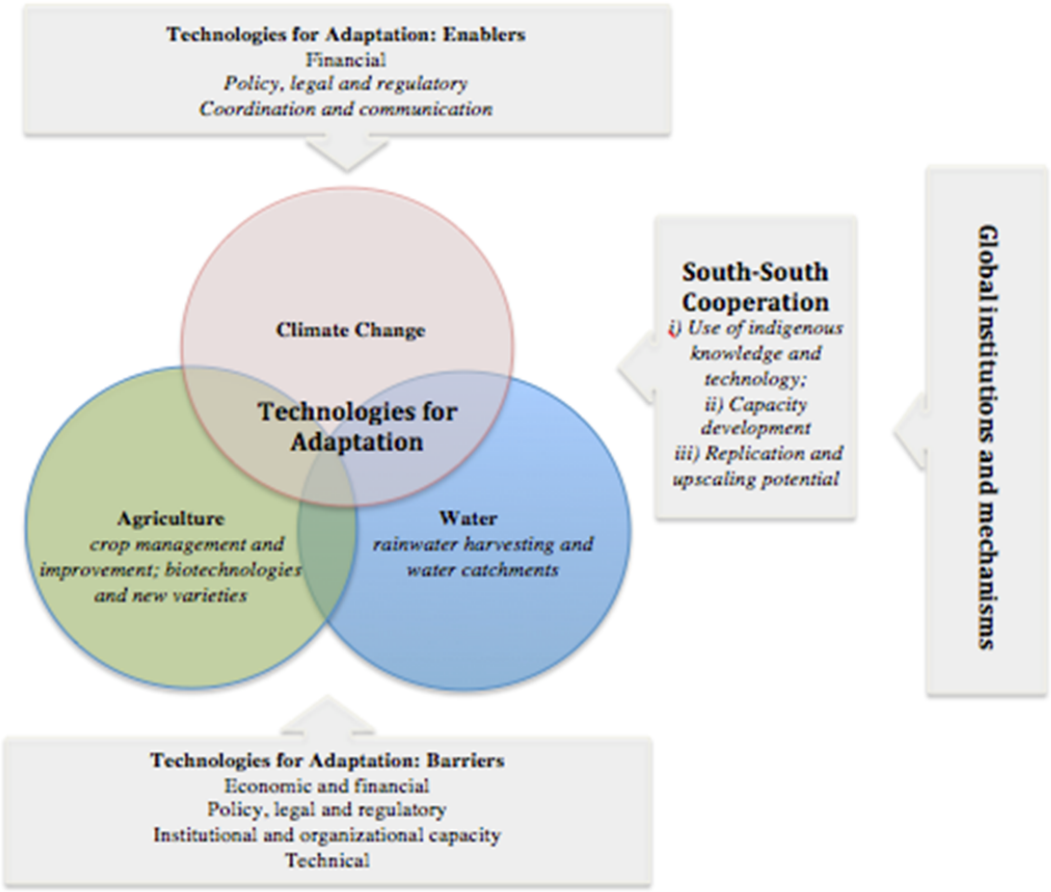
[12] The Global Environment Facility (GEF) unites 183 countries in partnership with international institutions, civil society organizations (CSOs), and the private sector to address global environmental issues while supporting national sustainable development initiatives. Today the GEF is the largest public funder of projects to improve the global environment. An independently operating financial organization, the GEF provides grants for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.

[13] The Green Climate Fund (GCF) is a fund within the framework of the UNFCCC founded as a mechanism to assist developing countries in adaptation and mitigation practices to counter climate change. It is governed by a Board of 24 members and initially supported by a Secretariat.

[14]Institutionally within the United Nations Development Programme, the UNOSSC has the primary mandate to promote, coordinate and support South-South and triangular cooperation on a global and United Nations system-wide basis. UNOSSC delivers its mandate through its 3-in-1 multilateral support architecture for South-South and triangular cooperation, which includes: i) the Global South-South Development Academy; ii) the Global South-South Development Expo; and iii) the South- South Global Assets and Technology Exchange (SS-GATE). In response to countries' demand, UNOSSC also manages pilot projects that can be further scaled up and replicated as well as special funds, like the United Nations Trust Fund for South-South Cooperation and the IBSA Fund.

[15]Supporting countries assess, systematize and exchange knowledge among themselves is at the core of the WB's work on South-South. This work is led by the Vice Presidency for Knowledge and Learning in coordination with sectoral and country departments through WB operations and the South-South Experience Exchange Trust Fund (SEETF).

FIGURE 1. How can global institutions and mechanisms promote technologies for adaptation through South-South Cooperation?



C. Objective of the study

Against this backdrop, the study seeks to provide background and context on SSC on technologies for adaptation in the areas of agriculture and water, in particular identifying enablers, barriers and contributing factors to successful replication and transfer of technology. The first section provides an overview of potential for SSC in technologies for adaptation in the agriculture and water sectors and outlines the main barriers to this type of cooperation, taking into account the nexus of agriculture-water-climate as well as the outcomes of the 2013 Third Synthesis Report of the technology needs assessment (TNA) of non-Annex 1 Parties (hereafter referred as 2013 TNA synthesis report)[16]. **There is no one general uniform status of SSC given the different interests, policies and approaches taken by Southern countries.** As such, this section looks at overall SSC project distribution and types of engagement, main actors and SSC potential by region, and major trends in SSC for technologies for adaptation.

[16] The Technology Needs Assessment (TNA) is a set of country-driven activities that identify and determine the climate technology priorities of developing countries. It involves stakeholders in a consultative process to identify barriers to technology transfer and measures to address these barriers.

In the second section, good practices and lessons learned from real examples are assessed. **Experiences from different regions were selected to showcase the water-agriculture-climate nexus in the context of SSC, the diversity of modalities used, and the options for multi-stakeholder engagement. The experiences also provide lessons for policy-making, mainly with respect to the use of local knowledge and technology, capacity development, replication and upscaling.**

Finally, the third section identifies the actions required for enhanced SSC in technologies for adaptation, taking into account the various factors that may contribute to successful cooperation. **Recommendations to foster technologies for adaptation in the context of SSC are provided in three levels: i) action by organizations engaging in this type of cooperation; i) policies and action by the TEC and the CTCN; iii) and opportunities for tapping the potential contribution by other global mechanisms and institutions.**

The research is mainly qualitative, based on primary[17] and secondary[18] sources. The methodology includes: i) literature review, e-survey[19] and mapping of SSC initiatives in technologies for adaptation in the agriculture and water sectors[20]; ii) selection of case studies[21] and interviews; and iii) analysis and drafting of the report. A peer review process including members of the UNFCCC/TEC taskforce on adaptation and CTCN as well as interviewees was conducted for quality assurance and accountability.

II. Potential for SSC in technologies for adaptation in the water and agriculture sectors

Adaptation is a response to global warming that seeks to reduce the vulnerability of human and geophysical systems to current climate change and thus reduce the negative impacts of global warming. Even if emissions are stabilized relatively soon, global warming and its effects will last several decades, and adaptation to the resulting changes in climate will be necessary. Adaptation is especially important in developing countries as poor people are predicted to bear the brunt of the effects of global warming. Climate-related hazards affect poor people's lives directly through impacts on livelihoods, reductions in crop yields, or destruction of homes and indirectly through, for example, increased food prices and food insecurity (IPCC, 2014). According to the 2013 TNA synthesis report,

[17]Interviews or other forms of conversations with counterparts from the selected countries and organizations

[18]UNFCCC/TEC documents, publications and online databases (e.g. World Bank Institute, UNEP) and other relevant sources (e.g. UNFCCC/TEC, SSC initiatives in technologies for adaptation undertaken with direct support of the CTCN, and CTCN network of contacts) on SSC for technologies for adaptation.

[19]An e-survey with 138 National Designated Entities to the CTCN, 14 CTCN Consortium Partner representatives, and 102 CTCN Network Member representatives was conducted between 15-30 November, 2015. Approximately 13% (35) of the organizations contacted responded the e-survey. The results are presented in the subsequent sessions.

[20]The mapping will comprise ongoing and completed bilateral, regional and global SSC initiatives over the past five years and information on champion organizations, the objectives and results achieved by these initiatives as well as the overall barriers and enablers.

