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# **Integrated Urban Water Management in Lima, Peru: Building capacity for treatment and reuse of wastewater for green spaces and urban agriculture**

## **A review of the SWITCH Lima project<sup>1</sup>**

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### **I. SUMMARY**

This paper presents an assessment of progress of SWITCH in Lima. It analyses the rationale of the intervention, main findings and lessons learnt and recommendations for the last phase of the programme in the city, as well as offering insights for other SWITCH cities and for similar initiatives elsewhere.

Lima started this project as a SWITCH research city, but the intervention logic and activities (which included a demonstration project) and the success of this demo and the organisation of a learning alliance (LA) on the use of treated wastewater for urban agriculture, made it a demonstration city, which was acknowledged by SWITCH in April 2008.

The assessment includes a revision of documents produced by the local team, interviews carried out with a sample of key stakeholders (partners and members of the learning alliances in the city) and an evaluation workshop held with members of the SWITCH Lima team.

The document provides an assessment of most of the activities and results within the project timeframe but was written before the conclusion of the SWITCH project in January 2011 and full and final lessons can only be comprehended after it has been completed.

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<sup>1</sup> Castro, C. et al. 2010. *Integrated Urban Water Management in Lima, Peru: Building capacity for treatment and reuse of wastewater for green spaces and urban agriculture - A review of the SWITCH Lima project*. [Online]. Available at: <http://www.irc.nl/page/58311> [Accessed 28 December 2010].

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## II. INTRODUCTION

The City of Lima was founded on January 18 1535, on the banks of the river Rímac by the Spanish conquistador Francisco Pizarro, who was looking for the “New Castle”, and founded the “City of Kings” (La Ciudad de los Reyes). The location was chosen because it was situated near a valley, had sufficient water, fertile soils and a good climate, all close to the Pacific. With the independence of Peru (1821–1824), Lima became the capital city, hosting the major governmental institutes of the Republic.

Work on Callao, the main port for Spanish commerce, started two years after Lima was founded. Callao was never part of the Lima Department and became a constitutional province. Lima and Callao, used to be separated by desert and connected by train, but today they are united in the Metropolitan area of Lima, and it is not possible to see the dividing line between the two cities.

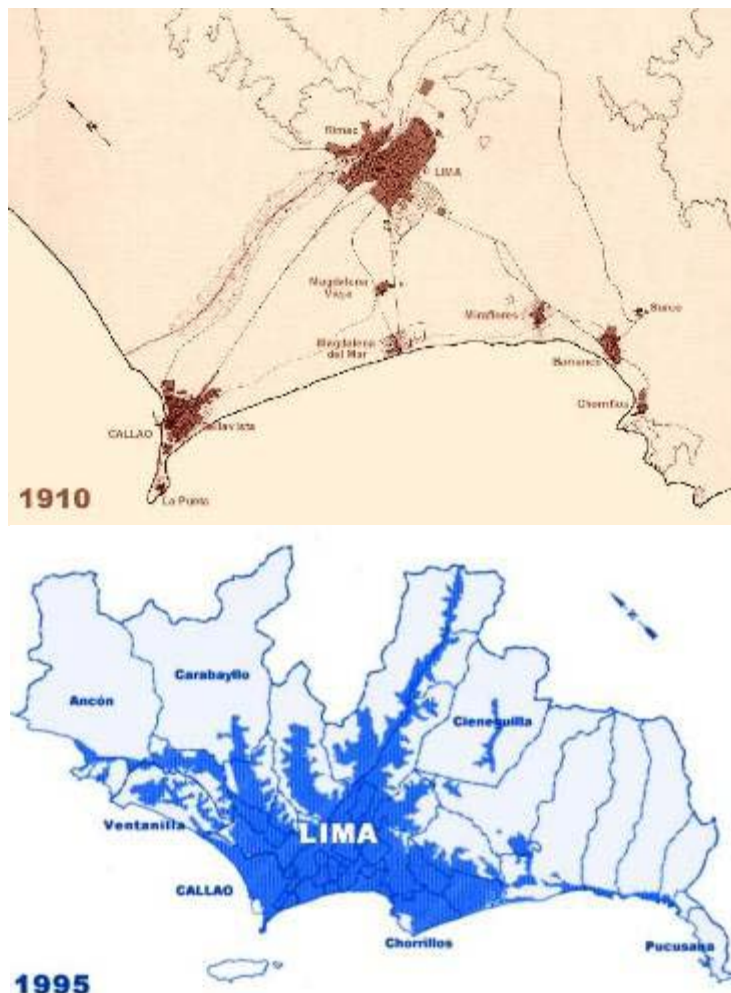


Figure 1 The growth of Lima and Callao as one

Source: Wikipedia (2005).

Urbanisation in the Peruvian coast is intense, especially in Metropolitan Lima, the main financial and administrative centre of the country. According to the 2007

census, Lima and Callao have a combined population of 8,472.935 residents (INEI, 2008), making this the fifth largest city in Latin America. The people of Lima represent almost 27% of the country's population, and the city has grown through migration, especially during the 1980s and 1990s, the years of major terrorist activity. Although the growth rate has fallen to 1.5% per annum, it is expected that by 2050 the city will have grown to 16 million people, doubling in size since 2007. Lima remains the most attractive city for migrants, because it hosts the highest amount of services and private enterprises in Peru, and so seems to offer the greatest opportunities for newcomers, who do not consider issues such as lack of water and lack of land.

Although Lima was initially founded in the valley of the Rimac River, today it extends to other surrounding valleys of the Chillón and Lurin rivers and extensive desert areas. Annual precipitation is nearly non-existent at around 9 mm per year<sup>5</sup>. Lima is considered the second most extensive city in the world built on a desert, after Cairo (Leon, 2009).



**Figure 2** Location of Metropolitan Lima

*Source: Moscoso & Alfaro, IPES (2008).*

The current main sources of water for Metropolitan Lima and Callao city are surface and underground water. Lima has a high dependence of water sources from the Andes glaciers: the average monthly flow of surface water for Lima in the last decade has been 39 m<sup>3</sup>/s from three rivers, Rimac (75%), Chillón (13%) and

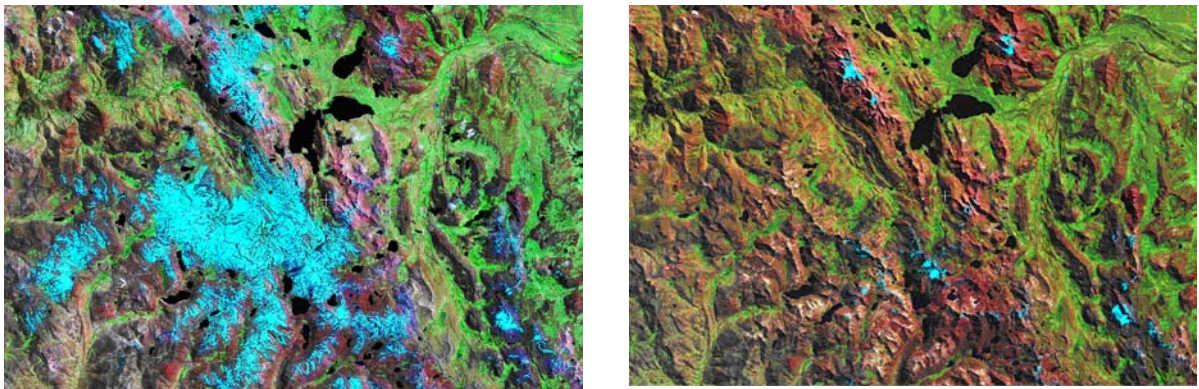
<sup>5</sup> Lima experiences temperature inversion which results in the city being covered by a layer of fog almost all the year round with high humidity of 80-90%. This is due to a combination of factors: the Peruvian Current (or Humboldt) averaging 18° C, the action of the Andes in halting the rain-laden winds from the forest and the action of the South Pacific anticyclone.

