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Rethinking good practices

in integrated land and water management at multiple scales in watersheds, integrating climate risks and financing mechanisms

A synthesis of the results from the knowledge management process promoted by the Swiss Agency for Development and Cooperation (SDC) in Latin America and the Caribbean. Taken from the electronic thematic forum and the Multi-Network Meeting in Esteli, Nicaragua, from 6 to 9 July, 2015

Asocam

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ASOCAM (www.asocam.org) is a Knowledge Management Service for Latin America of the Intercooperation Latin America Foundation (Ecuador) and Helvetas Swiss Intercooperation.

From the valuable contributions of the participants in the electronic thematic forum and in the Multi-Network Meeting held in Estelí, Nicaragua, from 6 to 9 July, 2015.

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Experiences analysed:

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Experience of the projects of the Watershed Committee of Estelí River, Nicaragua: Adapting to Climate Change in Las Segovias, in Nicaragua; PIMCHAS in Nicaragua; AGUASAN in Nicaragua; Catastrophe Micro-insurance Scheme with MiCRO - Fonkoze in Haiti; agricultural risk transfer projects of PROFIN in Bolivia; DRRP and GESTOR projects in Bolivia; SABA Plus project in Peru; the Incubator for RES Mechanism - IWS project in Peru and the PES scheme of JAPOE in Honduras.

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MAIN MESSAGES

1. **There is** a series of **good practices** for land and water management at different scales, which have proven their effectiveness in the sustainable and climate-smart development of watersheds, often with **multiple benefits** in terms of environmental protection, water-resource improvement, food security, protection from natural hazards, or income generation. Projects should promote those practices that contribute simultaneously to various **sustainable development** goals (win-win opportunities, or synergies) in different sectors and for different groups. A **nexus** approach between water, energy and food security can help achieve this.

2. Sustainable and climate-smart development interventions at the **watershed** level require a **multi-disciplinary approach**: from agriculture, forestry, water resources, environmental science and civil engineering to political science and economics. They should be designed and implemented following an **integrated approach** that takes into account the **interrelations** between different sectors and possible impacts (both positive and negative) beyond the sector-specific fields of work. However, SDC country strategies do not necessarily foster an integrated approach. A process is needed to bring thematic domains closer and to enable subject areas to become more aligned. Opportunities are foreseen to contribute to peri-urban areas and cities, something that gains relevance as Latin America is the most urbanised region of the world.

3. Watershed approaches must be **inclusive,** and take into account all stakeholders. Natural resource projects should not only focus on small farm holders with limited resources but seek ways to include those with more resources, as well as the private sector. Including such stakeholders not only allows for a broader geographical and social coverage; they can also be local **catalysts for change** (e.g. model farms). However, **differentiated** strategies should be designed especially for **financing** and providing **incentives** for sustainable land and water use practices, taking into account the specific needs and capabilities of each group.

4. Projects with a watershed approach must consider the interests of all groups involved, both public and private. This requires **solid negotiations** between all stakeholders, through **platforms for integration**, where each actor is given a voice. **Local governments** should be empowered to play a leading role in these spaces.

5. Such platforms are also an opportunity for developing innovative **financing mechanisms.** In addition to the traditional financing sources (taxes, tariffs and transfers), financing can also come from private sector compensation schemes, as well as from cross subsidies and public investment, especially in water infrastructure and management. SDC projects are introducing innovative mechanisms and new players, such as green interventions in the management of water supply and sanitation services for big cities, and compensation schemes for watershed services.

6. Embracing a watershed approach when planning and implementing **WASH** (water supply, sanitation and hygiene; the Spanish name for this project is AGUASAN) **systems** allows for a more comprehensive perspective, including issues such as the protection of water sources, waste water discharge and the interrelation with other water uses, such as agriculture, energy, industry and ecosystems.

7. Projects that pursue both environmental and agricultural productivity goals should consider a **market-based and value-chain approach** from their inception. On the other hand, market-driven interventions should conduct a thorough analysis of the environment and the watersheds, to avoid the risk of promoting, for instance, a water-intensive agricultural value chain in a context of limited water resources.

8. When rural families apply practices that make water availability, agricultural production and income **more secure** in the face of **climate risks**, they do not “just” reduce climate risks, but also generate a set of environmental, social and economic **benefits**. Disaster risk reduction, climate change adaptation and environmental protection practices will make development outcomes **more sustainable.**

9. If **micro-insurance** is promoted as a risk transfer mechanism, it needs to be integrated and closely linked to other (existing and improvable) **risk management practices** used by the farmers. Risk transfer is **additional** to risk prevention, mitigation, response and recovery of losses. Experience suggests that substantial (public) subsidies might be necessary for such micro-insurance schemes, at least in the early phases.

10. A better, deeper and more detailed **knowledge base** about environmental, social and economic conditions and their interrelations is still needed in most cases, both for the design of development interventions and for the monitoring of impacts. Research and technical expertise are also required for this purpose. Existing local empirical knowledge must be considered and valued. Capacity-building methods such as learning from fellow farmers and applied research have proven valuable at the beneficiary level.

EXECUTIVE SUMMARY

Rethinking good practices In integrated land and water management at multiple scales in watersheds, integrating, climate risks and finance mechanisms for upscaling. Synthesis of the results of the knowledge management process promoted by SDC in Latin America and the Caribbean, based on the electronic forum and the Multi-Network Meeting in Estelí, Nicaragua, from 6 to 9 July, 2015

This document synthesises the **conclusions** of the exchange of ideas and reflections between rural development professionals from the Swiss Agency for Development and Cooperation (**SDC**) and its partners in the **Latin America and the Caribbean** region. These professionals, experts in water and climate change issues, and working in different subject areas, such as access to water, agriculture, rural income, natural resources, climate change and disaster risks, have come together in order to **identify good practices and strengthen the interrelationships** between these issues, based on specific projects in a specific setting: the Estelí area in **Nicaragua.** This publication seeks to present a **current state of art** of the actions of a selection of projects in which SDC is involved in the region, and provide recommendations that emerged from this process of reflection and knowledge management.

The purpose of investment by agencies such as SDC is the **reduction of poverty** within a sustainable development framework. For a rural family or municipality, reality is multi-faceted and interrelated, and each decision taken implies trade-offs. The **reason** for focusing on the **relationships** between SDC's work areas is to avoid developing a **silo vision** of rural realities, due to the sectorial organisation structure. The hypothesis is that greater awareness of the interrelationship between, for example, forest and water, risks and income, and climate and drinking water, will **improve the effectiveness and sustainability** of cooperation investments.

The Multi-Network Meeting brought together **48 professionals** from 31 institutions and **9 countries** (Nicaragua, Bolivia, Honduras, Switzerland, Haiti, Peru, Colombia, Cuba and Mexico). Participants analysed **11 project experiences**, according to three themes of reflection:

1. Modalities for the **management and transfer of climate risks**, and adaptation to climate change at multiple scales.

2. **Financing and incentive** schemes for integrated natural resource management.

3. Water **governance** from a local perspective.

At the **local level** in a watershed, where different actors make decisions according to their own context and competence, **water** can be a **connecting element**. Therefore, the project experiences analysed follow a framework based on water **management levels** in each **territory**, from the level of the rural family-plot, the level of drinking water and sanitation systems, to a watershed level.

Within the theme of **water governance** in watersheds, **clarity of roles** and responsibilities is a key issue. Development projects do not always clearly consider the **collective territorial level** as an entry point for work coordination and organisation. **Local governments** play a key role in land management,

The hypothesis is that greater awareness of the interrelationship between, for example, forests and water, risks and income, and climate and drinking water, will improve the effectiveness and sustainability of cooperation investments.

▲Water reservoir, northern area of Nicaragua

service provision and risk management directly related to communities. The division of tasks between local territorial governments and national sectorial entities and their sub-national representatives is important. **In a watershed, platforms are needed for integration** between communities as territorial organisations and other stakeholders, to give them voice and make visible the relationships and impacts between water users, as well as to identify, agree upon and regulate changes in water and land-use decisions, and to monitor their effectiveness. Besides a legal framework, these platforms require **mobilisation and investment** to achieve representative participation. Finally, it was confirmed that there is need for **knowledge and local information** on the uses and dynamics of water, soil and vegetation cover in specific territories, in order to plan and manage these resources soundly. At the same time, more progress is needed in **monitoring and generating evidence about the level of effectiveness** of the various measures promoted, making explicit their multiple environmental, social and economic objectives.

Within the second theme, focused on how to operationalise the **consideration of climate risks** (which are aggravated by climate change) in projects related to agricultural production, water and sanitation, and natural resources, it was found that at the farm level rural families apply a number of **practices** that make water availability, agricultural production and income from those sources **more secure** against climate risks. More than "just" reducing climate risks, these practices generate **a set of environmental,**

social and economic benefits, and are therefore of interest to families. Some practices, such as agroforestry, improved stoves and ovens, and rainwater harvesting reservoirs, generate **multiple benefits** from different development goals at the same time. To promote the adoption of these good practices, projects must use the relevant approaches and strategies tested in the field of rural development. But perhaps it can only be stated **that a practice or project has considered DRR** (Disaster Risk Reduction) **and CCA** (Climate Change Adaptation) criteria if, during the design phase of the intervention, information on the local impacts of climate change and associated risks is taken into account; if the stakeholders are aware of these risks and motivated to adjust their actions; and if the consideration of climate (and other) risks is institutionalised and anchored in norms, policies and budgets.

In water and sanitation **systems**, disaster risks have become visible and are accounted for as **damage to infrastructure**. This has resulted in **adjustments to the criteria** used for planning, designing, constructing, operating, maintening and monitoring water systems. The **public investment** system of is a pathway through which investment rules can demand the application of these criteria, based on the sound argument of **avoided costs** to the State. Equally important, however, is to make visible **the role watershed ecosystems** play in risk management, through the provision of ecosystem services such as regulatory services. It is precisely at the watershed level that experiences show some **gaps** in the understanding of the **ecosystem's** importance in managing climate risk, for example through an appropriate combination of investments in physical (grey) infrastructure with (green) investments in natural systems, and a recognition of the **economic value** of water, as well as indicators to measure change. The responsibility of implementing risk reduction and climate change adaptation measures falls especially on the shoulders of **sub-national governments**, and requires methodological examples and access to resources.

Exploring the themes of **financing and incentives for managing natural resources in watersheds**, the analysis of the **costs** of implementing good practices, the **sources** of funding and **incentive** mechanisms for watershed conservation was **challenging**. In Estelí, Nicaragua, most investment comes from international cooperation sources and from the national government, with in-kind contributions from the communities. Private businesses have not yet made an investment, although the sector has shown interest in providing support to secure water sources.

Although several economic instruments for natural-resource conservation exist, projects utilise basically only two: **environmental compensation** and **payment (or compensation) for environmental services**. For the application of these mechanisms, there should be **differentiated** compensation **strategies** for different types of farmers, and the **sustainability** post-incentive and post-contribution of cooperation funding should be taken into consideration. In general, it will be necessary to secure that **solutions** (i.e. finance mechanisms) **do not overshadow the main objectives** (i.e. conservation of natural resources), that **the public sector assumes leadership** in the coordination of investments, and that the **effectiveness** of the tools and schemes used is **monitored**.