[21]The case studies were selected based on the mapping developed in phase 1 and taking into consideration the following aspects: i) water-agriculture-climate nexus; ii) regional balance; iii) availability of information; iv) different forms of multi-stakeholder engagements (government-government; public-private; civil society); v) results achieved and vi) potential for policy-relevant/actionable lessons learned. Interview protocols (e.g. list of interviewees, interview questions, interview request and facilitation, etc) were developed with UNFCCC/TEC taskforce on adaptation.

the most commonly prioritized sectors for adaptation were agriculture[22] (84% of the Parties) and water resources[23] (77% of the Parties).

Adaptation experience is accumulating across regions in the public and private sector and within communities. Governments at various levels are starting to develop adaptation plans and policies to integrate climate-change considerations into broader development plans (IPCC, 2014). **SSC can help increase countries' adaptive capacity, by applying transferred knowledge and technology that are more accessible, adaptable and affordable to developing countries. This knowledge and technology can further build local capacity and enhance countries' ability to adapt to climate change** (Table 1). Yet, the potential for SSC in technologies for adaptation remains largely untapped.

TABLE 1: SSC contribution to the adoption of technologies for adaptation in water and agriculture [24]

1. Strengthens productive capacity
2. Uses local knowledge, technological innovations, and improvement and replication to ensure contextual suitability and local acceptance
3. Transfers skills and technology at a lower cost
4. Shares more relevant and adaptable public policies for developing countries
5. Enables countries to develop joint solutions to common development challenges
6. Brings back focus on basic infrastructure for development
7. Approximates societies and individuals with similar cultural perspectives and priorities
8. Facilitates common agenda setting and advocacy

A. Overview of SSC initiatives in technologies for adaptation in water and agriculture

The result of the mapping of ongoing and completed projects between 2010-2015 in which transfer of technologies for adaptation in the agriculture and water sectors have originated in developing countries is presented in Table 2. Detailed information on the projects reported in the e-survey conducted with 138 National Designated Entities to the CTCN, 14 CTCN Consortium Partner representatives, and 102 CTCN Network Member representatives is presented in Annex 1.[25]

[22] Actions to combat land degradation, rules and regulations for seeds, renewable natural resources, agricultural modernization and natural resource management, combating desertification and food security

[23] Actions to improve water management techniques

[24] Based on the response of 17 organizations currently engaged in SSC for technologies for adaptation in the agriculture and water sectors. A total of 35 organizations responded to the e-survey between 15-30 November, 2015, out of which 18 said to have been or currently be engaged in SSC versus 18 organizations with no previous or current experience in SSC but willing ness to engage in the near future.

[25] The mapping and the e-survey provided a relatively small subset for generalization on trends across regions and countries. However, some overall patterns can be observed and are described in the following sections.

TABLE 2 - Overview of SSC initiatives in technologies for adaptation in water and agriculture

According to Table 2, **the relatively few SSC initiatives in technologies for adaptation in the agriculture and water sectors tend to concentrate in a small number of countries.** Two main factors seem to contribute to this phenomenon.

First, **the lack of a universally accepted definition of SSC poses questions on whether SSC encompasses people-to-people in addition to government-to-government cooperation**.[26] The Framework of operational guidelines on the United Nations support to South-South and triangular cooperation places partnerships involving governments, regional organizations, civil society, academia and the private sector at the heart of SSC and TrC. This understanding seems to be in line with the

[26] Interview

shift from more traditional aid models – in which States play a central role in project design and implementation – to partnership arrangements in which all development actors share responsibilities and results of their engagements. This also implies more or less structured approaches, beyond traditional project-type interventions. These include the exchange of both tacit and normative knowledge through different means, including from informal exchanges to online platforms and networks.

Second, and possibly influenced by the lack of a universal definition of SSC, is the still relatively low visibility of SSC. Cooperation among developing countries, whether through governments or non-state actors is not a new phenomenon. Yet, much attention has been placed on SSC in recent years largely driven by the financial crisis that has affected Northern countries and its impact on traditional aid, combined with the emergence of BRICS countries in global economics and particularly in development financing. This seems to have contributed to narrowing the scope of SSC as an instrument of foreign policy by 'emerging powers' when in fact it includes a much wider array of countries, actors, and modalities. As such, **many SSC initiatives fall off the radar: SSC partners do not classify their engagements as SSC and opportunities for SSC are missed**. For example, when projects have a SSC component, these are not explicitly defined in project documents and reports. There are also few case studies recounting initiatives led by governments, private sector and non-state actors, as well as few databases on demand and supply of knowledge and technologies, SSC experiences, and flows[27].

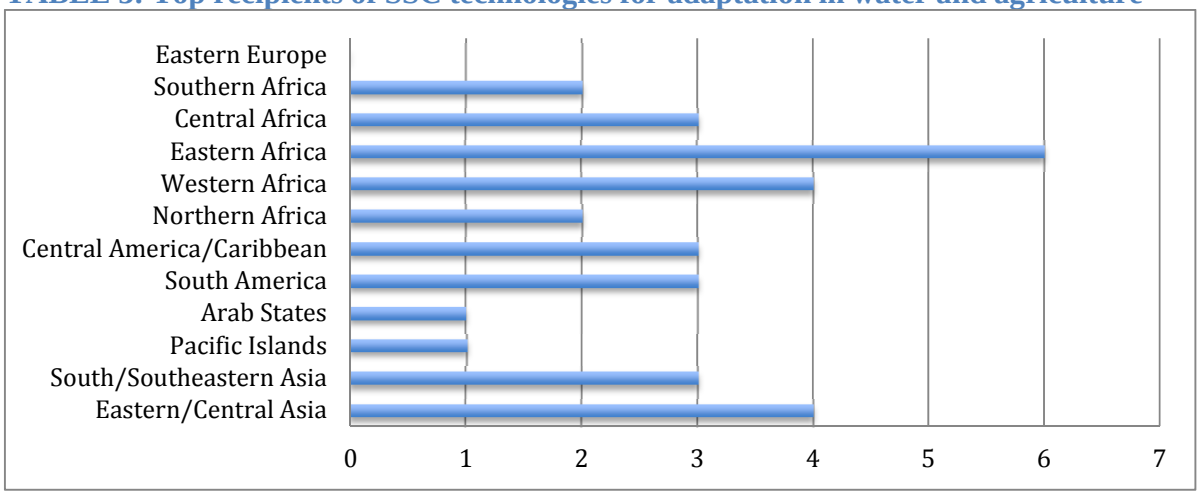
SSC initiatives in technologies for adaptation in the agriculture and water sectors can be divided into three main types of engagement. First, bilateral and global initiatives where Middle Income Countries (MICS) act as providers. Second, regional initiatives where Least Developed Countries (LDCs), Low Income Countries (LICs) and Small Island Developing States (SIDS) are both providers and recipients. These two types of engagement can be facilitated by an international organization either through funding, support to project implementation or knowledge sharing through trilateral arrangements. The third type of engagement happens when SSC is a component of a traditional cooperation project or a stand-alone initiative that promotes South-South engagements promoted by an international organization. Examples for each type of engagement are provided in Annex 1.

The role of international organizations in SSC in technologies for adaptation in water and agriculture cannot be underplayed. Climate change adaptation requires collective solutions through cooperation with other developing countries, and therefore international organizations have a key role to play in convening partners, brokering demand and supply of technologies for adaptation by mapping existing technologies in the South, matching knowledge and technology needs with countries' demand, piloting new initiatives and rolling out bilateral experiences or SSC components in larger projects to other countries. According to Table 2, **there are still few SSC initiatives that focus on the intersection between water, agriculture and climate change**. International organizations can further help countries to link these three areas. Examples of organizations engaging in SSC in technologies for adaptation are provided in Annex 1.

[27]Based on the mapping developed in phase 1 and taking into consideration the following aspects: i) water-agriculture-climate nexus; ii) regional balance; iii) availability of information; iv) different forms of multi-stakeholder engagements (government-government; public-private; civil society); v) results achieved and vi) potential for policy-relevant/actionable lessons learned.

The main recipient countries are in Africa, Asia, Latin America and the Caribbean. The results of the e-survey confirm this finding (Table 3). Possible reasons include the fact that agriculture still accounts for a large portion of these countries' economic activities and the effects of climate change can be more severely felt on the overall sector performance.