Lurin (12%) (Moscoso & Alfaro, 2008). The average consumption of water per inhabitant is 150 litre per day, varying by user and locality from 60 to 250 litres per capita per day.

Rimac river water comes from two main sources: Marcapomacocha Lake, which feeds the Santa Eulalia River, and the Rimac River, which derives its flow from springs near Ticlio (collected at Yuracmayo dam). SEDAPAL, the enterprise responsible for water and sewerage in the city, has invested great efforts and resources to catch water in dams from the Andean glaciers for Lima and Callao.

The water provision from the Andes is endangered by the progressive and accelerated disappearance of small and medium glaciers located more than 5,500 metres above sea level, an effect of global warming. This buffer is decreasing and in the long run will become completely depleted. It is obvious that this is disastrous as no rain falls in Lima.

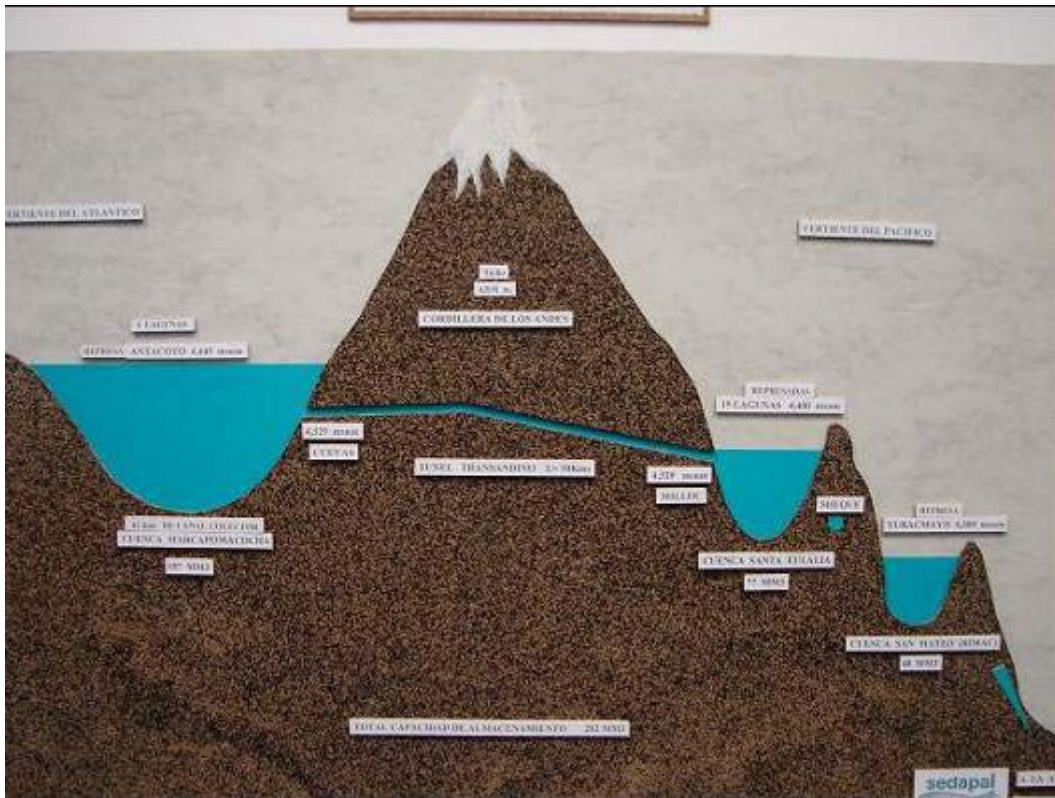
Figure 3 shows how Santa Eulalia glacier (one of the glaciers that provide water for Lima and Callao) has disappeared through melting in 5 years.



**Figure 3**                      **Glacial melt process of Santa Eulalia glacier (1999-2004)**

*Source: SEDAPAL (2008).*

A large amount of water for Lima is collected into reservoirs and conducted to through a tunnel through the Andean mountains (Figure 4). Any collapse of this tunnel would seriously affect the water provision for Lima.

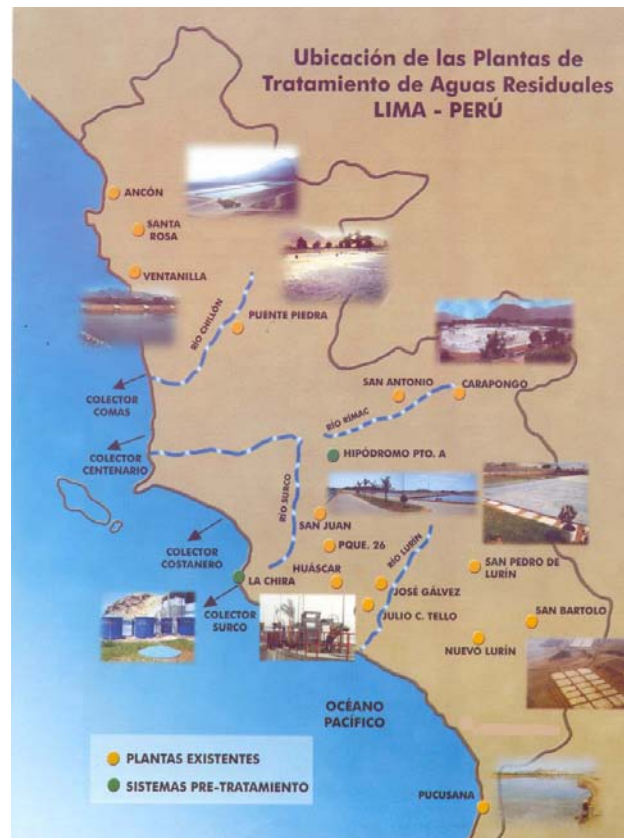


**Figure 4 Drinking water storage dams-tunnel system for Lima and Callao**

*Source: SEDAPAL, 2008*

Groundwater for Lima is fed by filtration from the Rimac, Chillón and Lurín rivers. It is extracted at a rate of 8.3 m<sup>3</sup>/s and, as with surface water, is primarily used for human consumption but also for agricultural and industrial activities (Moscoso & Alfaro, 2008). The sewerage system collects 17.5 m<sup>3</sup>/s of wastewater from 85.4% of Lima's population. The rest flows with the river to the sea. From the total amount of wastewater collected in the city only, 2.77 m<sup>3</sup>/s (15%) is treated in 16 treatment plants managed by SEDAPAL (Moscoso, 2010). Most wastewater is discharged without any treatment into the sea or rivers, generating high pollution problems and altering ecological systems that affect especially the fishery resources of the Peruvian sea.

Figure 5 shows location of the 16 existing treatment plants of SEDAPAL for Metropolitan Lima in 2009.



**Figure 5** Location of wastewater treatment plants of SEDAPAL in Lima

Source: SEDAPAL, 2009.

## Productive use of water and wastewater

Around 75% of the available water is used for human consumption, 22% by agriculture in peri-urban and urban areas and the rest (3%) on green spaces and for industrial and mining activities (Moscoso & Alfaro, 2008).