In conclusion, the importance of a **systemic vision** in the **design** of rural development projects **in a specific territory** was reiterated in the meeting.

The importance of a systemic vision in the design of rural development projects in a specific territory was reiterated in the meeting. That means taking a multi-level, multi-stakeholder and multi-use approach.

▲ Farmer family irrigating their crops due to lack of rain

That means taking a **multi-level**, **multi-stakeholder**, (family-plot, water use systems, watershed management, and public sector at the national level) and **multi-use** approach. At the **watershed** level, this implies ensuring that land and water use projects consider existing **interrelationships** between and effects upon other water uses and users, following the principles of integrated water management. **Thematically**, it implies that agro-productive and natural resource-related projects should take into account and procure market linkages that allow for higher and more secure rural incomes, **promoting local economic development**.

Applying a systemic approach in initiatives related to natural resource management, agricultural production and water governance in a watershed demands an **improved information and knowledge base** of environmental and social processes, and their interaction in the intervention areas. This information base is not only necessary for planning and designing a project, but also for **monitoring changes** attributed to projects. It needs to be built on **local knowledge** with **scientific** support.

1 INTRODUCTION

Objectives of the Multi-Network Meeting

What? To exchange and share lessons about good practices and innovations in the integrated management of water, soil and ecosystems in watersheds, and at multiple scales.

What for? To reflect upon the **interrelationships** in land management at multiple scales, in order to improve the **effectiveness** of our programmes in their mission to reduce poverty in the various countries where SDC works.

This document synthesises the conclusions of the exchange of ideas and reflections between rural development professionals from the Swiss Agency for Development and Cooperation (SDC) and its partners in the Latin America and the Caribbean region. These professionals who work in different subject areas such as access to water, agriculture, rural income, natural resources, climate change and disaster risk, have come together in order to **identify good practices and strengthen the interrelationships** between these issues, based on specific projects in a specific setting: the Estelí area in Nicaragua.

The purpose of investment by agencies such as SDC is the **reduction of poverty** within a sustainable development framework. The **reason** for focusing on the relationships between SDC´s work areas is to avoid developing a **silo vision** of rural realities, due to the sectorial organisation structure (both of SDC and its national counterparts) the thematic networks, and the implementation of projects by thematic sectors. These interrelationships may be common factors, synergies, complementary elements, cross-impacts or trade-offs. It is important not to lose sight of the fact that, for a rural family or municipality, reality is multifaceted and interrelated, and that each decision taken implies trade-offs. The hypothesis is that greater awareness of the interrelationship between, for example, forest and water, risks and income, and climate and drinking water, will **improve the effectiveness and sustainability** of cooperation investments.

At the **local level** in a watershed, where different actors make decisions according to their own context and competence, water can be a **connecting element**. History shows that planning and decision-making in a sectorial and segmented form can lead to unsustainable development decisions and to the inefficient distribution of water for different uses. In settings of growing competition for water where a (temporary) shortage is most likely, increased coordination between different stakeholders is necessary. To ensure greater security in the access to **water, energy and food** based on the use of water, it may be helpful to take a **nexus** perspective (Hoff, 2011; SEI, 2012) to understand the impacts, interactions and so-called externalities, to avoid that the benefits in a field come at the expense of another objective, to explicit compensation (trade-offs) and to identify synergies and practices with **multiple benefits** at the local level (e.g. greater use efficiencies, or coordination between sectors).

So to avoid losing the focus or depth in the cross-sectorial reflection to integrate subjects, **three axes of thinking** were prioritised and applied to each project experience analysed:

1. **Modalities for the management and transfer of climate risks**, and adaptation to climate change at multiple scales.
2. **Financing and incentive schemes** for integrated natural resource management.
3. **Water governance** from a local perspective.

These three themes are considered key factors of sustainability, appeal to the interests of each thematic network and are currently relevant for the design of new programmes in the region.

The project experiences analysed follow a framework based on **water management** levels in each **territory**, from the level of the rural family-plot, that of drinking water and sanitation systems, to a watershed level.

This publication synthesises the main conclusions of the participants in the **knowledge management** process undertaken on these issues. The process included an electronic thematic forum and the **Multi-Network Meeting** held in Nicaragua. The forum was conducted between 25 May and 15 June 2015. The first phase focused on theme 1 and the second phase on theme 2, with 34 and 16 contributors respectively. The face-to-face event, held from 6 to 9 July 2015, was attended by 48 professionals from 31 institutions and 9 countries (Nicaragua, Bolivia, Honduras, Switzerland, Haiti, Peru, Colombia, Cuba and Mexico). Participants work as SDC staff, in their project teams and in partner institutions in the region. The reflections and conclusions generated in the face-to-face event arose from visits and dialogues with farmers and water users in the area of Estelí, Nicaragua, and from the presentation of the other project experiences in the Latin America and the Caribbean region, analysed according to the three axes of reflection. They are based on the main **outputs** of the process, namely: the synthesis and thematic notes of the two forums, the materials submitted to and created at the meeting (available at www.aguaycambioclimatico.info), and the meeting's minutes (Jalil, 2015).

This **publication** seeks to provide a **current state of the art** of a selection of projects in the Latin America and Caribbean region in which SDC is involved, and share **recommendations** arising from this process of reflection and knowledge management. It is organised along the three axes of reflection, with reference to specific experiences. It points to **good practices** both in intervention strategies and in the management of natural resources, showing approaches, methodologies, outcomes and lessons learned from key experiences, and also themes that are open to exploration. It will have achieved its purpose if it is consulted by SDC staff, implementing partners and counterparts in the region, to design new programmes or monitor existing ones.

2 WATER GOVERNANCE IN WATERSHEDS: BETWEEN POPULATION AND PUBLIC POLICY

Water governance can be understood as *the set of formal and informal processes involved in making decisions regarding water use and management, involving public, social and private* ***stakeholders*** *and the way* ***their interests*** *connect, interact and* ***mediate***. Good governance implies, for example, that all stakeholders are clear about one another's role, that opportunities exist for interaction and coordination about the decisions concerning the use of water (at a local level, but in line with national regulations), and that dialogue leads to agreements and concrete actions whose effectiveness are to be monitored.

Participants came up with several findings in relation to water governance, inspired by the reality of stakeholders in the Nicaraguan setting, by experiences such as those of the Sub-watershed Committee of Estelí River, PAGRICC, and PIMCHAS, and by their own personal experience:

The first is about **how clear** the **roles and responsibilities** of the stakeholders are. Rural **families**, as land owners and/or users, are the ones who make day-to- day decisions on the use of water, land and ecosystems. They are often part of permanent **territorial organisations** that regulate access and use, such as communities, cooperatives or Water and Sanitation Committees. These organisations may include families with different interests and economic conditions. In addition, the decisions and the regulation and management schemes of **public and private institutions** (including development projects) affect the use of resources at the household level.

CASE 1.
The Sub-watershed Committee of the Estelí River, Nicaragua

The sub-watershed of the Estelí River, where Estelí city is located, in north-central Nicaragua, is part of the "dry corridor" of Central America. It is a particularly dry area affected by climate extremes, such as droughts, heavy rains and hurricanes. Within this densely populated, productive and revenue-generating zone, different types of farmers produce tobacco (2,000ha under irrigation, exports), coffee (19,000 ha), staple subsistence grains (maize and pulses) and pasture for livestock (POSAF et al., sf:26). This watershed drains to the Coco River, which flows into the Caribbean. It measures 1,667km^2 and has 183,607 inhabitants divided into seven municipalities: Estelí (133,000 urban residents in year 2000), Condega, Palacagüina, Estelí, Totogalpa, Telpaneca, Yalagüina and Pueblo Nuevo (Orozco, s/f:5). Altitude ranges from 600 to 1,600m above sea level, with a predominance of slopes. The temperature is around 17-20°C and rainfall is up to 800-900 mm/year, concentrated between May and November (Bendana García, 2011:35; Pong et al., 2015:4).

The main sectors of water use, from surface sources but also, and to a great extent, from underground sources, are irrigation (tobacco producers) and human consumption in cities and populated rural towns. The problems of water management in the watershed are: 1) Recurrent droughts

threatening farmers' harvests; 2) Pollution of the river and aquifers by sewage discharge, solid waste and agrochemicals; 3) Changes in land use (from forest to pastures) in the upper reaches of the sub-watershed, which reduces water regulation capacity and causes soil erosion and downstream sedimentation; 4) Reduction of the water table due to over-exploitation via wells, and 5) Urban sprawl, towards areas at risk of flooding from heavy rains and an obstructed water course, especially affecting the most economically disadvantaged population. Water scarcity and potential conflict usually occur in the summer months; to offset this, the rural population and local governments, with the support of international cooperation organisations, undertake the task of maintaining vegetation cover and deploy many efforts to support sustainable natural resource management (one example of this is MARENAPIMCHAS, see case 4).

At the organisational level, the principal authorities of five downstream municipalities came together in 1998 to form the Association of Municipalities of the Estelí River Sub-watershed, which included Estelí, Pueblo Nuevo and Condega. Among other objectives, the association aimed to monitor the watershed and create an information system, with the participation of universities and some state institutions. Since 2013, it has been given new impetus and formalised as a Sub-watershed Committee by the National Water Authority (Spanish acronym: ANA) under the General National Water Act No 620 (ANA, 2014:19). By law, the Watershed Committees seek citizen participation in water-resource management, particularly in water administration, development

of water infrastructure and management of financial mechanisms for actions targeting the conservation of water resources. The committees are made up of representatives of water consumers from the various uses within the watershed, representatives from the public sector and accredited NGOs. They offer a space for consultation, coordination and agreement between these stakeholders, for example in the formulation of plans (Art. 35 and 36).
In the case of the Estelí River Sub-watershed Committee, the main stakeholders are the municipal governments (12 Mayor Offices), the private sector, represented by the Tobacco Growers' Association, and the local delegation of the ANA. The Committee is seeking to expand this participation, working towards the inclusion of local representatives, as well as of Micro-watershed Committees or Drinking Water and Sanitation Committees.

Lessons learned

The panel discussion at the Multi-Network Meeting showed that, in order to cope with drought, communities living upstream require investment in reforestation, water recharge practices and water storage. In the lower middle part of the zone, tobacco growers with irrigation rights who are concerned about the availability of both surface and ground water agreed on the need for reforestation. As organised users, they also seek to optimise water use, by moving from flood irrigation to drip irrigation and reducing the use of agrochemicals. They are willing to invest upstream and attach importance to monitoring water and soil availability and the effects of reforestation. The municipality plays a role in water and sanitation procurement for the city, in safety in the face of flood risks, and also grants irrigation permits and ensures the sensible use of water.

Within this role, municipal authorities understand that regulation alone is not sufficient for proper water management: "Law imposed by force does not work." It is necessary to enter into dialogue, negotiation and planning with a variety of stakeholders, especially communities in protection and water recharge zones. Principal municipal authorities look for ways to compensate these rural communities for the environmental services they provide, and invest in cattle watering areas, reservoirs and fences to protect water recharge zones. The Estelí River Sub-watershed Committee is a good step towards better water governance with local relevance. This clearly shows the need for a tripartite alliance between the communities located in aquifer recharge zones, water users and local governments, to seek permanent financial mechanisms to enhance ecosystem services.