TABLE 3: Top recipients of SSC technologies for adaptation in water and agriculture[28]



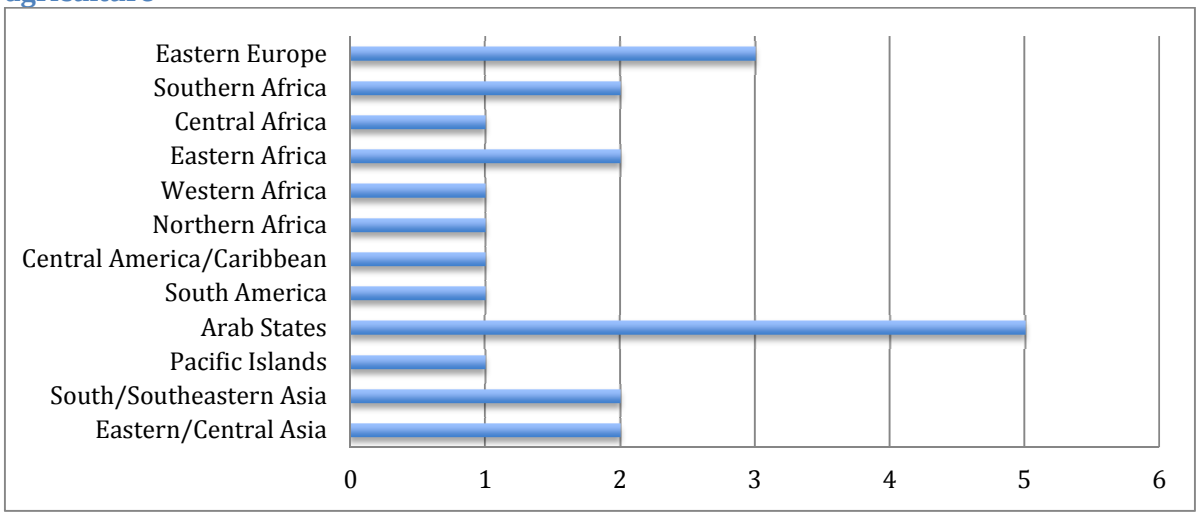
According to the e-survey (Table 4),[29] **there is wide scope for cooperation among all developing nations**. SSC is seen as more cost-effective than traditional cooperation. First, SSC focuses on the solution to complex problems based on previously tested experiences. Second, technologies used by developing countries are in many cases an adapted, less expensive version of the technologies available in the developed world. These technologies may also be more locally relevant, given the similar climatic conditions and geographical and cultural proximity among some developing countries. Hence, it may be easier to adapt technologies used in developing countries to other similar contexts. For example, in 2010 Brazil launched a set of programs aimed at increasing the use of sustainable agriculture technologies with high potential in mitigating GHG emission and fighting global warming. Each program proposes a series of actions, such as improving technical assistance, technology transfer techniques, and the creation of Technological Reference Units. Embrapa is involved in various actions, from enhancing and guiding scientific research on climate change and technologies to leading technology transfer events and actions in Brazil and other developing countries through SSC.[30]

[28]Based on the response of 17 organizations currently engaged in SSC for technologies for adaptation in the agriculture and water sectors. A total of 35 organizations responded to the e-survey between 15-30 November, 2015, out of which 18 said to have been or currently be engaged in SSC versus 18 organizations with no previous or current experience in SSC but willingness to engage in the near future.

[29]The mapping and the e-survey provided a relatively small subset for generalization on trends across regions and countries. However, some overall patterns can be observed.

[30] Interview

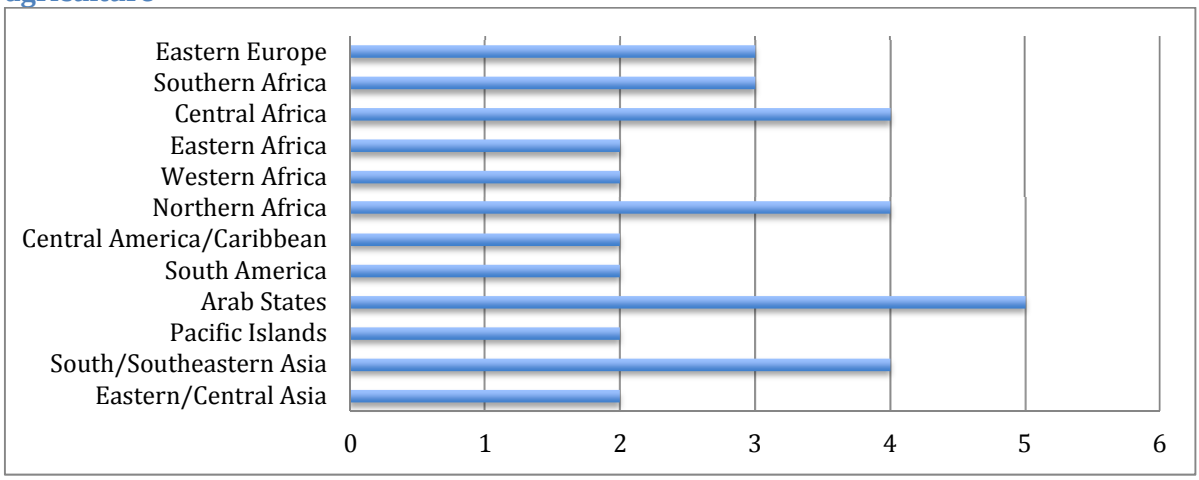
TABLE 4: Main potential providers of SSC technologies for adaptation in water and agriculture[31]



According to the e-survey, the main potential recipients of technologies follow the same pattern observed in Table 4, being **Africa, Asia and Latin America and the Caribbean among the main receiving regions**. The e-survey also points to the yet **unexplored potential of Eastern Europe and Arab States as providers of technologies for adaptation in the water and agriculture sectors** (Table 4). **Arab States also appear among the main potential recipients** (Table 5) of technologies for adaptation in the water and agriculture sectors, according to the e-survey. These countries, mainly those in the Middle East and Africa (MENA) region, have been one of the first to adapt their agriculture and water systems to climate change. As such, these countries have become a 'laboratory' for new technologies for adaptation and are now in a position to share their experiences with other countries, which are now beginning to adapt to rising temperatures.[32]

[31]Based on the response of 18 organizations willing to engage in SSC for technologies for adaptation in the agriculture and water sectors. A total of 35 organizations responded the e-survey between 15-30 November, 2015, out of which 18 said to have been or currently be engaged in SSC versus 18 organizations with no previous or current experience in SSC but willing ness to engage in the near future.
[32]Interview.

TABLE 5: Main potential recipients of SSC technologies for adaptation in water and agriculture[33]



B. Major trends of SSC in technologies for adaptation in water and agriculture

As discussed in the previous section, international organizations play a key role in matching knowledge and technology needs with countries demand, piloting new initiatives and rolling out bilateral experiences. According to the mapping and the e-survey, **most SSC in technologies for adaptation in water and agriculture are directly or indirectly supported by specialized international agencies, programs and funds** at the request of developing countries. This trend tends to grow as these international organizations structure their support services according to the needs of their member countries.

In the case of support by the Technology Mechanism, the Climate and Technology Center & Network (CTCN) receives requests for technologies for adaptation from its member countries through their National Designated Entities (NDE). CTCN identifies the appropriate provider from within its network. This network is comprised of public and private organizations like research institutes, government entities and consulting firms worldwide. SSC initiatives usually take the form of a technical assistance component in a nationally executed technical cooperation project. They might also take the form of knowledge platforms and networks of experts that allow for short-term or more sustained exchanges. CTCN has been trying to expand its support to SSC, including through the review of its network membership, institutionalized funding mechanisms, and support to NDEs in designing their requests[34].