Due to the scarcity of rain and the pressure on the water supply, green spaces and productive activities around the cities use piped water (particularly in urban areas), raw wastewater or river water (especially in peri-urban areas) and treated wastewater. Use of piped water is not formally permitted for irrigation but it does happen.

Urban and peri-urban agriculture is increasing in Lima (see Box 1). Around 94% of crops in peri-urban areas (including vegetables) are irrigated in an informal manner either with raw sewage or river water highly polluted by sewage. Only a small amount of the area (less than 3% of the total) is irrigated with treated wastewater that meets standards defined for irrigation of green areas or agricultural production (Moscoso, 2010).

## **Box 1            Urban agriculture in Lima**

Agriculture in urban areas in Lima has increased in the last decade as a strategy to increase access to food (vegetables) and to generate income and improve the environment. It is supported by the agricultural customs and traditions of the new inhabitants who came to the city from rural areas of Peru. This kind of farming in urban areas uses almost no chemicals, and its main source of water for irrigation is domestic piped water (in contrast to the practice in peri-urban areas).

According to the records of the Users' Boards of Chillón, Rimac and Lurin Rivers, (Patterns of Agricultural Land Use) 12,680 hectares (ha) in peri-urban areas are irrigated in Metropolitan Lima, belonging to 7,601 agriculturalists organised into 35 commissions. There are some other agricultural areas not covered by the Users' Boards, like those of Villa El Salvador (130 ha), San Juan de Miraflores (12 ha) and Ventanilla (50 ha), which are irrigated exclusively with water from wastewater treatment plants

Sources: Soto & Siura (2008) and Moscoso & Alfaro (2008).

Due to the low availability of water and low rainfall, there is also unmet water demand for irrigation of green areas. Lima has only 1.98 m<sup>2</sup>/inhabitant of green areas (contrasting to the 4m<sup>2</sup> recommended by the UN). Local government, many organisations and the general population in Lima use piped water and wastewater (treated or not) for green spaces. Less than 15% (210 ha) of parks and gardens in the city are irrigated with treated wastewater and over 1200 ha of green areas use polluted river water or drinking water for this purpose (Moscoso & Alfaro, 2008).

The potential of using treated wastewater for these productive uses has generated interest by national authorities. Particularly in urban areas along the coast in Peru, this interest responds to the need to reduce demand for piped water for uses other than consumption, as well as increasing the quality of (and control over) water used for irrigation of crops in peri-urban areas and green spaces in urban areas.

The SWITCH project developed in Lima in 2006 based on these issues. Since then, there have been changes to the national legal and regulatory framework: the Ministry of Environment was created in 2008, the National Water Authority was created in 2009 and a national Law on Water Resources was enacted for the first time in 2009 (Box 2). The potential of using treated wastewater for productive purposes is recognised in law although competencies regarding authorisation for its use are shared with sectoral authorities.

## Box 2            The law on water resources and the reuse of treated wastewater

In March 2009 the Peruvian government enacted Law No. 29338 on Water Resources, the first law to cover the use of water resources or treated wastewater. The Act states that the National Water Authority (ANA) through the Watershed Council, authorises the use of treated wastewater, according to the purpose for which it is intended.

The Regulation of the Water Resources Act (DS N ° 001-2010-AG) included a chapter on treated wastewater. According to that, ANA is responsible for authorising the reuse of treated wastewater so long as it meets the quality parameters established by relevant sector and they have an environmental certification granted by the competent environmental authority in the sector. The authorisation for reuse must take also into account the standards laid down for the relevant sector by the competent authority or, failing that, the WHO guidelines. The Water Management Authority is responsible for control and monitoring of wastewater reuse.

Source: ANA (2010).

### III. SWITCH IN LIMA AND PERU

The SWITCH global project "*Sustainable Water Management Improves the Health of the Cities of Tomorrow*" seeks to bring about change in the paradigm of water management in order to achieve sustainable, healthy and safe urban development. SWITCH promotes innovative technologies and sustainable urban water management in 12 cities around the world, combining research, training and demonstration projects within a learning alliance framework. All elements of the urban water cycle are included, from demand management, through the handling of rainwater, water pollution prevention, wastewater treatment and reuse, river rehabilitation and eco-hydrology. SWITCH is implemented by a global consortium consisting of 32 partners, and is coordinated by UNESCO-IHE<sup>6</sup> and funded by the General Directorate for Research of the European Union.

In Lima, the coordinating partner is IPES<sup>7</sup> - Promocion del Desarrollo Sostenible, which works on SWITCH in close collaboration with the Office of Environment (OMA) of the Ministry of Housing, Construction and Sanitation of Peru (MVCS), and with ETC Foundation<sup>8</sup> (The Netherlands). The main focus of work of SWITCH Lima is the use of wastewater for productive use in the city.

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<sup>6</sup> UNESCO-IHE, the Institute for Water Education in Delft, the Netherlands, carries out Research, Education and Capacity Building Activities in the fields of Water and the Environment.

<sup>7</sup> IPES seeks to improve food security and nutrition, generate decent jobs and fair incomes, provide access to good quality basic services and create a healthy environment for men and women of Latin America and the Caribbean especially the disadvantaged. IPES has 25 years of experience, working to make municipal areas environmentally, socially and economically sustainable with an emphasis on intermediate cities.

<sup>8</sup> The ECT Foundation works to develop information and knowledge-sharing particularly in governance, natural resources management and public health, contributing to ecological sound, socially equitable, economically viable and culturally acceptable situations.



In Lima, SWITCH was built upon a number of earlier efforts related to reuse of treated wastewater such as the regional project from Pan American Health Organization<sup>9</sup>/World Health Organization/Centro Panamericano de Ingenieria Sanitaria y Ciencias del Ambiente<sup>10</sup> (PAHO/WHO/CEPIS) and the International Development Research Centre (IDRC)<sup>11</sup>, and other projects in which IPES was involved, on urban agriculture and city greening such as the Cities Farming for the Future Project implemented by IPES as part of the RUAF<sup>12</sup> Foundation (Box 3).

An important lesson from these earlier activities was that, due to Lima's climate and soil conditions and the scarcity of water for irrigation, it was necessary to look for alternative water sources. Piped water is for human consumption, while treated wastewater is an alternative water source for urban and peri-urban agriculture activities and for urban green spaces. However, the legislative and regulatory framework did not promote this approach and in addition there was no proper institutional setting.

### **Box 3                      Cities farming for the Future Programme (CFF) in Lima**

The RUAF programme "Cities Farming for the Future Programme" (CFF) was implemented by IPES in the period 2005-2008 in Lima, (IPES is a member of the RUAF Foundation). The programme facilitated participatory and multi-stakeholder policy formulation and action planning on urban agriculture and productive green areas in one Municipality in Lima, including safe reuse of urban organic wastes and wastewater.

The City Strategic Agenda on urban agriculture and urban forestry (CSA) developed by the multi-stakeholder Urban Agriculture Forum in Lima seeks to facilitate access to water and works for its rational use in urban agriculture and green areas or agroforestry in the Municipality. Alternative approaches are needed due to the lack of water and high costs. The agenda defined as a key issue the possibility of exploring alternatives to the use of piped water for urban agriculture and agroforestry.

Source: IPES (2007).

This situation required SWITCH, not only to start research and demonstration activities in Lima, but also to lobby at national level to promote the development of a national regulatory framework and the use of treated wastewater in Peru.