Source: Orozco, s/f:5; POSAF et al, s/f:26; Jalil, 2015:64-70; Bendaña García , 2011:35

Estelí

CASE 2.

The PAGRICC Programme in Nicaragua

The Environmental Programme for Disaster Risk Management and Climate Change (Spanish acronym: PAGRICC) in Nicaragua hosted the dialogues in the field within the framework of the Multi-Network Meeting and provided a key experience for analysis. PAGRICC aims to reduce the vulnerability of rural populations in Nicaragua to phenomena associated with climate change, through risk-management strategies based on the management and conservation of natural resources in watersheds, prioritised according to their vulnerability. Drought is a particularly relevant hazard.

It is a current programme (October 2013 to December 2016), conducted by the Ministry of Environment and Natural Resources (Spanish acronym: MARENA) in coordination with a total of nine municipalities in two watersheds that form the San Juan River (the Lake Apanas sub-watershed, measuring 617 km^2, and Río Viejo watershed, measuring 245km^2). In total, PAGRICC works in 304 communities with 4,600 participants in an area of 23,500ha. It is funded by the government of Nicaragua (USD 0.4 million from direct contributions and a USD 10 million loan from the Inter-American Development Bank), the Swiss Agency for Development and Cooperation (SDC) (USD 3.1 million) and the Nordic Development Fund (USD 3 million).

PAGRICC has three components: 1) Support for the adoption of Environmental Restoration Systems; 2) Infrastructure for the reduction of losses due to disasters; and 3) Capacity building. The work scheme in component 1 was the focus of study and analysis, and this is where the relationship between rural families and the project is a direct one. The technical proposal seeks to encourage rural families to maintain and increase tree cover on their farms, as a strategy to reduce the risks of and adapt to climate change, as well as to increase the value of farm production. PAGRICC promotes seven types of environmental restoration system: agroforestry, silvo-pastoral, eco-forestry coffee, energy plantations, forest management, environmental regeneration and management, and industrial plantations. Each one consists of a selection of five to six good practices.

Due to the territorial impact sought by the Programme, farmers are eligible for PAGRICC support if they have a title to a property of between 1 and 7ha. Methodologically, the technical team, along with farm owners, develops a plan of investment for each farm, with practices and investments that the proprietor selects according to their own interest in a particular environmental

PAGRICC

system. For example, the agroforestry proposal suggests practices such as living fences, living and dead barriers, cover crops such as bean manure, fruit trees and *Musaceae* with annual crops, forest plantations and water harvesting.

One major issue is that practices produce benefits in the medium and long term (and partly off-farm), while costs are immediate (i.e. family investment in labour, or loss of grazing areas). That is why it is interesting to understand how PAGRICC uses incentives for the adoption of such practices. The project partially compensates farmers for this type of immediate cost, in the form of delivery of supplies such as seedlings or tools, accompanied by technical assistance. This investment is between USD 720 and USD 850 per family for the restoration of 2.8 to 7ha.

Lessons learned

In the context of the droughts of 2013-2014 and 2014-2015 (with a rainfall of 300-500 mm/year instead of the normal 1,200-1,600 mm/year (van der Zee Arias et al, 2012:20), the Programme's proposal was adjusted as the lack of rain reduced the ability of plants to germinate. The project delivers 40% of the predicted investment per family in seedlings, and also provides money for the other 60% of the seedlings' value. In return, families collect native seeds from their farms and allow natural regeneration of certain areas. Both practices are undertaken from the perspective that this is local plant material, adapted to dry periods. This experience in drought years will give an initial examination of the project's actions, in the light of extreme climate risks and the use of weather forecasts, as well as demonstrating the importance of flexibility in intervention strategies.

PAGRICC conducts detailed monitoring at the farm level, using indicators such as the number of sown plants and number of hectares involved in the investment plans. Additional questions about these improvements include: What kind of impact do these actions generate at the watershed level?
And: What is the level of vulnerability for rural households or for their income?

Component 2 is aimed at risk management at the municipal level: it includes conducting studies and constructing minor works to protect public and private property from flooding or landslides in the middle and lower parts of watersheds, due to peak flows.

Source: Based on Palma Rivera, 2015

PAGRICC

In practice, it is evident that development projects do not always clearly take into account the **collective territorial level** as an entry point for work coordination and organisation. Yet this collective management is crucial, since public institutions will always have limitations in terms of the human and financial resources present in the territory. Clarity (in regulatory frameworks) is essential in the field of **public administration** with regards to **which roles and responsibilities** are assumed at what level, especially in the division of labour between local territorial governments and national sectorial entities and their sub-national representatives. Ideally, temporary projects promote complementarity between roles.

A second element is the need for **spaces to connect interests between stakeholders**. For a single family, **the interrelationships and consequences** of decisions made in a greater territorial context, e.g. on people living downstream in a micro-watershed, **are not always clear**. It is noted that increasing pressure on natural resources is expressed in the occurrence of conflicts over access, use and benefits, in addition to endangering the sustainability of production and rural incomes. Therefore, **spaces are needed for integration** between territorial organisations and other stakeholders with an interest in a **watershed**, in order to give voice and visibility to interrelations and impacts on water users, and to identify, agree upon and regulate changes in decisions on water use, as well as to monitor their effectiveness (see case 1 for an interesting example from Estelí, Nicaragua). The creation of opportunities for coordination, such as watershed management committees, is also being increasingly supported by a **legal mandate** (e.g. in Bolivia and Peru).

This framework is important, but it is not enough. Watershed committees, as spaces of coordination among stakeholders, do not work without help: they require **investment and mobilisation** to achieve participation, with representation and coverage, as well as the informed presence of the parties and a continuous process of capacity building. This all needs to be accompanied by leadership and financial resources, from the national level. The creation of such platforms for water management in watersheds is a **long-term** project, and for it to be effective it must respond to the perceived priorities first.

A third finding is the need for **knowledge and local information on the uses and dynamics of water, soil and vegetation cover in a specific territory**, in order to plan and manage them soundly, for example, based on a watershed's water balance, which gives a more accurate idea of "water scarcity". Natural processes themselves pose challenges due to their variability in time and space, let alone at the local level, where information is usually largely absent. Yet it is necessary to **strengthen some knowledge**, such as, for example, for designing parameters for compensation schemes for environmental services, e.g. *How, when* and *to what extent* the local hydrological cycle and *natural resources in general* are being affected by reforestation? And: *What is the economic value generated by the use of water and what value can be assigned to the use of water and other services, such as soil retention, in a watershed?*

But there is also another side of the coin: more progress is needed in monitoring and generating **evidence about the effectiveness** of the various **measures being promoted**, making clear the likely multiple effectiveness objectives, such as: *When and to what extent is hydric recharge convenient in zone x? What are the limits for the responsible use of groundwater in zone x?* Progress should also be shown in estimating the **cost/benefit relation** of such measures. This evidence of benefit constitutes a **wealth of experience** that is necessary in order to move on from pilot projects, generating good experiences, towards their application to larger populations and territories, **with public funds and programmes**, on an upscaling path. That is not an easy task, since the effectiveness of certain actions cannot be measured overnight, and requires the skilful combination of science, "unrelated cases", testimonies of those involved and local measurement. For this reason, it is stated that actions in watershed management are **long-term investments** (as shown, for example, by the experience of the Integrated Watershed Management Programme [Spanish acronym: PROMIC] in Bolivia, where there were 24 years between the pilot project and the public policy, see Neumann, 2015:6).

The analysis of the presented experiences raises some RECOMMENDATIONS FOR DESIGNING USEFUL PROJECTS FOR SDC:

- To analyse and **design** water, soil and ecosystem management projects **from a multi-level perspective, starting from a concrete territory**, including family and plot, community, micro-watershed, local and national public policy.

- To make **visible an entry point via the collective**: rural communities are often the permanent stakeholders who manage territories or resources such as water. A project can be designed having the family as the entry and coordination level, but should further establish working agreements with **the community as a collective unit**, in order that the actions taken will have greater sustainability. This way, families are encouraged to see themselves as part of an ecosystem within which their decisions affect other families and other families' decisions affect them.

- To use **indicators that link** actions and effects at the family level (e.g. m^2 of restored or preserved forests, m^3 of stored water) with impacts of resource use at a micro-watershed level (e.g. dynamics in the level of vegetation cover, flow regulation capacity over time).

- To include **the generation of information and monitoring** of the natural system in projects aimed at making changes in the natural resource base, as well as of the **effectiveness and cost/benefit relation** of various management actions.

3 EXPERIENCES WITH THE CONSIDERATION OF CLIMATE RISKS IN WATER USE AND MANAGEMENT

An issue that generated expectations among participants of the meeting was how to operationalise the consideration of **climate risks** – exacerbated by climate change – within projects related to agricultural production, water and sanitation, and natural resources. This question **cuts across** the different levels of territorial water management, as rural households now have greater **concerns** such as the provision of drinking water, water storage for dry periods, and the need for ensuring income in more variable production contexts. The ways to reduce climate risks to agricultural production and to rural incomes are not limited only to good **"green" practices**; they also require **financial** schemes and practices – such as insurance – to reduce the impacts. The consideration of climate risks is also relevant for water and sanitation systems, since in a context of population growth, degraded watersheds, greater competition for water and increased climate variability the provision of water and sanitation services is more complex and less "secure", and requires preventive measures. Also at the watershed level, climate risks add pressure to recover the ecosystem functions of vegetation, such as water retention and regulation, and to make adjustments to urban land use, for example. That is why the interests of the various **thematic networks**, including agriculture and food security, as well as employment and income, converge on this issue.

During their meeting in Nicaragua, participants visited projects such as PAGRICC, PIMCHAS, AGUASAN, and Climate Change Adaptation in Las Segovias. From these experiences, along with some others in the Latin America and Caribbean region, such as micro-insurance mechanisms (explored through PROFIN and MiCRO-Fonkoze), and programmes like SABA and DRRP/GESTOR, which integrate risk management in sectorial-type programmes (see the respective boxes), they held discussions from which the following five findings emerged:

CASE 3.

CIimate Change Adaptation Project in Las Segovias, Nicaragua

The **Climate Change Adaptation Project in Las Segovias**, Nicaragua, is a project implemented jointly by the Ministry of Environment and Natural Resources (MARENA) and the United Nations Development Programme (UNDP), funded by the Swiss Agency for Development and Cooperation (SDC). The project has been developing since 2012 with an investment of USD 3,382,000. The area of intervention is the region of Las Segovias, in the districts of Estelí, Madriz and Nueva Segovia, in collaboration with 27 municipalities and in prioritised micro-watersheds in San Lucas, Totogalpa, Telpaneca, Mozonte, Macuelizo and Santa María. Some of the families in Telpaneca hosted a field visit for the Multi-Network Meeting.

The project's **objective** is *to contribute to poverty reduction by increasing the resilience to climate change of vulnerable populations and their livelihoods.* It particularly seeks that territorial stakeholders identify risks related to climate change; that people have an increased level of knowledge about those risks, to enable behaviour change; and that priority adaptation and mitigation measures are incorporated into local development planning (e.g. in municipal plans and regional adaptation strategies). In terms of action, it promotes **alternative production practices** (**agricultural and forestry**) in prioritised micro-watersheds, which help adaptation and mitigation.