According to the e-survey, **SSC for technologies for adaptation in water and agriculture is mainly delivered through capacity building initiatives**, being training, study tours, technology needs assessments, road maps and action plans some of the main instruments used. While these exchanges still take place on a more informal and ad-hoc basis, **support to SSC begins to prioritize capacity building initiatives for more sustainable transfers and uptake of technologies for adaptation.**

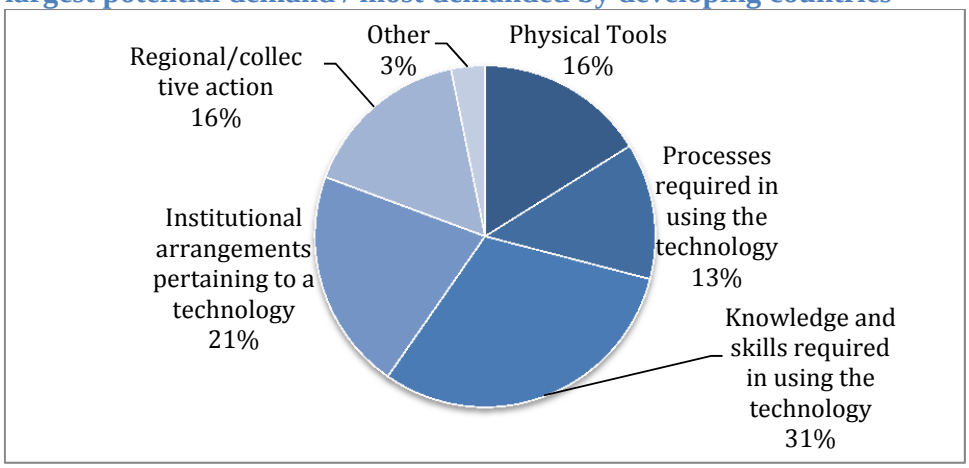
[33]Based on the response of 18 organizations willing to engage in SSC for technologies for adaptation in the agriculture and water sectors. A total of 35 organizations responded the e-survey between 15-30 November, 2015, out of which 18 said to have been or currently be engaged in SSC versus 18 organizations with no previous or current experience in SSC but willingness to engage in the near future.

[34] Interview

Therefore, **delivery modalities and instruments that build relationships and capacity beyond the project life-span** (e.g. train the trainer programs, joint research activities and knowledge and technology networks and platforms) **are gaining traction and being combined with one another depending on the context in more structuring interventions**. **Funds and trusts funds, in turn, figure among the main funding modalities used, while private sector engagement** (e.g. through public-private partnerships that provide seed capital to implement relevant and viable technologies, support uptake of successful adaptation, etc) **are not well documented now.**

In the case of SSC for adaptation, organizations participating in the e-survey have indicated the five hardware, software and orgware technologies most demanded by developing countries. Knowledge and skills required in using technologies for adaptation was ranked first with 31% of responses, followed by institutional arrangements pertaining to a technology (21%) and processes required in using the technology (13%) (Table 6). Financing for developing, piloting and upscaling technologies, and community engagement was also mentioned in 'other.'

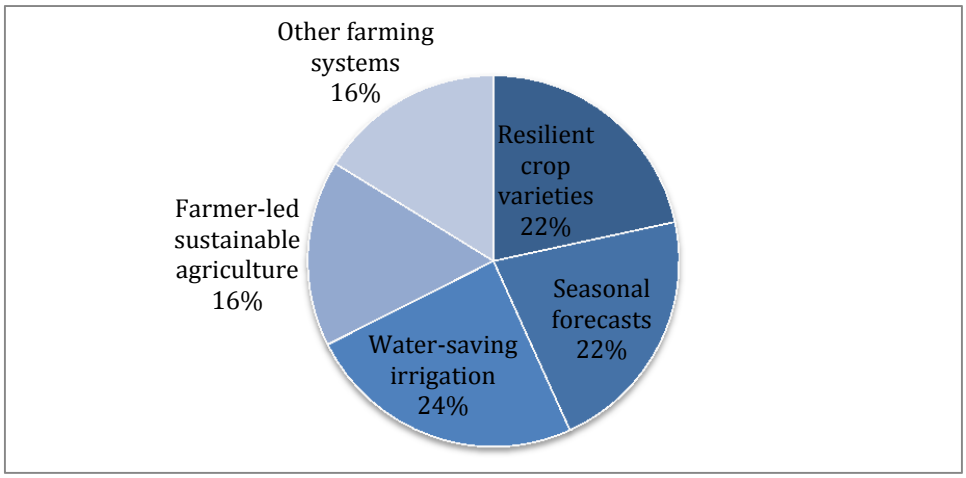
TABLE 6: SSC hardware, software and orgware technologies for adaptation with the largest potential demand / most demanded by developing countries[35]



In the 2013 TNA synthesis report, UNFCCC Parties identified more than 320 different technology options, from which more than 150 different technologies were prioritized. Within the agriculture sector, the majority of the technologies prioritized in the 2013 TNA synthesis report were related to crop management and improvement, mainly biotechnology, drought-resistant, salient-tolerant and short-maturing varieties. In the case of SSC for adaptation, organizations participating in the e-survey have corroborated this trend by indicating seasonal forecasts (22%) and resilient crop-varieties (22%) among the top three technologies for adaptation in the agriculture sector with the largest demand by developing countries. Water saving irrigation was ranked first, with 24% (Table 7). Other SSC technologies mentioned were climate risk management and risk transfer in case of loss and damage; conservation farming; vulnerability analysis and planning; and biodigesting.

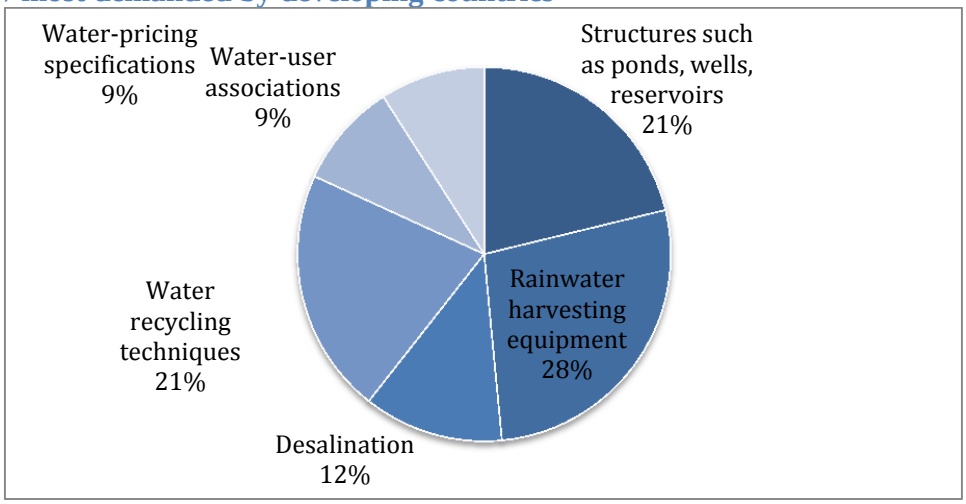
[35]Based on the response of 35 organizations to e-survey conducted between 15-30 November, 2015.

TABLE 7: SSC technologies for adaptation in the agriculture sector with the largest potential demand/most demanded by developing countries[36]



In the water sector, the SSC technologies for adaptation most demanded are rainwater harvesting equipment which was appointed by 28% of respondents, followed by structures such as ponds, wells and reservoirs (21%), and water recycling techniques (21%). (Table 8) Rainfall modeling, early warning systems; technologies for efficient use of water; and payments for ecosystem services/water funds were also mentioned.

TABLE 8: SSC technologies for adaptation in the water sector with the largest potential demand / most demanded by developing countries[37]



C. Promoting enablers and addressing the barriers to SSC in technologies for adaptation in water and agriculture

In order to meet the potential demand for technologies for adaptation and enhance support to existing initiatives, **SSC partners must consider the financial, policy, regulatory, institutional and**

[36]Based on the response of 35 organizations to e-survey conducted between 15-30 November, 2015.
[37]Based on the response of 35 organizations to e-survey conducted between 15-30 November, 2015.

technical challenges that commonly affect their efforts. Poor alignment with development priorities, sector strategies and plans, inadequate policy and regulatory frameworks, short-term focus and disconnect between the SSC initiatives and the local reality, and lack of or inadequate access to financial resources (Table 9) are examples of the challenges that still limit the transfer of technologies for adaptation among developing countries.