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<sup>9</sup> PAHO is the international public health agency for the Americas and the Regional Office for the World Health Organization.

<sup>10</sup> CEPIS (the Pan American Center for Sanitary Engineering and Environmental Sciences), is the specialised PAHO centre for environmental technology.

<sup>11</sup> IDRC is a Canadian Crown corporation that supports research in developing countries to promote growth and development.

<sup>12</sup> The RUAF Foundation is an international network that works with local government, producer organisations, NGOs, universities and private enterprise in cities to reduce urban poverty and to contribute to food security and employment.

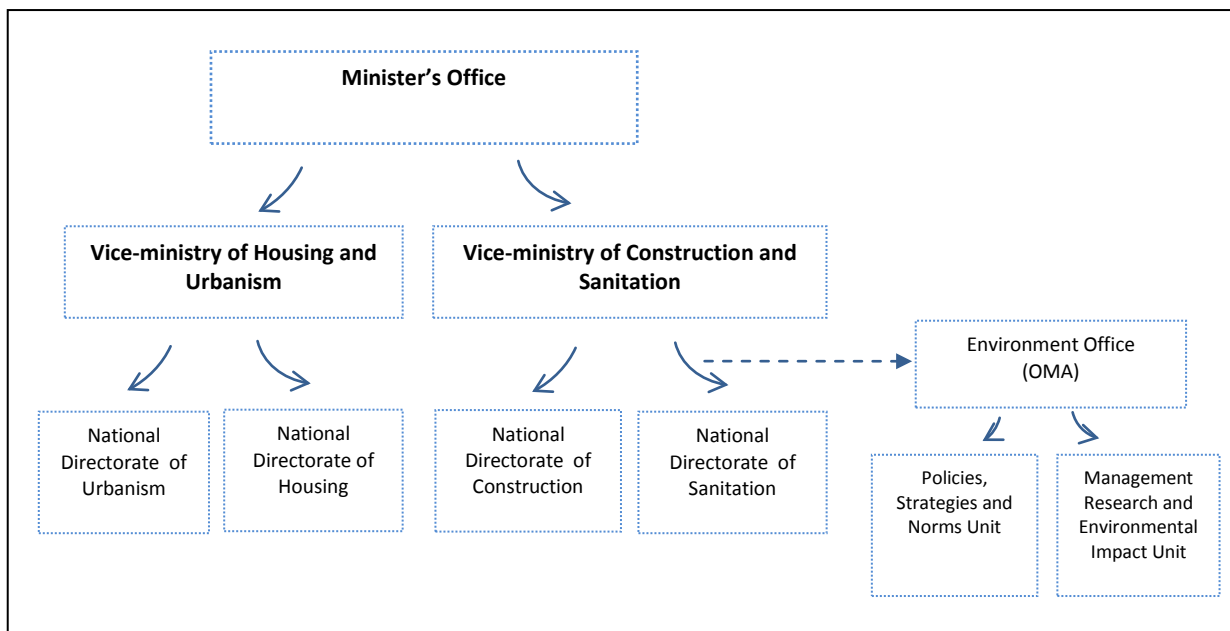
### ***Project origins and objectives***

The proposal for SWITCH to intervene in Lima/Peru was elaborated in 2005 under the former national government and with participation of other local authorities. In 2006, a new government launched an ambitious programme of investment in water “Water for All” (Agua para todos), to be implemented by the Ministry of Housing, Construction and Sanitation (MVCS). It was in this context that the SWITCH programme started, and sought to link research and demonstration to this Ministry, to jointly generate lessons to further enhance the national policy on water and sanitation.

In 2006, IPES made a rapid context analysis, interviewing key people and revising considering secondary data on the use of treated wastewater in urban agricultural irrigation, green spaces and forestry, to identify constraints and opportunities. This analysis identified that the potential use of treated wastewater was not considered to be great enough to respond adequately to the pressure on water sources in Lima and other cities on the Peruvian coast. The analysis also identified several experiences in using treated wastewater by different actors (local governments, private sector among others). It confirmed that one of the main limitations for the low use of treated wastewater (particularly domestic use) was the lack of legislation and policy in the sanitation sector to promote the use of treatment systems oriented to productive reuse.

This analysis was included in the further development of SWITCH activities in Lima which included the formulation of sectoral policy on sanitation to promote the use of treated wastewater.

IPES included an analysis of the competencies and functions of the MVCS, the governmental body responsible for this subsector, to see if it could act as the strategic partner in SWITCH Lima. The Office of Environment (OMA) was identified as the body within the Ministry that seeks to consolidate and strengthen environmental management, particularly in the formulation of policies, plans and strategies for the sector. The aim is to orient all housing, construction and sanitation activities towards sustainable development (MVCS/OMA, 2010).



**Figure 6 Organisation chart of the Ministry of Housing, Construction and Sanitation of Peru (MVCS)**

*Source: Castro, C. et al (2010).*

After the directors of MVCS/OMA had been briefed about SWITCH and the relevance of MVCS/OMA as a strategic partner, a team was selected and MVCS/OMA and IPES signed an agreement to implement the project jointly.

IPES and MVCS/OMA defined as their main objective the formulation and approval of policy guidelines for the sanitation sector that promote the reuse of treated wastewater. They also agreed to identify activities to achieve this, such as an analysis of gaps in the existing regulatory framework that limited implementation of integrated or decentralised systems for using treated wastewater for urban green spaces and agriculture. This analysis would look at the technical, institutional, economic, environmental, health and socio cultural aspects of such use.

The aim was for a set of guidelines that would establish a basis to cover regulatory gaps and would set a national and municipal agenda for the improved management of treated wastewater for productive use in urban areas, as well as improving access to and recycling of water resources in Lima. The whole process needed to contribute to the creation of a legal/regulatory framework for these issues, consistent with the situation of Peruvian cities along the coast.

### **Intervention Logic**

The intervention logic of SWITCH Lima was that access to and use of treated wastewater could be increased on the basis of:

- 1) Research and demonstrations rooted in a local learning alliance to provide evidence, and acceptance of that evidence amongst key stakeholders, on the nature of the problem and safe solutions

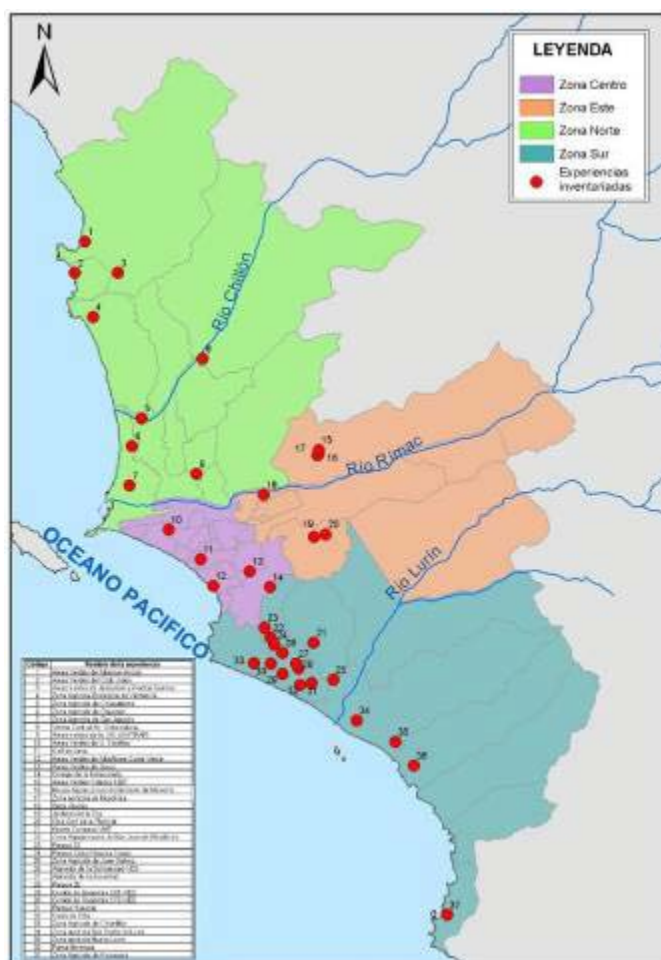
- 2) Development of officially recognised policy guidelines, involving a national learning alliance of key stakeholders, in order to facilitate scaled-up safe reuse of wastewater
- 3) Training and communication activities for stakeholders to participate in this process and for tools (website etc) oriented at improving the awareness of the new policy and the capacities to enhance its implementation