The main effects of **climate change** observed in northern Nicaragua are rising temperatures (a trend that is expected to continue in the future) and greater variability in annual precipitation, perhaps with a downtrend of annual totals. In a context of inadequate management of natural resources and socio-economic development deficits, these effects increase vulnerabilities in climate-dependent rural livelihoods and production systems.

An interesting exercise undertaken by the project was to conduct an **inventory** –prior to the implementation stage– **of practices and technologies for climate change adaptation** that are in place and have been tested at the local level (UNDP, 2014). These practices and technologies focused on three themes:

1. Forests and energy (13 technologies): agroforestry, forest plantations, energy forests, protection of water recharge areas, improved stoves and ovens.
2. Soil and crops (20 technologies): soil conservation, crop rotation, agro-ecology, diversification, planting dates, native seeds.
3. Water (14 technologies): rainwater harvesting (home and farm), infiltration works (ditches and terraces), efficient irrigation.

Methodologically, the project manages a grant fund for local NGOs, which in turn promote technical assistance methodologies for adaptation, through community promoters and **Agricultural Training Schools**. In these schools, on a laboratory farm, 10-15 farmers come together, with an interest in developing their skills and exchanging knowledge about, for example, forest coffee farming, a system that is based on *"learning by doing"*, with a view to replicating the system on their farms.

Lessons learned

Several of the practices promoted offer **multiple benefits**, such as the **improved stoves and ovens**, which serve to reduce GHGs (through energy efficiency, alleviating pressure on forests for firewood –by saving 40% of it-, and labour), improve health (less smoke) and create new revenue opportunities (through selling bread, which diversifies income towards activities that are less climate-dependent, and more sustainable in the face of climate change).
Other practices with multiple benefits are: 1) Rainwater **harvesting** from roofs and its storage in tanks at the household level. The tanks have a capacity of 3,800 litres, which with a catchment area of 50m^2 and an annual rainfall median of 800mm, could be filled up to 10 times during the rainy season, ensuring water for a household for about 10 days, and so for about 100 days of the year. It reduces hauling labour and provides the possibility of local treatment; and 2) **Coffee agroforestry systems**, which generate revenue from the sale of coffee, soil protection through forest cover and limit land use changes. Additionally, including a new variety of coffee in a diversification strategy will make these systems less vulnerable to changes in climate.

In conclusion, addressing the issue of climate change at the territorial level requires a **multi-stakeholder and multi-sectorial** approach, and it is necessary to develop processes of joint negotiation and management, identifying the roles and functions of key stakeholders, all of which results in various mechanisms and alliances (with universities, municipalities, communities, NGOs etc.) for implementation.

Source: Based on Benavides, 2015; Jalil, 2015:53; http://www.ni.undp.or

CASE 4.

The PIMCHAS Project in Nicaragua

The Integrated Watershed, Water and Sanitation Management Project (Spanish acronym: **PIMCHAS**) in Nicaragua was implemented within the framework of country-to-country cooperation between the governments of Canada and Nicaragua, being the official counterpart the Ministry of Environment and Natural Resources (Spanish acronym: MARENA). The PIMCHAS experience was host to the Multi-Network Meeting. The project was funded by the Canadian Ministry of Foreign Affairs, Trade and Development (French acronym: MAECD) for 10 million Canadian dollars. It was developed by an implementation team formed by the CARE Consortium, TECSULT and the University of British Columbia.

PIMCHAS was implemented between 2007 and 2015 (having now closed) in cooperation with **17 municipalities**, benefiting almost 20,000 rural **participants**, both men and women, in two watersheds (the Estero Real and Rio Negro watersheds), two sub-watersheds (Estelí and Rio Viejo rivers) and 23 micro-watersheds, in a total area of 5,032km^2 in north-central Nicaragua.

PIMCHAS aims to *improve the communities' quality of life and economic well-being, through improved water use and management.* This improved and integrated management was achieved by **developing capacities and tools and improving local conditions**, as well as by the restoration of sub-watersheds and the economic development of communities, through strengthening institutions, watershed management, and water supply and sanitation.

In addition to a **multi-level** intervention (starting from the household and plots, the community and micro watershed, through to the sub-watershed municipality, integrating a number of sectorial ministries), PIMCHAS applied a **systemic approach**, of which the salient elements were: 1) Understanding that the environmental management of **recharge zones** is one integral part of the management of drinking water systems; 2) Identifying areas of interest for water resources (e.g. springs, wells, ponds and riparian areas of streams, all mapped) to prioritise investment and the promotion of productive and environmental practices and technologies in these hydrological elements, in order to protect, safeguard or restore them; and 3) Avoiding sectorial-type investments in communities in favour of a more holistic perspective and of contribution to human development and poverty reduction.

Some examples of practices promoted are: the protection of riparian forests and water recharge areas (3,581ha); protection of water sources (300, average flow rate of 0.36l/s); a series of rainwater reservoirs and temporary springs placed along the overland flow, in order to also reduce landslide and flooding risks (68, with a total storage capacity of 68,000m^3); plots under agroforestry systems and family orchards (2,832ha, more than 1,000 productive family units; construction of community drinking water and sanitation systems; strengthening of drinking water and sanitation committees (440), creation of watershed committees.

Lessons learned

PIMCHAS applied several interesting **intervention strategies**. In order, to focus investment in sensitive areas, PIMCHAS, with local governments and residents, **prioritised micro-watersheds** within the larger area of intervention of the project's (sub) watersheds, applying criteria for the selection of *areas of environmental and social sensitivity*, such as: coverage of water and sanitation services; soil overuse; population density; and zones at risk of flooding and landslides. Under proposals for *environmental compensation*, the project funds municipalities and local organisations' implementation of initiatives for environmental restoration, diversification of production, and food security. That is, a community's Water Committee receives support for the rehabilitation and construction of its system, **in exchange for its commitment** to work in the protection of the water catchment area. The proposal is then co-financed by the community, main municipal authorities, and the project itself.

Methodologically, PIMCHAS has generated **a series of useful tools** for local planning and management, building on existing mechanisms (see Gadea, 2015:9,18).

Source: based on Gadea, 2015

PIMCHAS

A first finding is that the projects have achieved that **rural households apply a series of good practices** that make water availability, agricultural production and related income-generation **more secure** against climate risks: from rainwater storage to the incorporation of stubble and reduced tillage, live fences and semi-stabled livestock, and access to agricultural insurance. The adoption of these practices produces **a set of environmental benefits** (*water availability, soil conservation, firewood saving and landscape restoration*), social benefits (*cohesion, health, commons, less migration*) and economic benefits (*food security, income, more effective employment, stable family capital*) for families and their communities. Some practices even produce **multiple benefits**, including:

- **Agroforestry** (see Case 2) diversifies the products used for household consumption or animal feed. Some tree species improve soil fertility and contribute to climate change adaptation: perennial tree cover protects soil against intense rain events and helps soil infiltration; live fences protect crops against winds and shade them. Trees fix carbon. Ideally, its production reaches the markets.

- **Improved stoves and ovens** (see Case 3) that save on firewood, thus reducing the amount of work required to collect firewood and the speed of deforestation and greenhouse gas (GHG) emissions, reduce the smoke generated indoors, with less damage to health. Since they are tools to make bread, improved stoves and ovens contribute to the diversification of women's income, making it less dependent on the climate. They require access to microcredit to start a business.

- **Rainwater harvesting reservoirs** (see Case 4) that in times of surplus capture runoff after intense rain events, store it for (increasingly unpredictable and frequent) dry seasons and make possible the irrigation of food-security basic grains, which relying solely on rainfall might otherwise be lost. Such storage delays the flow of water in the watershed, allowing consumption in the upper reaches and reducing peak flows. These aspects make it necessary to consider reservoirs under a watershed approach, also analysing risks and damages downstream. They also demand efficient use, and a link between production and markets.

A second finding is that the adoption of these good practices is only possible when projects work from relevant **approaches** and with **relevant strategies**. It is all about known approaches in rural development: a ***comprehensive*** view of the rural development realities, which recognises benefits from the perspective of multiple goals and works in a ***participatory*** manner, taking into account knowledge and local practices. In the context of climate risks, appropriate **intervention strategies** include the *diversification* of non-weather-dependent income and the promotion of a *comprehensive risk strategy* within which there is access to micro-insurance (or other rural finance mechanisms) that transfer risks, combined with production practices that reduce risks. Other key strategies include building local capacities to enable replication of these practices, and strengthening community organisations as the first spaces in which they may be replicated.

When looking at these strategies, the following question arises (again): **When can we say** that a practice or project **has taken into account DRR and CCA criteria**? One condition relates to the **information** that is available, or that can be obtained when designing the intervention, **about climate change impacts at the local level**, such as climate scenarios, impact models and risk assessment tools. Only when it is founded on relatively reliable information made available to the population is a project in condition to propose specific actions to the population, such as trying to influence a shift towards "climate-smart" agriculture in farm planning. A second condition is that this access to information not only **builds awareness and empowers** people to action but also enables them to **demand action** from governments at all levels. A third condition (challenging in many cases) is that risk management should be anchored in **rules, institutions and budgets**. This involves formulating legislation, institutionalising approaches, methodologies and capacities, and ensuring the provision of public and private resources for this issue (see other conclusions of the electronic forum *Management and Transfer of Climate Risks at Multiple Scales*, at Doornbos, 2015:4).

CASE 5.

The AGUASAN Project in Nicaragua

The Water and Sanitation Programme (Spanish acronym: **AGUASAN**) in Nicaragua is a programme of the Swiss Agency for Development and Cooperation (SDC), which worked in north central Nicaragua from 2000 to 2005. AGUASAN was implemented with the Nicaraguan Aqueducts and Sewage Company (ENACAL – *Empresa Nicaragüense de Acueductos y Alcantarillados*) between 2000 and 2002, and worked in coordination with the PIMCHAS project until 2005 (see Case 4). During the design of AGUASAN, a synergy between the two projects had been envisioned, but this was not possible due to temporal differences in the planning of both initiatives. During the Multi-Network Meeting, participants visited some AGUASAN work sites and observed a certain complementarity between the two initiatives: AGUASAN, as a project of drinking water and sanitation, and PIMCHAS, with its emphasis on environmental management of micro-watersheds for water catchment to support these systems.

The purpose of AGUASAN was to facilitate **access to water and basic sanitation** as a universal human **right**, promoting at the same time access to technologies and good practices for **watershed management** and **environmental management**. It worked at **three combined levels**: i) community management as a key element for sustainability; ii) municipal management, in its role as territorial developer; and iii) national institutional strengthening for stewardship and sectorial development.

As for the **intervention strategy**, the project role was strengthening municipalities and national sectorial institutions, both technically and financially, accompanying processes and monitoring the intervention, as well as documenting the lessons learned. In turn, the municipalities assumed the role of identifying communities' needs, providing technical assistance, co-financing investments, monitoring and providing communities with post-project support.