TABLE 9: Main factors that hinder SSC in technologies for adaptation[38]

1. Poor alignment with development priorities, sector strategies and plans;
2. Inadequate policy/legal/regulatory frameworks;
3. Planning and coordination do not consider the local context
4. Short-term focus
5. Poor resource mobilization and predictability
6. Poor resource allocation and expenditure | Insufficient political support
7. Non-inclusive approach
8. Hardware, software and orgware technologies applied in isolation
9. Poor cost-effectiveness
10. Poor human/technical resources and capacity
11. Poor communication and knowledge management
12. Failure to account for possible climatic consequences and adaptation limits
13. Low ownership and local empowerment
14. Lack of local engagement and advocacy

According to a respondent of the e-survey, '**sometimes it is not lack of resources, but poor planning and lack of accountability in the use of available resources** (…) that providers of funding carry out their planning elsewhere while ignoring the local context, which might provide useful resource in any regard.' Another respondent adds that '**very often planning does not take into account the situation of countries**, such as the unstable political regimes and revolutions, thus generating **low participation of various stakeholders and civil society**.' The misuse of allocated resources was identified as another major barrier to SSC for technologies for adaptation, along with **lack of coordination** within groups handling technology issues in adaptation, **poor political support, advocacy, communication and outreach**, as well as resistance to change and cultural barriers limiting adjustments when necessary.

Nearly 50% of the organizations that participated in the e-survey have never engaged in SSC in technologies for adaptation in the agriculture and water sectors. Despite recognizing the potential for SSC, these organizations often report the limited information of who produces, how and the type of available technology as one of the main factors that hinder their engagement in knowledge and technology transfer among developing countries. According to a respondent, sharing technologies for adaptation means to buy hardware - which in most cases are very locally adapted - share general idea, or assist in implementation and management. Each of these options has its barriers, but 'all of them have in common that **technologies for adaptation used in Southern countries are not well known**.'

[38]Based on the response of 17 organizations currently engaged in SSC for technologies for adaptation in the agriculture and water sectors. A total of 35 organizations responded to the e-survey between 15-30 November, 2015, out of which 18 said to have been or currently be engaged in SSC versus 18 organizations with no previous or current experience in SSC but willing ness to engage in the near future.

At the institutional level, the **lack of funding and dedicated human resources** were identified as some of the main factors that hinder organizations' engagement in SSC in technologies for adaptation. Measures to increase funding for SSC have included the introduction of specific allocations for technology research and development activities in the national budget or by identifying and creating financial schemes and funds for technology transfer. Other enablers include setting up coordination and communication channels for information exchange between partners.

The **lack of regulatory frameworks for technology transfer and handling intellectual property** also provide negative incentives for organizations that are considering to invest in SSC. The measures put forward to overcome this challenge were quite diverse and include establishing quality control systems and agriculture crediting and certification systems, formulating detailed regulations and standards for the prioritized technology, creating policies to enforce land utilization and avoid conflicts between farmers, and reviewing the current regulatory framework to include an agricultural extension service (educating farmers to apply related scientific research to agricultural practices).

III. Case studies

The following case studies illustrate how countries have been addressing some of the barriers through SSC. **Many of the challenges faced by SSC initiatives are similar to those faced by traditional cooperation. Yet, SSC has provided some innovative solutions**. The case studies focus on three main contributing factors to the successful replication and transfer of technologies for adaptation through SSC: i) knowledge management and capacity building systems and strategies; ii) recognition and management of indigenous knowledge and technology in water & agriculture that can increase resilience; and iii) replication and up-scaling potential.

A. Case study 1: Adaptation to climate change induced stress in the Nile Basin

The Nile system is one of Africa's most important ecosystems, since it hosts 40% of Africa's population. The challenges emanating from climate change in the Nile Basin include uncertainty as regards precipitation and river flow, land degradation, reduced river flow, flooding, droughts, deforestation, and loss of species and ecosystems. Additional challenges are the lack of sufficient institutional capacity and networking, inadequate climate variability monitoring and response mechanisms, lack of communication between science and policy communities, and inadequate technical capacity that is needed to cope with climate change related impacts.

Although climate change has a fundamental role for water management, reforms in the water sector in the Nile Basin region often have very weak links to climate. Not all countries in the Nile Basin have a water policy, let-alone a comprehensive water policy. Vulnerable sectors to impacts of climate change in the Nile region were identified as agriculture, water, energy and ecosystems, and the identification for needs for adaptation to climate change included satisfying access to water.

The "Adapting to climate change induced water stress in the Nile River Basin" project was launched in March 2010 as a partnership between UNEP and the Nile Basin Initiative (NBI), sponsored by SIDA. The overall project goal was to build the resilience of ecosystems and economies that are most vulnerable to climate change induced water stress in the Nile Basin countries through building key adaptive capacity and piloting adaptation in "hotspots" with technical, policy and financial interventions. Specifically, the project aims at minimizing the projected stress of too little and too much water (flooding and water scarcity) for conflict prevention and disaster reduction, through knowledge-based policy intervention, technology transfer and investment in key infrastructure.

Results and information emanating from the project were expected to support policy areas and decision makers in the Nile Basin region in addressing the myriad complexities of increasing water scarcity, deteriorating water quality, lack of access to electricity, climate change and its potential impacts (i.e., droughts, floods, wetland degradation) as well as uneven levels of economic development. Additionally, the results from the project were to lead to increased cooperative management of the common Nile Basin water resources.

Recognition and management of indigenous knowledge and technology in water & agriculture
UNEP, in collaboration with DHI, developed an assessment methodology including themes, tools, criteria and indicators for selecting hot spots linked to scenario development. The framework sought to improve the regional knowledge and information based on adaptation strategies and transformative policies to manage these stared resources of the Nile Basin. A vulnerability assessment report was produced that identified adoption to climate change adaptation methods that build resilience of vulnerable sectors and ecosystems in the region. The purpose of the study was to extend the knowledge and information base and aid critical policy intervention that complements and strengthens ongoing efforts to address the challenge of managing water resources in the area.

Knowledge management and capacity building systems and strategies
The GWP and the NBI were responsible for building the capacities of government agencies, research institutes, non-governmental organizations and other social actors that can facilitate climate resilience at local and national level. The NBI facilitated political and technical processes and provided relevant climate information, while GWP provided training, information management and dissemination through climate change adaptation portals and awareness material. Based on these interventions, several policy areas and recommendations for policy actions were identified.

Replication and up-scaling potential
Based on information generated by the comprehensive assessment work on hot spots, Uganda and Ethiopia were selected as pilot countries where demonstrations were undertaken. UNEP collaborated with several partners to implement functional and replicable demonstration sites linked to adaptation practices in a mountain or wetland ecosystem. Results from the demonstration site were shared with other countries within the basin.

B. Case study 2: Barley-livestock systems for better climate change resilience in Jordan and Iraq

Barley-based livestock production systems largely depend on agricultural production and animal keeping activities, and sustain some of the poorest segments of the rural population in North Africa and West Asia. In Iraq and Jordan, barley-livestock systems rarely provide a dependable means of food supply and income for farmers. Limited access to inputs, fragmented extension and research programs, and unsustainable farming practices lead to increased poverty and insecurity.

These already severe problems are complicated by climate variability and the increased incidence of drought. In recent years, barley farmers in both countries have experienced significant losses during prolonged dry spells. Areas harvested with barley decreased by 50 per cent in Jordan in 2008, and declined from 750,000 ha to only 25,000-75,000 ha when drought struck northern Iraq in 2008 and 2009. In the coming decades, climatologists predict more frequent climatic extremes: longer droughts,

more intense storms, and extreme low temperatures that will damage or destroy crops and vegetation unable to adapt.

This IFAD-funded project builds on previous ICARDA research initiatives to improve awareness of climate change at the policy and community levels, deliver technologies to resource-poor communities, and encourage farmers to adopt sustainable agricultural practices. The project aims to increase the productivity of barley-livestock agricultural systems in Iraq and Jordan while strengthening climate change resilience among targeted rural communities in the two countries. This is expected to be achieved by enhancing national and community-level awareness about the expected detrimental impacts of climate change, and extending ready-to-use technologies that help vulnerable rural communities adapt to climate variability and implement effective responses.

Recognition and management of indigenous knowledge and technology in water & agriculture
An important part of the Project's reform efforts are community consultations, events held to discuss the climate changes that communities have witnessed in living memory and using this as the basis to introduce the concept of climate change and enhance understanding and awareness of the threats posed to local livelihoods. The consultations have framed community climate change plans. Simple and action-oriented, these plans prioritize adaptation strategies and are designed to help communities cope with the negative effects of climate change.