The Learning Alliances in the form of multi-stakeholder platforms at two levels, with a later informal third level, brought together all major stakeholders linked with treatment and reuse of wastewater in a new form of communication, decision-finding and decision-making that would allow implementation of successful innovations on a large scale.

### **Generating locally-based evidence for the development of the guidelines**

Research activities aimed to generate information to guide the construction of guidelines based on local practical realities, not just on theory. During this phase inventories of current experiences with using treated wastewater in Metropolitan Lima and of urban agriculture experiences in Lima were undertaken. The SWITCH Lima team of IPES, Universidad Nacional Agraria La Molina (UNALM) and MVCS staff, was trained on the methodology and tools to be used in the inventory.

The inventory described various experiences of the treatment and reuse of wastewater in urban and peri-urban Lima and Callao, which were examples of different sizes, complexity, actors and users.



**Figure 7** Location of experiences on treatment and reuse of wastewater in Lima and Callao identified within SWITCH project.

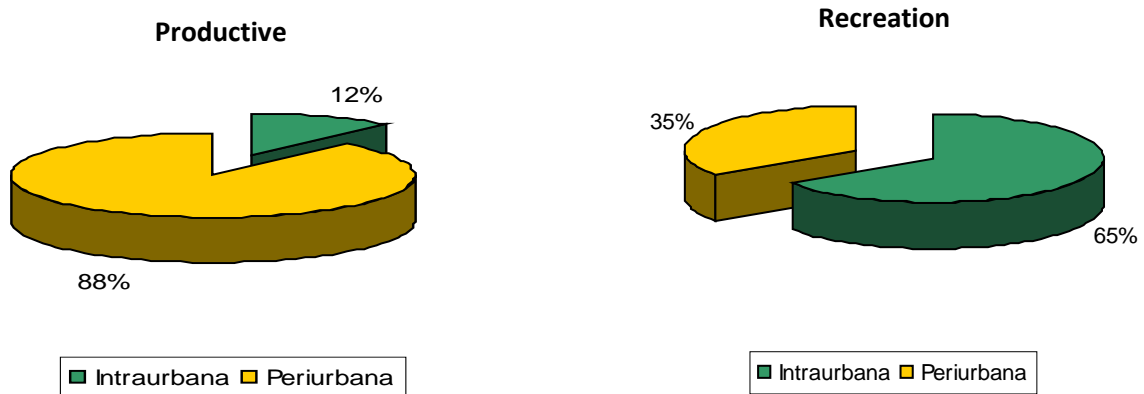
Source: Castro, C. et al (2010).

The inventory identified 37 experiences of the reuse of treated wastewater, 20 of them in peri-urban areas and 17 in urban areas. Of these, 51% were used for green spaces (recreation areas), 37% for agricultural use and the others for a combination of greening, aquaculture and agriculture. The inventory of urban agriculture identified 42 experiences: 26 in urban areas and 16 in peri-urban areas. Of these, 5 used treated wastewater for irrigation (1 in urban areas and 4 in peri-urban areas) and 19 used piped water (all of them in urban areas).

Use of treated wastewater	Cases	(%)	Ha	(%) irrigated area
Productive (agriculture)	18	45	753.5	77
Recreation (green areas)	22	55	228.5	23
Total	40 (*)	100	982.0	100

**Table 1** Use of treated wastewater of the experiences identified in the inventory

Source: Castro, C. et al (2010).



**Figure 8** Type of reuse activities in peri-urban and intra-urban areas

Source: Castro, C. et al (2010).

The research team also analysed the normative and institutional framework related directly or indirectly to water management with a focus on wastewater. This 2007 report became a key document in the preparation of the policy guidelines, since it suggested necessary changes in the existing legal framework and identified the need for capacity development of and inter-institutional collaboration. In 2008 two new important government agencies were formed that are currently involved in the issue directly and indirectly: the National Water Authority (March 2008) and the Ministry of Environment (May 2008), which made the work more relevant (and accepted), but also made it necessary to build the capacity of new staff.

After the inventory, IPES and MVCS/OMA identified research needs (the weaknesses in using treated wastewater) and research lines (to generate more knowledge about their causes and effects) to be covered through local case studies.

In addition the inventory was used to develop a typology of wastewater reuse and urban agricultural experiences, based on the following main characteristics:

1. Location (urban or peri-urban),
2. Type of activity in which the wastewater treated is using – productive (agriculture or forestry) or recreation (green areas and golf courses)
3. Treatment technology (stabilisation ponds, aerated lagoons, activated sludge, constructed wetlands, or trickling/percolating filter)

Matriz de Tipología								
Ambito	Casos	Tipo de actividad	Casos	Tecnología de tratamiento	Casos	Tipo		
Periurbano	21	Recreativa	8	Lagunas de estabilización	3	1Aa		
				Lodos activados	1	1Ab		
				Lagunas aireadas	4	1Ac		
		Productiva	15			Lagunas de estabilización	5	1Ba
						Lodos activados	1	1Bb
						Lagunas aireadas	6	1Bc
						Humedales artificiales	1	1Bd
						Ninguna	2	1Bo
Intraurbano	16	Recreativa	14	Lagunas de estabilización	2	2Aa		
				Lodos activados	4	2Ab		
				Lagunas aireadas	2	2Ac		
				Humedales artificiales	3	2Ad		
				Filtros percoladores	2	2Ae		
				Ninguna	1	2Ao		
		Productiva	3			Lagunas de estabilización	2	2Ba
						Lodos activados	1	2Bb

Fuente: (Moscoso, IPES 2007)

**Table 2** Typology developed for in-depth research phase

Source: Moscoso, IPES (2007).