Some specific **practices** promoted were: the provision of household water for human consumption and latrines, as well as rainwater storage tanks, crop diversification in backyards and improved stoves and ovens. **Co-investment** took the following form: the community contributed labour and local materials, and assumed responsibilities such as reforestation or natural forest regeneration, soil conservation, micro-measurement of consumption and tariff application, or changes in hygiene practices, while municipalities contributed financially to community projects. AGUASAN funded between 50% and 100% of the costs of community projects and technical assistance. One limitation to further adoption of **rainwater harvesting reservoirs** was the limited or non-existent ability to be self-financed or gain access to **credit**. This was also a limiting factor for agricultural production in general.

AGUASAN in Nicaragua is currently in phase 13, running between 2013 and 2015, and is funded by SDC with an investment of USD 9 million. In earlier phases, more than 330,000 people were given access to improved drinking water services, sanitation, and health and hygiene education in 16 municipalities of Las Segovias, West, North and North Atlantic Nicaragua; these zones show the highest poverty rates in the country. The programme continues to strengthen capacities for planning, constructing, operating, maintaining and managing drinking water, sanitation and hygiene systems at all three levels (community, municipality and national sectorial institutions, like the New Emergency Social Investment Fund [NUEVO FISE – *Fondo de Inversión Social de Emergencia*], and the Nicaraguan Institute of Aqueducts and Sewage [INAA – *Instituto Nicaragüense de Acueductos y Alcantarillados*]) according to their competence, jurisdiction and functions. It is worth mentioning progress in the development of a guide for analysing and reducing vulnerability to risks and climate change, to be applied in the cycle of water and sanitation projects and during the service provision phase (INAA, 2011).

Source: based on Pong et al, 2015; http://www.aguasan.org

Good practices in risk management are also needed at higher levels, such as **drinking water and sanitation systems**. This is highlighted by experiences such as PIMCHAS (Case 4), AGUASAN in Nicaragua (Case 5) and SABA Plus Project in Peru (Case 9).

A third finding here is that disaster risks are generally made visible and accounted for as **damage to system infrastructure**. This has resulted in **adjustments to the criteria** for planning, designing, constructing, operating, maintaining and monitoring water systems, in order to reduce their vulnerability to climatic factors and mass land movements in the short term. Specific examples suggested in the Multi-Network Meeting were: to incorporate *micro-measurement* from the design phase, increase water *storage* capacity, or encourage *communities to monitor* the hydro-climatic hazards that affect their systems. These adjustments require awareness and abilities, as well as policies, strategies and, particularly important, **tools** that guide technicians to design systems less prone to damage. The **public investment system** could be the best way to achieve investment rules that make the application of these guidelines mandatory, based on the strong argument of **avoiding costs** to the state. Projects such as SABA, with its methodologies and tools, can contribute to public funds being spent in this way. The consideration of climate risks as a preventive measure within the water and sanitation project cycle is a good practice. There is evidence that it may be **cost effective** –a surcharge of 3% to 20% of the investment, and a return up to a ratio of 1:7– although it is necessary to conduct further analyses of costs avoided "with" and "without" risk-reduction measures.

However, infrastructural adjustments should be accompanied by a reassessment of the **role of watershed ecosystems** in the **provision of ecosystem services** such as water regulation or the safeguarding of water quality; these elements are still sometimes not considered by the sector, but are **more relevant** to risk management **in the long term**.

CASE 6.

The Catastrophe Micro-insurance Scheme with MiCRO -Fonkoze in Haiti

Haiti is a country that is particularly susceptible to extreme events, with disaster risks such as earthquakes, hurricanes or tropical storms. The country ranks low on the human development index, has social and economic inequality, and weak institutions and public services. In this context, extreme events become disasters for those of the population who have the lowest income and are most vulnerable.

Between 2011 and 2015, SDC supported a **catastrophe insurance scheme** in Haiti, with the objective of protecting livelihoods and **enabling rapid recovery after natural disasters**. The challenge was that 50,000 women with limited resources would take out a **micro-insurance policy** to protect themselves against losses. Through the project, the expectation was that SDC would generate new **insights** about the development of the financial sector.

The idea was that rural women and their families, when accessing a loan from **Fonkoze** (a **micro-finance** institution) would also acquire a micro-insurance policy that protected them against loss in the event of wind, heavy rains or earthquakes. The insurance premium was about 3% of the loan (deducted as part of the credit). In case of damage, clients of the micro-insurance would receive a compensation of USD 85 and a loan amortisation. Fonkoze was

in turn reinsured by MiCRO (Microinsurance Catastrophe Risk Organisation, a private company) via basic risk coverage (with a payment limit of USD 1 million, 15% risk retained by Fonkoze) and a parametric insurance (backed by SwissRe) with a limit of USD 10 million. There was not a limit to the total amount covered by the insurance to families. SDC inserted CHF 900,000 in MiCRO through Fonkoze.

This scheme turned out **to be infeasible in 2012**, when five hurricanes occurred in a single year, Isaac and Sandy being the most destructive. Fonkoze had to pay USD 6.3 million to its 30,000 customers but only received USD 4.7 million from MiCRO, a company that had stronger protection because of its payment limit.

Lessons learned

The experience highlighted several lessons: i) when designing a micro-insurance policy, it is necessary **to have sound technical expertise,** and **information** on the probability of occurrence of extreme events and on their impacts, as well as a **feasibility study** and **pilot** experiences. If this information is not available, innovative ways to collect data are required; ii) the **insurance system** should be **consistent at each level** (e.g. payment limits between one level and another) but the institutions should also have **sufficient capital** to cover the insured amounts in case of damage. If a subsidy is necessary, it should be explicitly included in the project design; iii) project partners must have **solid technical expertise**. Importantly, **strategy and business management** should be the responsibility of **private sector** stakeholders; iv) finally, the economic sustainability of an insurance scheme requires a product that covers an entire sector, as well as the possibility of being **scaled up**.

In summary, a micro-insurance scheme can be an **efficient and complementary tool** to reduce the vulnerability of rural communities, provided it is **economically sustainable** and based on **solid knowledge and product design**.

Source: based on Lötscher, 2015

The fourth finding is precisely that experiences at territorial level of the **watershed** reveal **several gaps** in relation to the conception of its importance in **climate risk management**. It is necessary, for example, to ensure an appropriate combination of investments in physical infrastructure, with **"green" investments** in ecosystems as regulators of hydrological extremes (see Case 10). It is as well necessary to acknowledge that **water also has an economic value** and that users **are paying for its use**. In addition, interventions at the watershed level should use **indicators** that make possible to measure changes against a baseline.

Finally, the fifth finding is that the responsibility of reducing the risks of and adapting to climate change falls particularly on the shoulders of **subnational governments**, since they face the challenge of **implementing rules and identifying resources** that allow them to address these growing and complex issues. It will be important to **facilitate and strengthen their capacity to access (international) financial mechanisms** for dealing with climate change.

CASE 7.

The PROFIN Agricultural Risk Transfer Projects in Bolivia

In **Bolivia**, agricultural producers are also exposed to a range of climatic hazards, such as frost, hail and drought. In the context of climate change, these threats are on the increase. Most vulnerable are small farmers, who work less than 5ha (94%), in the Andean valleys and highlands.

From 2006 to date, the Swiss Cooperation in Bolivia has supported **Risk Transfer Funds** (RTFs) for various districts and crops in the country, through projects such as the DRRP (Disaster Risk Reduction Programme, a project of the *Climate Change* area), PROSEDER (its Spanish acronym – the Programme for Rural Economic Development Services) and Rural Micro-insurance (from the *Employment and Income* area). The **aim** of these RTFs is ***to increase***, through risk transfer, the ***resilience*** of small farmers to climate hazards. Pilot programmes in agricultural insurance and micro-insurance promotion go hand in hand with the process of financial education and the coordination of stakeholders, such as the Autonomous Municipal Governments (AMGs), the Agricultural Insurance Institute (Spanish acronym: INSA), the Supervision and Control Authority for Pensions and Insurance (Spanish Acronym: APS), the National Service of Meteorology and Hydrology (Spanish acronym: SENAMHI) and the private financial sector. The Foundation for Productive and Financial Development (**PROFIN**) acts as facilitator.

The **methodological work sequence** was:
1) Identification of the major **hazards** in each region;
2) Generation and compilation of **information** about produce and risk (e.g. historical weather, damage levels according to phenological phase, historical crop yields and production costs, geographically disaggregated);
3) Development of risk transfer **mechanisms;**
4) Early warning systems, based on records from local meteorological stations;
and 5) Continuous **awareness-raising** and **financial education** among farmers, in order to build an insurance culture.

In an RTF mechanism, rural producers transfer part of the climate risk by paying a premium and in the event of an incident (climatic events such as frost, hail, and in some cases also drought and excess moisture), they receive compensation for **incurred production costs which were lost**. This may be based on total verified damage after each event and immediate partial compensation, or on an end-of-season finding, when the harvest is compared to the average yield in the area, and if it is less than a percentage established, because of the incident, compensation is paid to cover the difference in yielding. While the producer has to assume 30% of lost, this compensation **will increase their resilience** in

financial terms, as it allows for replanting next season, and also covers other immediate expenses, such as education.

In 2011, the government of Bolivia created the **Pachamama Universal Agricultural Insurance** (Law No. 144). Since 2012, catastrophe insurance has been in force in 8 districts and 156 municipalities. The catastrophe insurance is **100% subsidised** - that is, the insured party does not pay a premium. The municipality registers the property of the farmer, up to 3ha, and in the event of total loss, the producer receives USD 150 per ha. This scheme differs from FTRs promoted by PROFIN, in which producers pay premiums, although both schemes are (partially) subsidised.

Lessons learned

Agricultural insurance **only works** if accompanied by **technical assistance** in the implementation of **best agricultural practices** (non-financial services provided in partnership with competent institutions or GAMs) and **access to**

opportune climate information (e.g. locally relevant forecasts), within the framework of an **agricultural risk management approach**.

PROFIN currently operates several FTRs for various crops (potato, grapes, peach and maize) in different regions of the country. In all cases, the producer pays a commercial premium and membership is voluntary. The number of producers insured has increased from **85 to 1,000** in four years, based mainly on word-of-mouth referrals, reflecting a good reputation and corporate responsibility in the payment of compensation. The FTRs operate with the **affiliates' premiums**, SDC funds and the profits of the FTRs. So it is now a scheme **partially funded by the cooperation**. In national contexts with predominance of small producers, and given the nations' interest in food security for those producers and the whole country, it might have to be this way, although **subsidised by public funds** (national, district and/or municipal government) and with a **differentiated** policy.

A current challenge **for RTFs** is to **expand the base** of affiliates who face different risks and at different levels, so there is a critical mass that can ensure profitability of the scheme and thus attract the **private commercial sector to enter** the agricultural insurance market. Another challenge for countries is to ensure a solid and permanently **updated foundation of climate and agricultural information,** which allows for the design of products based on reliable information, matched to the characteristics of the producers.

Source: based on Vargas, 2015

CASE 8.

The DRRP and GESTOR Projects in Bolivia

Two SDC projects in Bolivia promote greater **climate resilience** in rural towns and municipalities by applying a watershed management approach. This box summarises elements from a combined presentation, given that both aim to reduce the impact of climate change: a) Natural Resources and Climate Change Management (Spanish acronym: **GESTOR**), which after completion led to another project called Integrated Water Management (IWM), more aligned with public policy on watershed management; and b) Disaster Risk Reduction Programme (**DRRP**). These projects are implemented by HELVETAS Swiss Intercooperation.