Helping rural communities to adapt to the impacts of climate change also requires the uptake of new innovations that can deliver productivity gains against a backdrop of shifting weather patterns and increasingly scarce water resources. The project builds on existing expertise and knowledge to offer communities technology packages targeting barley and small ruminant production – a mainstay of rural production systems in Jordan and Iraq. Technologies and management practices for barley cultivation (e.g. improved, drought-tolerant barley varieties, zero tillage, early sowing, modified seeding rates and the benefits of reduced inputs and reduced fuel costs) and small ruminant production (e.g. basic improvements in fertility and productivity through measures such as early weaning and simultaneous milking, correct dosage, and timing of parasite control and feed blocks) developed in similar agro-ecological systems are immediately available for adaptation and adoption in target areas, and offer tangible benefits towards improved food security and income generation.

Knowledge management and capacity building systems and strategies
Ensuring that new transformative technologies were placed directly in the hands of farmers, giving them the tools to change their practices and mitigate the threat posed by climate change, was one of the main priorities of the project. In order to achieve this goal, an evaluation and climate change proofing of appropriate technologies was conducted. This was followed by efforts to identify the opportunities and potential for the generation of new technologies capable of strengthening farmer resilience. Potential technologies were evaluated according to a series of relevant criteria: suitability and resilience to climate change, and measurable improvements in livelihoods within targeted rural communities. Efforts to transfer new information and technologies to farmers were promoted via peer-to-peer learning, an effective means of demonstrating new innovations, directly illustrating their transformative potential to farmers. The capacity of extension agents will be raised through regular trainings and workshops.
Replication and up-scaling potential

Efforts are made to ensure that project activities are promulgated at the policy level. Once 'Living Memory' workshops are held and surveys completed, meetings for relevant community members, extension officers, researchers, and policy makers will be held to disseminate the results and formulate recommendations for helping local communities to cope with the impacts of climate change. Plans will then be developed based on these policy recommendations, enabling the community to bring climate change into sharper focus and implement adaptation activities. It is expected that an initial 1600 households in the target areas in Iraq and Jordan – approximately 10,000 people – benefit from the project. The project shall be extended to communities living in similar agro-ecologies throughout the Middle East and North Africa.

C. Case study 3: Capacity building program for agricultural development in Latin America and the Caribbean

While the countries of Latin America and the Caribbean have increased their agricultural, forestry and fishery production at rates above the global average over the past decade, they also face serious problems of soil degradation, water depletion and pollution, deforestation, biodiversity loss, social, economic and environmental sustainability threats and increased risks associated with climate change. The acute vulnerability of these sectors to natural disasters and weather events has led to recurring emergencies threatening the livelihoods of thousands of people. Emerging pests and diseases of plants and animals also pose an increasing threat owing to their impact on trade, public health and food security.

With the aim of promoting agricultural development in the Caribbean and South-South cooperation, Mexico offered training for at least 150 agricultural producers from Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Haiti, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and the Dominican Republic, under an agreement between the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) of Mexico and the Inter-American Institute for Cooperation on Agriculture (IICA).

The training is designed to foster agricultural development in the Caribbean region and promote Mexico's international cooperation with the Caribbean, based on the capacity, talent and experience of Mexico's educational and research institutions. Specialists of Mexico's Graduate School (COLPOS), the Regional Center for Integrated Services in Protected Agriculture (CRESIAP), the Autonomous University of Chapingo (UACH), the Mexican Institute of Water Technology (IMTA) and the Yucatán Scientific Research Center (CICY) teach the classes.

Recognition and management of indigenous knowledge and technology in water & agriculture

Productivity models that could be replicated in the economies of the recipient countries were identified. One example is the COLPOS-Puebla, who developed a model for family agriculture that made it possible to reduce capital costs, overcome food problems and harness natural resources. The model forms part of the trainings provided in the context of the program.

Knowledge management and capacity building systems and strategies

Participants in the training include producers and technical officers and professionals drawn from the public and private agricultural sectors of the 15 participating Caribbean countries. The training is part of a larger capacity-building program comprised of three stages. The first stage is a technical-practical training for Caribbean producers; the second consists of follow-up to programs carried out by the Caribbean trainees in their respective countries; and the third involves Mexican academics and

researchers traveling to the Caribbean to evaluate and reinforce on the ground the new expertise acquired by the trainees.

Replication and up-scaling potential

In 2015, six Central American countries were added to the agricultural capacity-building program after the ministries of agriculture of those countries expressed their interest. The program is being carried out under the technical cooperation agreement that SAGARPA and IICA signed in April of this year in Yucatán, during the Third Mexico-Caribbean Community (CARICOM) Summit. Mexico's Secretariat of Foreign Affairs (SER), through the Mexican Agency for International Development Cooperation (AMEXCID), is supervising and assisting with the program.

D. Lessons Learned: using local knowledge and technology, developing capacities, and replicating and upscaling SSC initiatives

The initiatives analyzed represent some of the forms that SSC in technologies for adaptation can take, from fully-fledged SSC programs, South-South component of a traditional project; to IT platforms and networks for knowledge and information exchange funded through bilateral, trilateral and multilateral channels. All these examples provide lessons for the transfer of technologies for adaptation in the water and agriculture sectors in the context of SSC**.**

Recognizing, using and developing indigenous technology can increase climate resilience

The case studies demonstrate how indigenous knowledge and technology can be more accessible, adaptable and affordable to the context of developing countries. Mechanisms to identify, use and develop this knowledge and technology in the context of SSC include bottom-up, participatory approaches like community consultations and peer-to-peer learning. These approaches help transfer new information to farmers and extend ready-to-use technologies that help vulnerable rural communities adapt to climate variability. They are also important to empower local communities to contribute to action-oriented plans that prioritize adaptation strategies and cope with the negative effects of climate change.

Adaptive programs and multi-dimensional partnerships contribute to the implementation of more contextually relevant, sustainable technologies

Through the case studies, the adoption of mechanisms for assessing countries' needs and identifying suitable technology to be transferred was evidenced as a key step in SSC in technologies for adaptation. These mechanisms include criteria and indicators for selecting hot spots linked to scenario development, vulnerability assessment reports, as well as frameworks to improve the regional knowledge and information among others. Programs and partnerships must be flexibly formed in order to adapt to local contexts as well as be time and cost efficient. The case studies also point to the need to extend the knowledge and information base to aid critical policy intervention that complements and strengthens ongoing adaptation efforts.

Capacity building systems and strategies should be designed to enable countries to devise solutions for their self-development

Another lesson from the case studies is the need to strengthen local capacities (human capital, systems and institutions) so that the basic conditions are created for countries to lead their own development process. Capacity building activities should therefore comprise a combination of technical-practical training, supervised practice, evaluation of learning and complementary initiatives

to reinforce the learning process on a case-by-case basis. They should also include permanent structures or systems like climate change adaptation portals as well as platforms and networks to provide appropriate, cost-effective mechanisms for continuous collaboration and exchange of information. As for capacity building strategies, the case studies point to the need to invest in political and technical processes like technology inventories, policy and technology observatories, information management and dissemination systems. These processes can strengthen local participation, identification of policy priorities and actions, as well as mutual accountability.

A systematic approach is needed to take the cooperation to scale and fully leverage the diverse cooperation modalities under the SSC framework to advance development goals of a country. There is a need for partners to form a strategy for SSC and embed that strategy into national development planning. According to the case studies, further efforts are needed to ensure that project findings and results feed into policy processes and help devise policies to reduce barriers to technological application. This can be done throughout the project lifespan as for instance through meetings with relevant community members, extension officers, researchers, and policy makers to discuss, validate and disseminate results as well as to formulate recommendations for helping local communities to cope with the impacts of climate change. Action plans based on these policy recommendations can further enable communities to bring climate change into sharper focus and implement adaptation activities.

IV. Actions for enhanced SSC in technologies for adaptation in water and agriculture

Based on the e-survey, in-depth interviews with selected respondents and the lessons from the case studies, there are a number of actions that could be undertaken by various stakeholders to foster technologies for adaptation in the context of SSC. It is important to note that this list represents preliminary suggestions for further discussion and validation by TEC members. As such, the actions indicated below are by no means exhaustive.

A. Governments, research institutes, specialized UN agencies, programs and funds, and other national and international organizations

Collectively, actions could include:

a. Develop knowledge base of integrated technologies for climate change adaptation from the South

Water, agriculture and climate change are closely intertwined. Yet, there seem to be few examples of SSC in technologies for adaptation that adopt integrated approaches to the water-food-climate nexus. Similarly, there is no broadly accepted definition of adaptation technologies or even adaptation actions. There is also limited awareness of what and where hard, soft and orgware technologies for adaptation from the South are located.