Based on this typology, twelve experiences (6 of wastewater reuse and 6 urban agriculture cases) were studied in more depth. A framework for analysis was developed by the research team, to assess these studies under five dimensions of sustainability, taking into consideration both the treatment and the reuse aspects. The criteria have the acronym FIETS (which means bicycle in Dutch):

- **Financial (economic):** For treatment: investment costs, annual operating and maintenance costs and annual maintenance, commercialisation costs, and estimated cost/benefit ratio. For reuse: investment costs, production costs, price for marketing, and estimated cost/benefit ratio.
- **Institutional and legal:** For treatment: name and location of the treatment plant, years of operation, scope of experience, purpose of treatment, owner, type of organisation, institutional promoter of treatment, financial institutions of treatment, identification of indirect stakeholders, existing agreements, existing conflicts, legal problems. For reuse: name and location of the experience, length of operation in years, scope of the experience, purpose, experience, land tenure, type of organisation, promoter of reuse, reuse financial institutions, identification of indirect actors, existing agreements, conflicts, legal problems.
- **Environmental and health:** For treatment: type of soil treatment area, process quality controls, positive impacts, negative impacts. For reuse: size of the experience, soil type, volume of water used, wastewater characteristics, wastewater quality, positive and negative impacts of reuse
- **Technical:** For treatment: plant size, treatment technology, treatment process, design capacity, current flow, the size of the plant, retention periods and

capacity of removal, disposal of effluent treatment and disposal of sludge management problems. For reuse: type of irrigation, characteristics of major crops, quality of management

- **Social-Cultural:** For treatment: direct and indirect beneficiaries, acceptance levels, estimated population and houses that provide the wastewater to the treatment plant. For reuse: direct and indirect beneficiaries, acceptance levels of products irrigated with wastewater.

Based on this information, the legal and institutional study proposed to:

- promote centralised treatment systems (public, private or mixed service providers in sanitation) and decentralised reuse, with municipalities to coordinate the irrigation of green areas and parks and urban producer associations.
- Support the development of privately managed, decentralised treatment and reuse systems.
- Show interested parties the linkages between treatment and reuse systems, based on location, maintenance costs, etc., and based on the FIETS analysis.

### **Development of networks (learning alliance) of key stakeholders for dialogue and exchange of knowledge**

IPES and MVCS/OMA considered it relevant to design and structure a learning alliance to enable the formulation of policy guidelines based on the results of research and dialogue and coordination between different government sectors and civil society.

As part of the activities planned in the work package, IRC<sup>13</sup> and ETC conducted a training workshop in Lima (June 2007) on the methodology of learning alliance, which helped strengthen capacities of IPES and MVCS / OMA for its design. This combined the knowledge gained during the training and the expertise developed by IPES in implementing multi-stakeholder processes to formulate urban management policies.

SWITCH Lima developed learning alliances at two levels (national and local) to support research activities, involve actors in the process and set a basis for disseminating action-oriented research products. LA members were identified using a results of inventories, the study on the institutional and legal framework for the treatment and use of wastewater and results of the study on governance of urban environmental sanitation led by IRC in LAC cities.

Those known to be involved in reuse and treatment of wastewater and/or urban agriculture issues were invited to the launch of the Lima SWITCH project in 2007: NGOs and foundations, local governments, academic and research institutions,

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<sup>13</sup> IRC International Water and Sanitation Centre, based in The Hague, the Netherlands, is an international partner in the SWITCH project.



farmers' organisations, cooperatives, the private sector and the national government. During the event the learning alliance approach was presented and IPES and MVCS/OMA invited the attendees to be part of the process. Some of them expressed their interest in following up the SWITCH Lima project and become part of the learning alliance.

The formal establishment of the learning alliances in Lima was done in April-May 2008 in the form of two multi-stakeholder platforms: The National Learning Alliance (Peru) and Local Learning Alliance (Lima). The National Learning Alliance integrates sectoral governmental organisations linked directly or indirectly to the formulation and approval of policy guidelines for the use of domestic treated wastewater. The Local Learning Alliance integrates local stakeholders (local government, the private sector, academic/research institutions, producer organisations, etc.) with experience of treating or using treated wastewater for irrigation of green, forestry and agricultural areas (as practitioners, operators, users) and research or academic institutions whose work is connected with the treatment or reuse of wastewater.

Box 4 lists the members of the learning alliances in Lima divided into national and local).

**Box 4      Institutions involved in the Learning Alliance in Lima**

<b>National LA members</b>	<b>Role</b>
<p>Ministry of Housing, Building &amp; Sanitation (MVCS) – Leader of the learning alliance</p>	<p>Established in 2002, MVCS is the governing body of the sanitation sector through the Vice Ministry of Construction and Sanitation (VMCS) and the National Directorate of Sanitation (DNS). The Ministry formulates, approves, implements and monitors the implementation of national policies on water and sanitation. The Office of the Environment (OMA) seeks to consolidate and strengthen environmental management in the Ministry by incorporating it into the institutional dynamics, particularly in the formulation of policies, plans and strategies of the sector. The aim is to orientate all housing, construction and sanitation activities towards sustainable development and plan the protection and recuperation of the urban-rural environment and rural resources related to sectoral activities. OMA assumed the leadership of the SWITCH project in the learning alliance.</p>

<p>National Superintendency of Sanitation Services (SUNASS)</p>	<p>SUNASS is the regulatory body of the sanitation sector. Its functions are to supervise, regulate, give norms, control, punish, and resolve disputes and complaints from users under the scope and limitations established by law. The agency is funded by 1% of the turnover of the Municipal Service Providers (EPS). SUNASS is a decentralised body attached to the Presidency of the Council of Ministers, with full legal, administrative, functional, technical, economic and financial autonomy.</p>
<p>Ministry of the Environment (MINAM)</p>	<p>MINAM develops, directs, oversees and implements the National Environmental Policy (under which the National Water Resources Strategy and policy are elaborated) and the National Water Resources Plan. It has the power to establish environmental quality standards for the treatment of wastewater for use in coordination with the relevant sectoral authorities.</p>
<p>Ministry of Health /General Directorate of Environmental Health (DIGESA)</p>	<p>These bodies exercise functions in the health aspects of water quality for human consumption and environmental protection to health</p>
<p>National Water Authority (ANA)</p>	<p>ANA is the specialised technical body for water within the Ministry of Agriculture. It is the agency responsible for the multisectoral and sustainable use of water resources and river basins in the country in the framework of integrated management of natural resources and environmental quality management. It works through national strategic alliances with regional and local government and with social and economic actors involved. Its main functions are to formulate policy and national strategy for water resources management and to formalise the rights to water use, distribute it equitably, ensure quality control and help resolve conflicts.</p>
<p><b>Local LA members</b></p>	<p><b>Role</b></p>
<p>Municipalities of Villa El Salvador,</p>	<p>The municipalities provided information about case studies for the treatment and</p>