The national context in Bolivia promotes a commitment to **decentralisation**, with autonomous governments and planning mechanisms from national, district and municipal governments. The regulation and sectorial policy framework includes: the framework of the Law of the Rights of the Mother Earth, which regulates the conservation and sustainable use of natural resources based on the notion of integral development (2012); a Risk Management Act; and the implementation of a National Watershed Plan. **Climate-change management** is based on mechanisms of adaptation and mitigation, alongside a joint mechanism for forest management, which pursues both objectives. Having the framework in place, the challenge is how to put this legislation into practice at a local level, and this is where the two projects work.

At the **local territorial level**, there is a close relationship between the degradation of natural resources, rural poverty, disaster risk, climate change, and the tensions and conflicts over water. To increase the resilience of the population in terms of livelihoods and infrastructure, it is necessary to incorporate **DRR and CCA** in action lines such as the development of capacities of local stakeholders, local planning and investment of municipalities, agricultural production, within a strengthened local governance scheme. Both projects work in various districts of the country and share **decentralised approaches** to land management, as well as a **multi-level** work approach.

The DRRP aims to **integrate insights of disaster risk reduction** at different levels of public management, with emphasis on planning and investment at the **municipal** level. For influencing government policy, it is crucial to incorporate information about **the costs avoided** as a result of disaster prevention: investment in prevention can save up to seven times the potential cost of damage. GESTOR promotes **sustained investments and processes** for Integrated Water Resources Management (IWRM) and Integrated Watershed Management (IWM) at the **micro-watershed** level. It pursues equitable access to water for rural communities –both for irrigation and human consumption–, ecosystem protection , and strengthened local institutions for watershed management. It encourages negotiation and consensus between municipal governments and local stakeholders on the prioritisation and development of IWRM/IWM actions in micro-watersheds. In the next phase, through the Integrated Water Management project, there will be a focus on strengthening **watershed management agencies** (intercommunal level) and consultation processes through watershed platforms.

Examples of **good practices** promoted by these projects include wells and ponds for water **storage**, in anticipation of drought, as well as enclosures **to protect water sources**. On a larger scale, examples include the agreement on **collective regulations** for the establishment of protected areas (community, municipal) aimed at the conservation of water sources and aquifer recharge areas, and the implementation of **early warning systems** against flash floods and droughts. At the institutional level, other examples include strengthening Municipal Risk Management Units and connecting them to experiences in the field.

Lessons learned

Regarding the **funding** of these practices (financial or other incentives), both projects have agreed on the importance of **resource concurrence** and coordination between the three levels of state intervention at the watershed level. It is necessary to fund **demonstrative** integrated initiatives that promote the practice of *learning by doing*. However, these must also envision means for **influencing thematically** instruments such as District or Municipal Development Plans, alongside local stakeholders, as well as for having impact at the national level, for integrating DRR/CCA in public investment.

Source: based on Paz Rada and Zubieta, 2015

CASE 9.

The SABA PIus Project in Peru

The SABA project of Basic Rural Sanitation in **Peru** (Spanish acronym: SABA) is a longstanding programme running from 1995 to date and funded by SDC, along with a number of public and private stakeholders at **multiple levels**, such as regional governments, local governments, community water and sanitation boards, and sectors such as health and education. The **objective** of the current phase, SABA Plus – Phase II, is to *help **increase equal coverage** of sustainable and high quality **water and sanitation** services in rural areas*.

Over the last 20 years, the intervention by SDC has created a **management model**, evaluated in two regions of the country and currently being replicated through **public investment** in 14 more regions, in the highlands and the Amazon, and in the northern coast and highlands. This model began in 1995 at the **community** level with integrated water and sanitation projects, with Management Boards of Water and Sanitation Services (Spanish acronym: JASS) and municipalities. Capabilities and coordination between **municipalities** and the **regional government** were then strengthened, after which the national government became interested in the **model and its replication** in other regions of the country. New approaches such as integrated water resources management, disaster risk reduction and climate change adaptation

were included over the course of the project.

The **institutional model** for the management of water and sanitation services is interesting, with a **clear division of roles and responsibilities** between:

- **national** sectorial ministries (housing, construction and sanitation, development and social inclusion, health and education) responsible for sectorial policies and promotion of investment mechanisms concerning their subject;
- **regiona**l governments and their sectorial departments (including education and health) in charge of capacity building on risk management and technical assistance to local governments;
- **provincial and district** governments, which should have technical areas of sanitation before being able to dispense public funds. These areas provide technical assistance to JASS, audit and conduct supervision as well. At this level, both education (technical vocational training, environmental education) and health (water quality supervision and audit) perform related functions.
- **communities** and their JASS, which self-manage services and start improving their hygiene habits.

Lessons learned

Thematic lessons that are part of the accumulated knowledge include: water and sanitation go hand in hand, and it is necessary to work on them **simultaneously** since drinking water is only viable when it reaches the **household** level; the project cycle should include a social and infrastructure component; proper disposal of solid waste must be included; and work activities should be coordinated with all stakeholders who give permanent support to rural communities.

In the face of climate change, **climate risk management** in the water and sanitation sector is increasingly important, due to tangible **public investment losses**. Some **good practices** that have proven effective for this task are:

- Including DRR in the project cycle of the **National Public Investment System** at the level of studies, investment and post-investment. Specifically, this implies that studies should include an analysis of hazards, one of vulnerability, a risk assessment, an evaluation of alternative measures and cost estimates..

- At the **community** level addressing also in the training cycle the **protection of water sources and watersheds**, raising awareness on hazards and teaching what to do in the face of disasters (using maps or models)

- For **technicians**, the project has developed **tools for** vulnerability analysis: guides, designs and software for prospective and corrective risk management (see Pacheco and Mendez (2011, 2011a) and Pacheco et al. 2011).

The initial **additional costs** to include DRR/CCA and prevent damage and losses would be between **3% and 20%** of the project cost. The costs avoided include those incurred in emergency response, rehabilitation and reconstruction, loss of use benefits due to service disruption, and additional social costs perceived by users and associated with the disruption of service. However, beyond a short-term concern focused **solely** on the implementation of DRR/ACC measures in **infrastructure**, which have positive effects, it is also necessary to **promote changes in social, environmental and institutional management at the watershed level**.

SABA Plus

The analysis of the presented experiences raises some

RECOMMENDATIONS

FOR DESIGNING USEFUL PROJECTS FOR SDC:

→ With regard to projects focused on family production systems or water and sanitation systems, recognising the **watershed as a relevant workplace**, for example:

- in the coordination and management of territorial interventions between stakeholders coming from different systems of knowledge and expertise.
- in the management of information on the availability and use of water (including efficiency and equality) and trends in land use, climate and risks.
- in ensuring a balance between investments in infrastructure and ecosystems.
- in the reflection and analysis of the economic benefits produced by the use of water, in order to share them.

→ Visualising and focusing **specific efforts at the watershed territorial level** because of its importance in climate risk management.

4 KNOWLEDGE GAINED IN FINANCING AND INCENTIVES FOR NATURAL RESOURCE MANAGEMENT IN WATERSHEDS

In Estelí, Nicaragua, as in many parts of the region, there are problems of overexploitation, pollution and degradation of natural resources (water, soil, vegetation and ecosystems in general). Within a changing climate context, these issues compel the need to conserve, restore and use resources in a more sustainable way, to ensure the continuity of the ecosystem services they provide (e.g. water, carbon, biodiversity).

In order to achieve this, one of the challenges is to seek mechanisms **to finance and encourage local actions**, which generate local benefits that are sustainable over time. Such actions should be applied on a sufficient scale to produce regional and even global benefits. This was the theme of the second electronic forum *Financing and incentive schemes for integrated natural resources management in watersheds,* prior to the Multi-Network Meeting (see Doornbos, 2015a for a synthesis).

The theme of good practices' costs, sources of funding and incentive mechanisms for watershed conservation was **challenging**, and it was not easy to work through within the cases analysed during the meeting. While this might suggest these are not issues of strategic reflection, the cost element is important for upscaling the application of practices via stakeholders and public investment.

There are several **economic instruments for the conservation** of natural resources and ecosystems, which can be grouped into six types (Moreno-Sanchez, 2012:15-33):

1. Assignment of property rights, such as water use rights or forest concessions.

2. Creation and improvement of markets with, for example, schemes of payment for ecosystem services, REDD+ (Reducing Emissions from Deforestation and Forest Degradation) mechanisms, and certification and eco-labelling.

3. Fees/rates, such as entrance fees to protected areas, fees charged to water users for watershed protection, or charges for water pollution.

4. Fiscal and tax mechanisms, such as taxes on property or shares, tax deduction and subsidies.

5. Financial assistance through, for example, grants for community organisations in the framework of conservation or sustainable use projects, soft loans for establishing productive activities such as eco-tourism and organic production, or debt-waiver programmes.

6. Responsibility systems/bonds and deposit-refund systems, such as fines for environmental damage, or environmental performance bonds.

These different mechanisms are also based on different donors and ***funding sources***. Such economic mechanisms can serve as *incentives*, as they encourage stakeholders (owners, communities or governments) to **make other decisions** on the use of resources that would not have taken place without incentives. Incentives are not just financial; they can also be social and institutional measures, such as capacity building and institutional strengthening, which influence decision changing (Abed, 2012:33).

A first finding is that **funds** for the implementation of good practices at the level of households and plots in the projects visited in Nicaragua come from public investment (20% approx. especially from local governments), community contributions (10% in kind, valued in the form of labour and local materials) and international cooperation (70%). A rough estimate of investment is **USD 1,000 per family** (see e.g. Case 2), although there are not many figures available. No investments have been observed from the private business sector.

A second finding is that projects mostly promote or apply **two instruments** from the choice of available economic instruments for conservation:

1. The so-called **environmental compensation**, which according to the experiences is the provision of goods (drinking water systems), production inputs (plants) or money and assistance to **homeowners and communities in exchange for their commitment** to reforest, preserve or allow forest areas to regenerate. Other projects explicitly argue that this compensation is for the **loss of income** resulting from the use of labour or land for conservation activities, showing an analysis in terms of trade-offs.

   The **use of compensations** in the form of goods or cash for families, as part of the project intervention strategy, must be analysed from different angles and according to the proposed project goal. If the project goal considers only physical land cover (*number of conserved hectares*), then compensation works for any producer who can undertake the project, and the bigger the area a farmer can devote to it, the better. That may lead to work with medium-sized producers, whose participation can catalyse greater and more rapid change. If the project goal includes (also) benefits at the population level, in terms of *poverty reduction or greater resilience to the effects of climate extremes*, it is necessary to consider **differentiated work strategies** in both the identification of participants and the provision of technical assistance and compensation for soil conservation and management practices.

2. **Payment for environmental services**. The cases reviewed in the meeting (see Case 10 and Case 11) are examples of payment/

*compensation schemes for **water** environmental services;* there were no cases dealing with carbon in forests. The mechanisms used are local trust **funds**, with contributions from water users and other sources. The electronic forum highlighted some other examples in the region, representatives of some others of the six instrument types, although the exchange was also focused on schemes of compensation for ecosystem services.