Action may include expand ongoing efforts to develop a broadly accepted definition for adaptation technologies, mapping of technologies and systematization of exchanges among developing countries, including the approaches taken, the modalities used, as well as the strategies for capacity building, management of indigenous technology, and scaling up. These efforts should as much as possible build on and integrate with similar pre-existing initiatives. This will not only increase coherence but also outreach.

b. Increase visibility of existing technologies and networks from the South

SSC goes beyond financial transfers. It can foster adaptation measures through the exchange of technologies that countries accumulate in their own development processes and their adaptation to other similar environments. Yet, evidence shows that many SSC initiatives, particularly in technologies for adaptation, remain unaccounted. This is mainly due to the lack of a universally accepted definition for SSC, the overall fragmentation and low visibility of SSC initiatives in organizations portfolios.

Action may include indicators for identifying SSC projects and activities, and the development of a SSC 'marker' to identify whether or not a project is designed to effectively promote the exchange of technologies for adaptation among development countries or when a technology from another developing country has been used.

c. Map existing climate funds for technologies for adaptation and how to access them

Bilateral funds and global trust funds figure among the main avenues for financing SSC in technologies for adaptation, while private sector engagement needs to be further developed.

Action may include a mapping of existing commitments by countries, the mechanisms trough which this funding will be disbursed, how organizations can access these mechanisms, and potential barriers to assess, disburse and execute this funding. In addition, organizations may consider diversifying their funding sources, including through public-private partnerships that provide seed capital to implement relevant and viable technologies and support uptake of successful adaptation.

d. Mainstream SSC in technologies for adaptation into programs and secure regular funding

Mainstreaming can take different contours, ranging from knowledge-focused to programmatic and operational incentives given at various levels of an organization. Evidence of successful SSC mainstreaming also varies considerably. While some organizations expect the scaling up and development of new programs as the main evidence of successful mainstreaming of new practices and modalities in operations; others consider the internalization of knowledge from previous programs to be more important including for the quality of services offered through its reuse in new initiatives.

Action may include for the organizations engaging in SSC to consider defining 'mainstreaming' and the actions needed at the strategic/programming, project and knowledge levels. They may embed specific allocations for technology research and development in organizational planning and budgeting processes to secure regular funding for SSC initiatives.

e. Invest in capacity building at all levels

SSC is mutual support and should be a win-win solution. However capacity gaps often lead to less equal partnership or unrealized mutual benefits. Countries have a disproportionate ability to manage and participate in SSC mostly because capacities to share, access, plan, coordinate and monitor are variable across participants. SSC in technologies for adaptation must strengthen local capacities (human capital, systems and institutions) so that the basic conditions like are created for countries to lead their own development process.

Action may include creating incentives and mechanisms for continued collaboration after the project conclusion, like empowering recipient countries to become providers of the technology received by

embedding knowledge sharing initiatives and platforms with neighbouring countries facing similar challenges in the projects. Organizations should further pursue a combination of two or more modalities, secure regular and diversified funding for projects, and establish joint-governance, decision-making and knowledge management mechanisms.

f. Address policy and regulatory gaps

Action in this area may include establishing quality control systems and agriculture crediting and certification systems, formulating detailed regulations and standards for the prioritized technology, creating policies to enforce land utilization and avoid conflicts between farmers, and reviewing the current regulatory framework to include an agricultural extension service (educating farmers to apply related scientific research to agricultural practices).

B. TEC/CTCN enhanced support to SSC in technologies for adaptation in water and agriculture

Recommendations for specific policies and actions by the TEC/CTCN for more effective SSC technologies for adaptation include:

a. Create a policy space and network to promote SSC in technologies for adaptation

The world needs a better understanding of what SSC is and be ready to fully gain strength from the diversity it brings. There is still some blurry understanding of the concept. In addition, SSC frequently happens under different modalities, which are normally not assessed; there is currently no systematic and widely available information on the trends and patterns of SSC; and there is a lack of monitoring and evaluation frameworks that can assess its strengths and weaknesses in which developing countries can use. There also needs to be an enabling environment and space in which institutions and experts from the South are able to share information and knowledge to which they can easily and freely access.

The TEC may consider including SSC as a topic for discussion in the annual meeting, and thematic dialogues and other regular events. This would be an opportunity for the TEC to regularly assess the state of SSC in technologies for adaptation, review progress, identify areas for enhanced support, and propose recommendations. The TEC may further establish a Panel comprised of SSC experts and practitioners in the area of climate change adaptation to provide strategic inputs in advancing SSC in technologies for adaptation, including through advocacy with internal and external partners. An online community of practice under the TT: Clear website and participation in TEC annual meeting, thematic dialogues and other regular events could be the main avenues for interaction among the Panel, the TEC, and other relevant adaptation mechanisms.

b. Develop an online knowledge repository and exchange platform to identify and match the demand with the supply of SSC in technologies for adaptation

The TEC may recommend the creation of a SSC marker to identify SSC projects and activities in technologies for adaptation or when a technology from another developing country has been used. It may also facilitate a global initiative to map technologies and systematize exchanges among developing countries, in partnership with research institutions, governments and academia worldwide.

The CTCN may consider developing a registry with all relevant information on SSC in technologies for adaptation (e.g. existing technologies, demand for technologies for adaptation, funding mechanisms, how to access these funds, etc) and information on Parties' technologies for adaptation in water and

agriculture that could be matched with countries' demands. The registry would serve as a ¨one stop shop¨ to be hosted in CTCN website. It could also serve as a knowledge repository and include case studies of solutions exchanges and the lessons learned for future program design and implementation.

c. Facilitate the creation of partnerships at the local, national and regional levels

The TEC could encourage Parties and organizations to share information on SSC on technologies for adaptation. The CTCN may further explore the potential for Arab States, Eastern Europe, and other regions as providers of sharing technologies for adaptation with other developing countries by identifying centers of excellence in these regions and engaging them in its network. CTCN membership may also be reviewed to balance regional participation and include a mix of private sector, research institutions, think-tanks, NGOs and government organizations.

d. Assist Parties access and make better use of funding mechanisms

The TEC may propose a review of the operational procedures of the Green Climate Fund (GCF) and the Global Environment Facility (GEF) to ensure these mechanisms can best support SSC in technologies for adaptation. For example, projects submitted to the CTCN could be funded by resources pooled from different mechanisms, GCF and GEF could include specific criteria and performance indicators for South-South exchanges, and incentives could be provided for stand-alone SSC projects. The TEC may consider recommending specific allocations for SSC in technologies for adaptation are created. These initiatives could have a powerful demonstration effect, thus enhancing countries' appetite for SSC.

Additional action by the TEC may include a recommendation for a mapping of existing commitments, the mechanisms trough which funding is disbursed, how organizations can access this funding, and potential barriers to assess, disburse and execute this funding. An example could be the China's USD3.1 billion commitment to mainstream investments in line with the 2 degrees goal as well an additional USD 60 billion climate finance for development projects in Africa.

e. Recommend actions to enhance country-level support, mainly in least developed and most vulnerable countries

Joint research work could be explored along with enhanced support by the TEC and CTCN to the National Designed Entities in liaising with national stakeholders, developing projects that are context relevant and in line with national development priorities, mobilizing new resources, following up on commitments and monitoring project implementation.

While exchanges still take place on a more informal and ad-hoc basis, support to SSC begins to prioritize capacity building initiatives for more sustainable transfers and uptake of technologies for adaptation. Delivery modalities and instruments that build relationships and capacity beyond the project life-span are gaining traction and being combined with one another depending on the context in more structuring interventions. The TEC may systematize experiences that use different modalities and draw lessons for selecting which modality to use in which context.

C. Tapping the potential contribution by other global mechanisms and institutions

The Paris Agreement affirms that adaptation to climate change is a central issue for global climate action. It establishes a global goal of enhancing adaptive capacity, strengthening resilience and

reducing vulnerability, including an adequate adaptation response given the Agreement's temperature goal. In addition, the Agreement also calls for countries to strengthen their cooperation on adaptation actions, including sharing information, good practices, experiences and lessons learned.