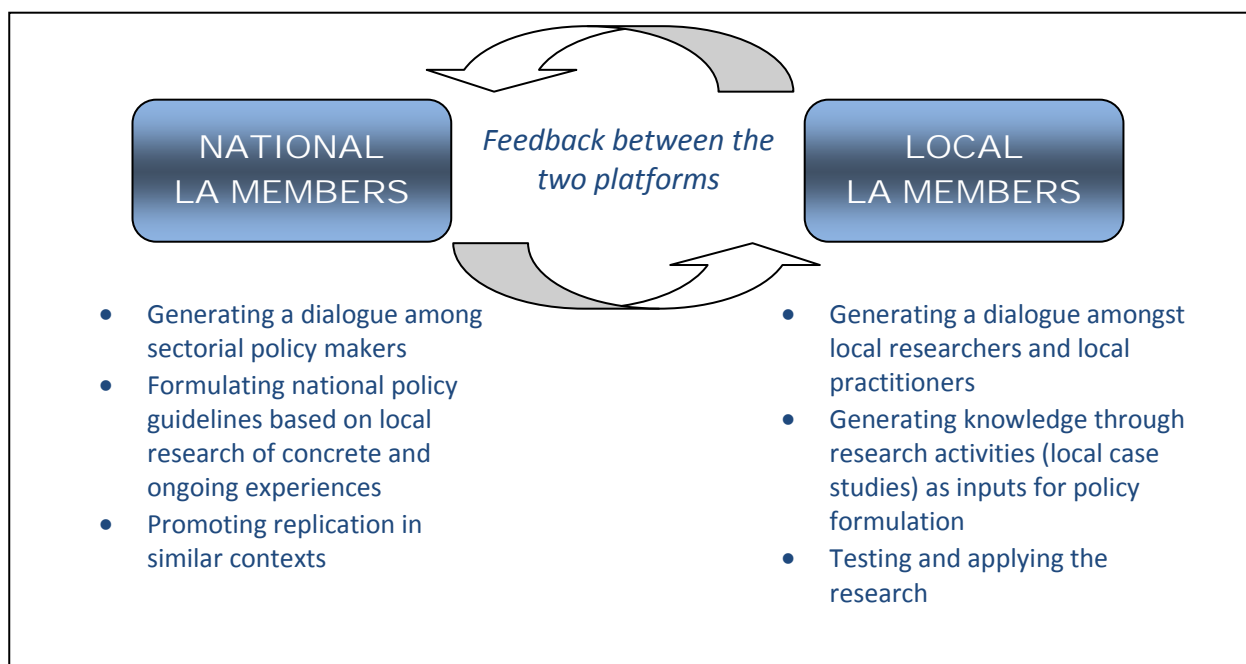
Pucusana, Miraflores, Metropolitan Lima, Carabayllo and Comas	reuse of wastewater. Contributed to the identification of constraints and potential for use of treated wastewater, information that was used in the elaboration of the National Policy Guidelines.
Rimac River Users' Board (agriculturalists)	Provided information about the case studies of treatment and reuse of treated wastewater. Contributed to the identification of constraints and potential for use of treated wastewater, this information was used in the elaboration of the National Policy Guidelines
Inmaculada School	Provided information about one of the case studies of treatment and reuse of treated wastewater. Contributed to the identification of constraints and potential for use of treated wastewater, information that was used in the elaboration of the National Policy Guidelines
National University of Engineering	Contributed to the identification of constraints and potential for use of treated wastewater, information that was used in the elaboration of the National Policy Guidelines.
National Agrarian University of La Molina	A key partner for implementing the research phase. One professor supported the compilation of the inventory and development of the case studies related to urban agriculture.
IPES – Promoción del Desarrollo Sostenible (facilitator)	

Source: IPES/MVCS (2008)

The two multi-stakeholder platforms, related to the mandate and competencies of the different stakeholders (e.g. policy makers/regulators vs. practitioners and support organisations), and their institutional interests (e.g. policy and law formulation vs. improving/exchanging experiences). IPES as facilitator of both platforms supported the exchange and communications between them in a direct or indirect way (presented/published the information generated in the platforms and organised joint meetings of both platforms together)

The Learning Alliance focused on:

- generating a dialogue amongst sectoral policy makers,
- generating a dialogue amongst local researchers and local practitioners
- formulating national policy guidelines based on local research of concrete ongoing experiences,
- testing and applying the research
- promoting replication in similar contexts



**Figure 9 Learning Alliances in SWITCH Lima Project**

*Source: Castro, C. et al (2010).*

### **Demonstration activities to motivate stakeholder involvement and lessons learnt on the approach promoted by SWITCH**

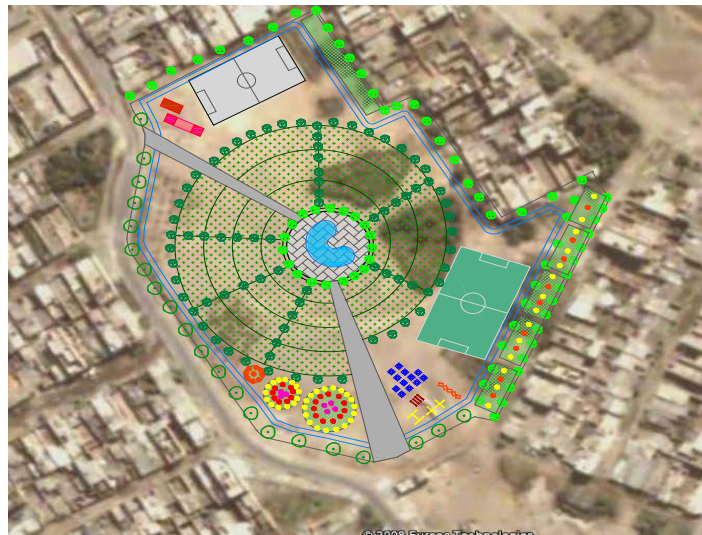
The demonstration project, OGAPU, was designed and implemented in the district of Villa el Salvador, Lima, with the purpose of validating proposed elements of the policy guidelines, and to establish an experience that could be further used as a research and demonstration site, as an example for replication of productive green areas and treatment/use of wastewater.

An Eco-Productive Park was designed in a participative way with the community and community based organisations, architects, and authorities. It included awareness raising on the subject and an inventory of ideas through a series of workshops so that the park reflected the needs of local people. The Eco-Productive Park has four components: Recreation (games for children, chess table); Sports (a grass football field, cycle path); Production (growing ornamental bushes to sell to the city for its parks); and a tertiary treatment pond for wastewater at the top of the hill.

OGAPU (which in Spanish is an acronym for Optimising Water Management to Combat Urban Poverty) aimed to demonstrate the importance of multi-stakeholder approach and citizen participation in the use of treated wastewater and the necessity of multi-functional use of land to include green and productive areas. In practice, the demonstration project aimed to show decentralised (re)use of treated wastewater on 2 Ha of productive and multifunctional green areas (the Eco-Productive Park). Such areas have the potential to demonstrate a social

function (community building, recreation, social inclusion, etc.), an economic function (food, income, solidarity), and environmental function (use of open space, greening, improvement of air, reuse of waste, etc.).

Originally, the project looked to strengthen the practice of urban agriculture for growing food and to make urban green spaces more visible in a district that is characteristic of desert areas. Plans to grow food had to be abandoned because of legislation does not permit the use of wastewater for this purpose.



**Figure 10** Design of the Eco-Productive Park in Villa El Salvador

*Source: Castro, C. et al (2010).*

The location of the Project was selected between the Municipalities from the Local Learning Alliance based on the following criteria: a) location near to centralised treatment plant from the SEDAPAL, b) political interest and support from the local government to the pilot and to promote its scaling up, c) poverty level of the population, d) interest of the population for the development of urban agriculture

(plant nursery). Based on these criteria the Municipality of Villa El Salvador was selected.

Three members of the LA, MVCS, IPES and the Municipality of Villa El Salvador (MVES) took the lead in this and created an informal learning alliance at neighbourhood level along with the private enterprise Peruvian Energy Network (REP) and local CBOs REP took responsibility for providing the children's play areas in the park.

## Participative Formulation of Policy Guidelines

The Policy Guidelines aim to contribute to national water management, by including sanitation, treatment and reuse of wastewater in urban areas, as a substitute for drinking water. They were approved in November 2010 after a long process, through Ministerial Resolution 176-2010-VIVIENDA.

The preparation of the guidelines was a participatory process. Based on a SWOT analysis with the MVCS, the FIETS analysis, and dialogue between the various stakeholders, the guidelines identified 5 main objectives (Box 5). For each objective specific activities were identified which were developed under the leadership of MVCS and in which the other actors of the LA participated, as part of an inter-sectoral governmental committee. This committee represents the continuation of the LA.