Electronic forum participants warned about a clear risk in **preferring and prioritising a particular ecosystem service**, such as the water or the carbon contained in forests. The approach taken should be holistic and look at the set of ecosystem benefits as a whole. Also on the side of compensation, it is worthwhile to broaden the scope: from a *simple monetary payment* to owners in upper watersheds to *multiple forms* of compensation for specific actions undertaken by these owners, which generate a more sustainable use and utilisation of land, water and/or vegetation (see Doornbos, 2015a:4-5).

In general, while these schemes are appreciated by recipient communities for the income they contribute, there are concerns about the sustainability of the conservation *actions* they seek to incentivise (after the incentive ends) and about the **sustainability** of the *mechanism* itself (after cessation of cooperation projects, for example). It will be necessary to ensure that **the solutions do not overshadow the objectives** of conservation and sustainable management. Therefore financing is only *one* strategy and compensation schemes only *one* mechanism.

CASE 10.

Incubator of RSEH* Mechanisms in Peru– IWS Global Project

* Spanish acronym for Retribution for Water Ecosystem Services

The Incubator of **Retribution Mechanisms for Ecosystem Services** (acronym in Spanish: MRSE) in Peru is supported by SDC within the framework of its global project *Investments for Watershed Services* (IWS) of the Water Initiatives Global Programme. The national counterpart in Peru is the Ministry of Environment (acronym in Spanish: MINAM), and the implementation of IWS falls under the responsibility of Forest Trends.

The **aim** of the Incubator is *to facilitate the design and implementation of retribution mechanisms tuned to the needs of each territory and to develop guidelines that generate agreements for conservation and protection of ecosystem services*. The initial focus is on mechanisms linked to **water** ecosystem services, such as regulation and quality. The strategy consists of **three streams of work** operating in parallel: (i) to build on existing specific projects and **local expertise** in MRSE in the country; (ii) to provide technical **advice** to strengthen capacities; and (iii) to **influence** public policy.

As part of a study of the factors (institutional, legal, technical, economic and social) for the success of water MRSE in Peru, the project identified **17 local experiences**, of which only the experience of **Moyobamba** was rated as **effective**.
In the city of Moyobamba, drinking water users (60,000 inhabitants) contribute an additional 1 sol (equivalent to USD 0.31) in their tariff (per connection/month) towards a fund that **compensates** owners, at the upper part of the micro-watershed sources of water, for actions that preserve, recover and sustainably use forests in watersheds for a positive impact on the water quality and quantity. The project accompanies and follows up on this and other initiatives and promotes that the Moyobamba case be considered as a model in the development of environmental and management regulatory frameworks and policy for the water and sanitation sector.

MRSEs should increase investment capacity in protecting, restoring or enhancing *natural or green infrastructure* in watersheds, such as forests, wetlands or grasslands, which provide a **variety of ecosystem services** beyond water regulation and quality, such as habitat for biodiversity, carbon sequestration, or others.

On a national level, since 2010, the **legal framework** in Peru has been moving to **facilitate MRSEs**: the Sanitation Services Modernisation Law (30045) of 2013 indicates that Sanitation Service Provider Entities (Acronym in Spanish: EPS) and the National Superintendence of Sanitation Services *"must set in the Optimised Master Plan, mechanisms of environmental compensation and watershed management"*.
In 2014, the Law of Retribution Mechanisms for Ecosystem Services (30215) was adopted. This law provides design guidelines, establishes the roles of different government levels and authorises *public entities to raise financial resources and transfer them to those contributing to the ecosystem service*.
The company providing the Water Supply and Sewerage Service to Lima (Acronym in Spanish: SEDAPAL), in its Optimised Master Plan 2015-2020, recently allocated

(for the first time) 1% of the fee (USD 23 million) for "**green interventions**". A study on cost-effectiveness and the potential impacts of a range of possible green interventions in Lima's three watersheds suggests that practices such as the *restoration of amunas* (ancient systems of channels for seasonal artificial water recharge), *wetland hydrological restoration*, *exclusion of cattle from puna ecosystems and rotational grazing in punas*, implemented at scale, could help substantially to reduce water deficits during dry periods. These actions would cost less than or the same as grey infrastructure options (Gammie and Bievre, 2014:13).

The Incubator is part of the global project Investments in Watershed Services (IWS), aimed at **upscaling the use** of investments in watershed ecosystem services as a cost-effective way to meet challenges relating to the quantity and quality of water, connecting downstream water users with upstream communities, generating benefits for both parties and improving their livelihoods. IWS has three lines of work: a) projects that demonstrate solutions and generate lessons and models that can be disseminated and adapted to other contexts; b) development of knowledge and capacities products through the provision of information resources and tools from regional centres; and c) strengthening communities of practice. Between 2011 and 2016, IWS has worked in Peru, Brazil, Bolivia, Mexico, China and Ghana and at a global level, with an investment of CHF 4,470,000.

Source: based on Toranzo, 2015; Toranzo, 2015a; Gammie and de Bievre, 2014

And finally, a third reflection from a watershed level perspective is that, at this level, there are already **mechanisms for coordination** among municipal governments, community organisations and international cooperation initiatives. The private business sector might then show a predisposition to pay (see Case 1) but there should be **public sector leadership** for the coordination of investments and for the design, planning and monitoring of ecosystem services compensation schemes. These mechanisms require an appropriate regulatory framework, comprehensive technical advice and appropriation processes..

For ecosystem services compensation schemes, tools such as the "**water footprint**" could be useful, so that different stakeholders can become aware of the impact of their economic activities on water, and can quantify this in monetary terms.

It is also important to **monitor the effectiveness** of the mechanisms applied: in the case of a CES (compensation for ecosystem services) scheme, are the funds being invested in concerted actions that would not have been possible without compensation? Do these actions contribute to ecosystem services that favour those who contribute to the compensation? Both questions are part of an **applied research agenda**, which requires **academic** participation.

CASE 11.

PES* Scheme of JAPOE in Honduras

*Payment for Environmental Services

This describes the experience of the Local Council for Administration of Water and Sewage Disposal (acronym in Spanish: **JAPOE**) in the municipality and urban area of Jesus de Otoro, in the Intibuca district in **Honduras**. JAPOE is a community organisation in charge of construction, management, operation and maintenance of a water system serving 1,600 families (10,000 inhabitants, 80% of the total).

Between 2001 and 2002, JAPOE began developing a scheme and pilot project for **Payment for Water Environmental Services**, within the framework of SDC´s project PASOLAC (Spanish acronym for Sustainable Agriculture Programme in Central America Slopes). Six or seven similar experiences were fostered in Honduras, El Salvador and Nicaragua.

It consists of cash and in-kind compensation for water environmental services, from urban drinking-water users to landowners in the watershed catchment area. The water for the system comes from a protected mountain area in the Montecillos range, especially from the Cumes watershed (3,180ha). Specific problems are: reduction of vegetation cover (as a result of changes to crops and pasture), land degradation in specific areas, and water pollution from livestock, coffee cultivation and human occupation.

Each user household contributes 10% of its basic consumption rate (USD 3.87 /month) to a fund. In 2001, it was USD 0.06 /month and now this contribution is USD 0.39 USD/month. This money goes into the **Municipal Environmental Services Fund** administered by JAPOE, which also receives donor contributions for water and sanitation works. Each year from this fund JAPOE transfers USD 58/family to about 30 farm families (defined as providers of environmental services), as a form of compensation. In 2001, from user contributions alone, the scheme generated approximately USD 830 per year (Martinez, 2008). Because the fund is limited, families are **prioritised** by identifying certain critical sites in the watershed. The amount transferred is the result of a negotiation and agreement between the parties, primarily based on the **ability to pay** of water users; an economic valuation exercise of the service calculated its value to be 12 times higher.

This money is invested in **their farms, in the implementation of various sustainable and environmental-management agricultural practices and technologies**, both in their traditional crops, such as

coffee and other items of diversification, and in the care of **community forest areas** located in the watershed. In addition, PASOLAC provided families with training and technical assistance, and supplies such as plant material, latrines, community works and other activities aimed at improving the social and productive condition of those in the watershed area. The agreement is embodied in a contract between JAPOE and each farmer as an environmental service provider.

Lessons Learned

The scheme has received much attention and serves as a model. Over time, the concept of a cash payment has evolved to include other forms of compensation, such as payments in kind, environmental bonds or management of community development projects. JAPOE has also had upheavals in its operation. The rationale behind the PES scheme has not always been passed on to new managers and municipal authorities in favour of a municipal contribution to the Municipal Environmental Services Fund (Acronym in Spanish: FONSAM). This is evidence that the operation of the scheme requires a process of **awareness-raising and ongoing training** for all involved (e.g. through educational visits).

Another important action is training and **follow-up** on soil and water conservation **practices** on the plots of farmers receiving compensation. Looking at the objective of the scheme, **effectiveness is evidenced** by indicators such as the Cumes River flow (which has shown a small increase in the last two to three years) and water quality (made better by organic production and the construction of latrines. In addition, relationships between downstream users and upstream owners have improved. Another issue to monitor would be a cost/benefit analysis from the **perspective** of upstream owners.

Source: Ventura, 2015; Martinez, 2008; Jalil, 2015:37-39

JAPOE

The analysis of the presented experiences raises some

RECOMMENDATIONS

FOR DESIGNING USEFUL PROJECTS FOR SDC:

- To apply **differentiated** intervention **strategies** for various stakeholders. It is necessary to continue supporting small producers, while partnerships may also be enhanced with **medium-sized producers** (which can be faster-paced change catalysts due to the resources at their disposal) and with the **private business sector**. In this case, corporate social responsibility must go further, towards true co-responsibility in natural resource management that generates benefits for all stakeholders in the territory, including businesses, because they also require water for their operations.

- **From the beginning** of interventions, to include strategies and **sustainable incentive and financing mechanisms** with the participation of public and private stakeholders, so they are not based solely on cooperation grants.

5 INTERRELATIONSHIPS BETWEEN TERRITORIAL MANAGEMENT LEVELS AND THEMATIC AREAS

The key questions of the meeting sought to identify the interrelationships in water management among families, systems of use and other watershed management stakeholders, up to the national sectorial level, and how they could be optimised. And the same questions apply to the thematic areas: could the connections between the different analysed projects be optimised from thematic angles, such as water, risks, climate change, agricultural production and income?

As for **interrelationships in land management**, cases such as the **Sub-watershed Committee** of the Estelí River (Case 1) and others evidence that **there are already** spaces of coordination between land management levels, moving towards a **participatory planning** of water use and investments in vegetation cover management.

This participation should be based on **awareness** raised and **capacities** developed in stakeholders regarding the limits and precautions of water use, as well as on updated **information** about, for example, the status and trends of water use in their watershed.

Local municipal governments play a **crucial role** in these interrelationships, since they can intervene at three levels: farm (e.g. with compensation schemes for environmental services), systems of use (e.g. through strategies of capacity building for drinking-water committees and boards) and watershed (via planning processes for urban and rural land management processes that, e.g., prioritising strategic areas for water conservation or recharge or including a risk-reduction approach).