As regards to pre-2020 actions, countries agreed to launch a technical examination process which endeavor to identify opportunities for strengthening resilience, reducing vulnerabilities and increasing the understanding and implementation of adaptation actions. This will be pursued through, practices and actions such as promotion of cooperative action on adaptation and identifying opportunities to strengthen enabling environments and enhance the provision of support for adaptation in the context of specific policies

As the overall advisory body on adaptation under the UNFCCC, **the Adaptation Committee can foster SSC to help deliver the Paris Agreement.** This can be pursued through engagement with national, regional and international organizations; centers and networks; as well as through information and recommendations for consideration by the COP when providing guidance on means to incentivize the implementation of adaptation actions, information communicated by Parties on their monitoring and review of adaptation actions, support provided and received.

Other global mechanisms and institutions like the Technology Facilitation Mechanism[39] (TFM) can potentially help advance SSC in technologies for adaptation that use integrated approaches to the water-food-climate nexus. As previously discussed, water, agriculture and climate change are closely intertwined. Yet, there have been relatively few examples of SSC in technologies for adaptation that adopt integrated approaches to the water-food-climate nexus. As a gateway for information on existing science, technology and innovation (STI) initiatives, mechanisms and programs within the UN across the 17 Sustainable Development Goals (SDGs), the TFM can help address complex development challenges like the water-food-climate nexus.

There is potential for complementarity and cooperation among the TFM, the TEC and the CTCN with regards to the matchmaking function as well as the facilitation of access to information, knowledge, experience and best practices with regard to the implementation of SSC initiatives in technology for adaptation. As an inter-governmental body, the TFM's focus on initiatives, mechanisms and programs may potentially create limitations in terms of support to private innovation and small businesses. These could be addressed by the CTCN through its multi-stakeholder network and initiatives. Complementary might also be explored with the TEC, through joint policy spaces and networks to promote SSC in technologies for adaptation. Coordination of the SSC in technology for adaptation initiatives taken by the TFM, the TEC and the CTCN should be further discussed as the TFM evolves and taking into

[39] Launched in September 2015, the Technology Facilitation Mechanism (TFM) aims at increasing the creation and use of innovative technologies that will help achieve the 2030 Agenda on Sustainable Development. The Mechanism will be composed of a UN Inter-Agency Task Team (IATT) on Science, Technology and Innovation (STI) for the SDGs, chaired by UNEP and the UN Department of Economic and Social Affairs (UN-DESA); an annual forum; and an online platform as a gateway for information on existing STI initiatives, mechanisms and programs. The online platform will be used to map information on existing science, technology and innovation initiatives, mechanisms and programs. It will facilitate access to information, knowledge and experience, as well as best practices and lessons learned, on science, technology and innovation facilitation initiatives and policies. The multi-stakeholder forum on science, technology and innovation will be convened once a year, for a period of two days, to discuss science, technology and innovation cooperation around thematic areas for the implementation of the sustainable development goals. It will identify and examine technology needs and gaps, including on scientific cooperation, innovation and capacity-building. The mechanism is part of an overall deal to improve development financing and organize funding for the Sustainable Development Goals (SDGs).

consideration the review of adaptation activities under the Convention scheduled for 2017 as well as the implementation of the 2030 development agenda.

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ANNEX 1 – Detailed information on SSC initiatives in technologies for adaptation in the agriculture and water sectors[40]

PROJECT NAME	TYPE	PROVIDER	RECIPIENT	SECTOR
ABC Program - Low Carbon Agriculture	TBC	Brazil	TBC	Agriculture
Agriculture Marketplace	Global	Brazil	African region	Agriculture
National Program for Food Security and the National Mongolian Livestock Program	Bilateral	China	Mongolia	Agriculture
Sustainable Development in Turkey	Bilateral	Mexico	Turkey	Agriculture
Learning International Good Practice Approaches on Conservation Agriculture from Brazil: Guandong's Experience	Bilateral	Brazil	China	Agriculture
Implementing and Sustaining Shade-Grown Coffee in Burundi and Rwanda: An Exchange of Traditions with Colombia and Ethiopia	Global	Colombia, Ethiopia	Ethiopia, Burundi, Rwanda	Agriculture
Reshaping Pakistan's Agricultural Innovation Systems and Research: Learning from the Experience of EMBRAPA Brazil	Bilateral	Brazil	Pakistan	Agriculture
Learning from Experience with Small-scale Irrigation in West Africa	Regional	Burkina Faso, Mali, Niger, Nigeria	Burkina Faso, Cote d'Ivoire, Ghana, Mali, Niger, Nigeria, Senegal, Togo	Agriculture
Improving Water and Soil Conservation in Africa to Enhance Sustainable Agriculture and Poverty Reduction Efforts	Bilateral	China	Burundi, Ethiopia, Ghana, Kenya, Malawi, Nigeria, Rwanda, Sudan, Tanzania, Uganda	Agriculture
Capacity building program for agricultural development in Latin America and the Caribbean	Regional	Mexico	Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Haiti, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and the Dominican Republic	Agriculture
Barley-livestock systems for better climate change resilience in Jordan and Iraq	Bilateral	Jordan and Iraq	Jordan and Iraq	Agriculture
Support to Agricultural Research for Development of Strategic Crops in Africa: Wheat	Regional	Sudan	Sub-Saharan African Countries	Agriculture

[40] Based on project mapping and the result of e-survey conducted with 138 National Designated Entities to the CTCN, 14 CTCN Consortium Partner representatives, and 102 CTCN Network Member representatives

Adapting to climate change induced water stress in the Nile River Basin	Regional	Egypt, Sudan, Ethiopia, Uganda, Kenya, Tanzania, Burundi, Rwanda, the Democratic Republic of Congo (DRC)	Egypt, Sudan, Ethiopia, Uganda, Kenya, Tanzania, Burundi, Rwanda, the Democratic Republic of Congo (DRC)	Water
Middle East Water and Livelihoods Initiative	Regional	Egypt, Iraq, Jordan, Lebannon, Palestine, Syria, Tunisia, Yemen	Egypt, Iraq, Jordan, Lebannon, Palestine, Syria, Tunisia, Yemen	Water
Regional Water Scarcity Initiative in the Near East	Regional	Near East and North of Africa (COAN)	Near East and North of Africa (COAN)	Water
Strengthening Water and Sanitation Systems in Yemen	Bilateral	Uganda	Yemen	Water
Transformative water harvesting plan for Namibia	Multilateral	UNEP	Namibia	Water
Burundi, the Democratic Republic of Congo, and Rwanda have formed a neighborhood mechanism to coordinate and manage water supplies while also ensuring water resources can be used to generate electricity.	Regional	Burundi, the Democratic Republic of Congo, and Rwanda	Burundi, the Democratic Republic of Congo, and Rwanda	Water
Implementing Sustainable Water Resources and Wastewater Management in Pacific Island Countries	Regional	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	Water
Integrated Water Resources Management.	Regional	Cape Verde, Comoros, Maldives, Mauritius, Sao Tome and Principe, and Seychelles	Cape Verde, Comoros, Maldives, Mauritius, Sao Tome and Principe, and Seychelles	Water
Adaptation to climate change induced stress in the Nile Basin	Regional	Uganda and Ethiopia	Nile Basin region	Water
Tanzania's Msingini-Mtoni Wastewater Management Project in ChakeChake	Regional	Tanzania	Kenya/ Western Indian Ocean	Water-Agriculture-Climate Change
The RESCCUE project	Regional	Fiji, French Polynesia, New Caledonia and Vanuatu	Fiji, French Polynesia, New Caledonia and Vanuatu	Water-Agriculture-Climate Change
South-South cooperation special program for food security PESA	Global	PESA is now operational in 69 countries	PESA is now operational in 69 countries	Water-Agriculture-Climate Change

Improving Water and Soil Conservation in Africa to Enhance Sustainable Agriculture and Poverty Reduction Efforts	Global	China	Burundi, Ethiopia, Ghana, Kenya, Malawi, Nigeria, Rwanda, Sudan, Tanzania, Uganda	Water-Agriculture-Climate Change
Enhancing Capacity, Knowledge and Technology Support to Build Climate Resilience of Vulnerable Developing Countries	Global	China	Africa and Asia-Pacific (e.g. Mauritania, Seychelles and Nepal)	Water-Agriculture-Climate Change
Identification of green water and agriculture technologies for rural areas and design of a guide for local communities	TBC	UNEP	Mali	Water-Agriculture-Climate Change
African Adaptation Program & Mainstreaming in Mozambique.	Regional	Mozambique	Africa	Water-Agriculture-Climate Change