Some countries have not yet developed an **enabling legal framework** for better integration and synergies between public actors from different government levels, or for **partnerships between private and public stakeholders**, for example, to design mechanisms to reward sustainable management actions in upper watersheds. There is general agreement that in many countries there is still **a long road ahead** to strengthen spaces and mechanisms of coordination and relationships between all stakeholders at the watershed level.

As for **interrelationships between thematic areas** that require improvement, the following examples were identified, on specific issues that will increasingly demand coordinated management in watersheds:

- water **quality** for human consumption, affected by productive activities and land use in watersheds.
- **efficiency** in water uses, by sector and focused on water-use zones in watersheds.
- hydro-meteorological **hazards** for urban areas and rural production, which can be managed via early-warning systems in watersheds.
- **compensation for ecosystem services schemes** which link water, sanitation and also irrigation projects, with natural resource management issues.

The analysis of the presented experiences raises some

RECOMMENDATIONS

FOR DESIGNING USEFUL PROJECTS FOR SDC:

- **To conceive and design** projects with a **global view** from the beginning, both, in-house and in dialogue with national counterparts of the different sectors involved, to ensure consistency with public policy.
- It is necessary **to ensure the inclusion of a market-driven vision and a value-chain approach** in productive environmental projects from the design stage: improving production, transformation and marketing processes, until access to markets is achieved.
- To ensure coherence between development goals (and project goals): between **poverty or vulnerability** reduction (here the focus is on families) or improvement of **vegetation cover in a watershed** (here the focus is on work at the level of owner-families settled in relevant areas of the watershed, with the intention to generate effects/impacts at the watershed level).
- It is necessary to establish **indicators and baselines, and to monitor project effects** at multiple levels (e.g. vegetation cover, from the farm to the watershed).
- To create **opportunities for internal exchange** within SDC (between projects of different thematic areas) and also with external public stakeholders, to ensure greater programmatic coherence.

6 CONCLUSIONS

It is proposed that although a **sectorial organisation** is needed in State entities and in cooperation agencies such as SDC, as well as in rural development projects, this should not lead to a disciplinary or **"tunnel" vision** of rural reality, for the simple fact that, for rural families, the management of the natural-resource base that sustains their livelihoods in a context of risk is interrelated. Placing poor and disadvantaged rural populations at the very heart of efforts to create sustainable rural development and reduce poverty requires the project design to take a **systemic vision** in a specific **territory**.

This implies working from a **multi-stakeholder, multi-level** (management levels of family-plot, water use systems, watershed) and **multi-use** approach. In a watershed, that means, for example, ensuring that projects related to the use of land and water consider the **interrelations** and involvement of other water uses and users within different time scales, both upstream and downstream, in accordance with the principles of integrated water management. This implies that agro-productive projects should consider commercial links that can generate higher and more secure rural incomes, in order to strengthen local economic development.

Thus within a project, considering the importance of a systemic approach does not mean advocating a return to the integrated rural development projects of the 1970s, when a project "did all at once", or neglecting technical-thematic expertise. Rather it means remembering that a project is ideally **designed and carried out using** a comprehensive approach, considering the interrelationships between sectors and possible impacts outside specific areas of work. It requires some flexibility in the design of interventions and investments. Specifically, it means encouraging different stakeholders to fulfil **coordinated roles** within a certain territory, linking different themes, as seen in the cases of AGUASAN and PIMCHAS in Nicaragua.

Seeking integration or links creates increasing complexity in terms of analysis, action and coordination between stakeholders. An obvious result of this is a requirement to analyse, explicitly recognise and **monitor the effects and negative impacts** of a promoted practice and any trade-offs to be considered (e.g. new risks in the construction of water harvesting reservoirs, or in the reforestation of dry areas). Concepts such as **the water footprint**, an indicator of how much water is used to produce certain goods and services, can help move this analysis forward.

On the other hand, this invites all participants to continue identifying and promoting, with more substantial arguments, **good practices** that generate **benefits on multiple fronts** and contribute to several Sustainable Development Goals (win-win opportunities or synergies), e.g. agroforestry practices seen within PAGRICC. SDC's Multi-Network Meeting allowed a shared awareness of practices such as water-harvesting reservoirs, agroforestry systems, improved stoves and ovens, and public investments that incorporate risk management within water and sanitation projects. Participants also became more aware of progress made towards the main required outcome: creating spaces of integration between stakeholders and agreements for action and compliance monitoring, such as the Management Committee of the Estelí River watershed.

The experience of directly seeing the practices has highlighted, as a *first final thought*, the importance of designing suitable **financial mechanisms** within projects in order to **encourage** good natural resource management at the producer level. Incentive schemes should also seek a **post-project sustainability** of incentives, as well as ensuring that the population undertakes reforestation for better reasons than just receiving incentives or goods. Working with landowners on natural resource issues in economic differentiation contexts necessitates that resources are **focused** on those who need them most, by implementing **differentiated subsidy** strategies, especially when using incentive systems. It was established that incentive mechanisms for natural resource management is a topic that merits further reflection.

A *second final thought* is that the application of a systemic approach to initiatives related to natural resource management, agricultural production and promotion of water governance in a watershed demands an **improved information base and improved knowledge** of environmental and social processes and their interaction within the territories of intervention. For example, baseline information about the climate and its trends; how much water is used in a watershed, by whom and for what purpose; the condition of the ecosystem; land use and its temporal dynamics; water balance under different scenarios; and productivity.

This information baseline is not only necessary for the conception and design of a project, but also for **monitoring changes** attributable to projects at multiple levels (from the number of owners and individual plots to the effects on hydrological services at the sub-watershed level), as well as for stating where this monitoring is beyond the scope and main purpose of a development project.

In rural settings with little documentation and record-keeping, and complex socio-environmental issues, improving this information baseline requires it being built from **local knowledge**, with **scientific** support. It is necessary to generate evidence and arguments that are drawn from multiple sources, to influence public policies that provide the appropriate conditions for farmers to apply sustainable natural resource management practices, which meet their multiple development objectives and aspirations.

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WEBSITES

www.aguaycambioclimatico.info/: This web portal is dedicated to the process of knowledge management on Good practices in integrated water management at multiple levels, integrating climate risks and financing mechanisms, a process undertaken by SDC with its partners in the Latin America region since January 2015, with methodological support from ASOCAM, a Knowledge Management Service for Latin America of the Intercooperation Latin America Foundation (Ecuador) and Helvetas Swiss Intercooperation. In addition to the contents of the Multi-Network Meeting (interviews, presentations, discussion and photos), the web portal includes the thematic notes and synthesis of two pre-event electronic forums, as well as a digital library of 200 titles catalogued according to the main topics covered.

ANNEX 1.
ACRONYMS

CCA	Climate Change Adaptation
DRR	Disaster Risk Reduction
IWM	Integrated Watershed Management
IWRM	Reducción de Riesgos de Desastre
MRSE	Retribution Mechanisms for Ecosystem Services (Spanish acronym)
PES	Payment for Ecosystem Services
RES	Retribution for Ecosystem Services

ANNEX 2.
CONCEPTS

Trans-disciplinary / trans-sectorial analysis

This is understood as the effort to **collaborate** across (scientific) disciplines. In this case it is focused on working towards **solving complex, real-world problems** by crossing disciplinary boundaries and achieving a more holistic understanding of the issues. This cooperation can become increasingly intense and integrated, yet also increasingly complex and even unreal as it moves from a **multi-disciplinary concept** (people from different disciplines, each with their own disciplinary knowledge, working together) to an **inter-disciplinary notion** (integrating knowledge and methods from different disciplines, using a real synthesis of approaches) and finally to a trans-disciplinary action, which means the creation of a unit of intellectual approaches, beyond disciplinary ones (www.arj.no/2012/03/12/disciplinarities-2/). In the latter concept, non-academic participants are included, such as local stakeholders who have an interest in the issue (Stock and Burton, 2011)

Systemic vision or approach applied to rural development

The application of a **systemic approach** involves understanding that a system is made up of elements of reality that are **interrelated to and interdependent** upon other elements, with positive effects (synergies) or negative effects (impacts, trade-offs) if something were to change within a particular element. It requires an interdisciplinary and dynamic view of a complex multidimensional reality, within the contexts of time and space. The relevance of a systemic vision for the practice of rural development, natural resource management and governance of the stakeholders has been recognised since the 1990s. Its implications are clearer when applying the approach to actions within a specific **territory**, such as in a watershed. More recently it has been used in efforts towards **territorial rural development**.

Governance

It is understood as "the set of formal and informal processes in **decision-making**, involving the public, social and private **stakeholders** with similar or opposing interests" (Gentes, 2008). "Good governance" could consider principles such as subsidiarity, transparency and participation of all sectors. For some, governance differs from the notion of **governability** because the latter only relates to the public sector.

Land and water governance

"Governance refers to the system of **stakeholders, regulations, mechanisms and processes** through which **access, use, control, transfer and conflicts related to land and water are managed**. Defined as such, the notion of governance recognises the vital political dimension of land and water resources, which are now increasingly becoming the focus of disputes" (GWP, 2014:12). Water governance at the local level would then be the set of formal and informal processes in decision-making regarding the use and management of water, soil and vegetation in a watershed, involving the public, social and private stakeholders and the way they integrate, interact and intermediate their interests.

Disaster Risk Reduction	This denotes both a policy objective and the strategic and instrumental measures used to anticipate the future risk of disaster, by reducing exposure, hazards or existing vulnerability, and enhancing resilience (IPCC, 2014:1763).
Risk transfer	It is the practice of **passing the** financial consequences **risk** of particular adverse events **from one party to another**, either formally or informally (IPCC, 2014:1772). In this mechanism, a household, community, company or state authority obtains resources from the other party after a disaster occurs, in exchange for continuous or compensatory social or financial benefits provided to the other party (Lavell et al., 2012:35).
Adaptation to Climate Change	It is the process of adjustment to the current or expected climate and its effects. In human systems, adaptation aims to moderate or avoid harm or to exploit beneficial opportunities. In some natural systems, human intervention can facilitate adaptation to the expected climate and its effects (IPCC, 2014:1758).
Resilience to catastrophic events associated with climate change	This means the **capacity** of social, economic and environmental systems **to cope with** an **event, trend or dangerous disturbance**, responding or reorganising so as to **maintain its essential function**, identity and structure, while also maintaining the ability to adapt, **learn** and transform (IPCC, 2014:1772; also see Lavell et al, 2012: 34).

For a rural family or municipality, the reality of development is multi-faceted and interrelated, and each decision taken implies trade-offs. The aim of the Swiss Agency for Development and Cooperation (SDC) is the reduction of poverty for these families, within a sustainable development framework. In order to avoid developing a silo vision of rural realities, due to a sectorial organisation structure, it is important to analyse the interrelationships between themes such as water, agriculture, climate, risks and income. This document synthesises the conclusions of the exchange of ideas and reflections between rural development professionals of these diverse thematic areas, from SDC and its partners in the Latin America and the Caribbean region. Based on specific projects, it presents a current state of art of the actions and recommendations that emerged from this knowledge management process, for the achievement of greater effectiveness and sustainability of cooperation investments.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Climate Change & Environment Network

SDC Network RésEAU

e+i employment and income network

SDC Network Disaster Risk Reduction