**Figure 11** Specific objectives of the Policy Guidelines

Source: Castro, C. et al (2010).

**Box 5 National Policy Guidelines for Promotion of Domestic and Municipal Wastewater treatment for greening of urban and peri-urban areas**

On November 5th, 2010 the Ministry of Housing, Building and Sanitation enacted the Ministerial Resolution 176-2010-Vivienda, that promotes reuse of treated wastewater for greening of urban and peri-urban areas that agrees with the National Sanitation Plan.

The objectives of the guidelines are to:

**OBJECTIVE 1.** Contribute to the national management of water resources, by including in national water and sanitation policy the reuse of municipal and domestic wastewater for irrigating urban and peri-urban green areas.

**OBJECTIVE 2.** Encourage the use of effective and adapted water treatment technologies for reusing domestic and municipal wastewater for irrigating urban and peri-urban green areas, and to support the implementation of specific research that contributes to improving sanitary quality and reducing the costs.

**OBJECTIVE 3.** Establish mechanisms that promote the participation of the public and private sector, civil society and international organisations to invest in developing water treatment systems geared toward reusing domestic and municipal water for irrigating urban and peri-urban green areas.

**OBJECTIVE 4.** Promote social participation and public access to information about stakeholders involved in the treatment and reuse of domestic and municipal wastewater, in order to ensure transparency, control and efficiency of managing said processes.

**OBJECTIVE 5.** Strengthen the capacities of those involved in the sector; the Sanitation Service Providers, other government bodies responsible for the sector and users of domestic and municipal treated wastewater.

Each principle has a matching policy implementation guideline:

**GUIDELINE 1.** The reuse of treated domestic and municipal wastewater for irrigating urban and peri-urban green areas must be incorporated into sectoral policy, plans and strategies.

**GUIDELINE 2.** The use of effective treatment technologies must be a part of national sanitation policy, (along with promoting and supporting research).

**GUIDELINE 3.** Active participation of the public sector, the private sector, civil society and international organisations is key to strengthening management and guaranteeing sustainability and financial support.

**GUIDELINE 4.** Promoting citizen participation and the public access to the information must be assured as a way of guaranteeing transparency, control and efficiency.

**GUIDELINE 5.** Strengthening capacities and training for diverse public and private stakeholders must be a permanent part of sector policy for which specific resources should be allocated.

The Guidelines consider as a priority the development of a National Strategy for promoting the reuse of domestic and municipal wastewater for greening in urban and peri-urban areas. They enable the design of a specific institutional and regulatory framework and propose the inclusion of such works on projects that would be formulated by the National Public Investment System (SNIP).

Among the activities that the proposed Guidelines, it is the development of differentiated strategies by type of actor (e.g. regional, local, sanitation service providers and users) to meet their demands and training needs.

They established that control planning and implementation of the guidelines will be made by a Multi-sectoral Committee composed of ministries of Housing, Health, Environment, ANA and SUNASS. This committee will coopt other actors (public or private) for advice.

The MVCS is responsible for preparing a work plan that will be submitted for consideration and approval of the Committee, which will enable each sector to prioritise activities, and to schedule and coordinate the implementation of one or more pilot projects that incorporate the guidelines, involving the EPS and other stakeholders.

The members of the LA prioritised one of the key objectives identified in the Guidelines for implementation in 2010: a National Training Course on Treatment and Use of Wastewater. The course was conducted by IPES and MVCS/OMA with members of the National LA (PAHO/WHO/CEPIS, SUNASS and ANA). It was designed for municipal officers and water and sanitation technicians of enterprises managing centralised and decentralised wastewater treatment systems and oriented towards the reuse of treated wastewater in agriculture, forestry and green areas. The course was intended to strengthen the use of SWITCH project findings, support the implementation of the policy guidelines and promote the scaling up of the recommendations at national level.

## **Knowledge management and dissemination of SWITCH Lima**

SWITCH Lima developed a website (<http://www.ipes.org/au/switch>) as part of information and dissemination of the research findings and the policy guidelines among members of the Learning Alliance. The contents of the website, including documents produced as part of the research process, were also put onto a CD and disseminated to LA members.

Two publications with results from the research/diagnosis and a draft document with the policy guidelines for discussion and validation have been disseminated at various events, with a focus on the PERUSAN sanitation conference. A video showing the results of the Demonstration project has been disseminated through the project and Ministry websites.

For wider dissemination of results, the SWITCH project was linked with the MVCS Safe Water sub-committee concerned with protecting water resources in Peru, using it in a sustainable manner and trying to avoid the pollution that comes from dumping wastewater in the sea.

At an international level SWITCH attended the LatinoSan Conference in Brazil in March 2010 on community-led total sanitation and has links with the Network for



the Management of Wastewater in Latin America and the Caribbean (REGAR-LAC), spreading knowledge and exchanging experiences with other Latin American countries. LatinoSan extended the horizons of the SWITCH project and increased its knowledge about potential technologies and management of wastewater for Peruvian cities.

All the SWITCH Lima project processes, including research, training and demonstration activities results, are being made available for all learning alliance members. Two activities during the final six months of the project were related to dissemination of findings and capacity building. IPES planned with MVCS and SUNASS a National Workshop for strengthening the capacities of technicians working for organisations responsible for design, approval and implementation of wastewater treatment and reuse of treated wastewater (from local government, national government, enterprises responsible for sanitation, farmers' boards and other user groups and the new local authorities for water). This aimed to focus on skills to enable practical application of guidelines for reuse of treated wastewater in urban areas. The course contents included findings of the research phase (costs, effectiveness of technologies, etc.). A virtual resource centre is also being developed to include publications, accounts of experiences, project reports, research studies and others materials related to the treatment and reuse of wastewater systems.

#### **IV. FINDINGS AND DISCUSSION**

The previous sections described the specific situation of the city of Lima and the intervention logic and process developed by SWITCH to adequately respond to this, focusing on the theme of reuse of wastewater for productive use. This section looks at five key issues of intervention and success, followed by an assessment of the progress made under SWITCH over the past five years in Lima.

##### **Building on experiences, using available opportunities and working with key partners**

The SWITCH programme in Lima focused on the productive reuse of water for urban agriculture and recreation, linked to resource recovery. The facilitating institute, IPES, had a number of years' experience in earlier programmes working with multi-stakeholder approaches, related to urban agriculture under the RUAF programme.

SWITCH focused well on the opportunities, building on the issue of access to water for food production, which had been identified in the strategic action plans on urban agriculture developed in the Lima municipalities of Villa Maria del Triunfo and Villa El Salvador. Increased attention was also being paid to urban agriculture and its multiple functions in urban development at national level in Peru. Institutions involved in these experiences were included in SWITCH.

The use of (partially) treated wastewater, is not allowed for food crops under current legal arrangements, so the focus was on using treated wastewater for urban agriculture and for greening parks and gardens, which relates well to the recent attention being paid to parks and gardens in participating municipalities as well as in the programme of the MVCS.

The use of untreated wastewater is illegal, while the use of treated wastewater is also a legal grey-area and not properly regulated. Both occur, and the potential for using treated wastewater is seen as high by many institutions, so there was a need for regulation. It was expected that using treated wastewater for green areas and urban forestry would facilitate more public recreational spaces and improve the city's landscape, while also leading to other social and environmental benefits. A first identification and analysis was undertaken of several cases to broaden understanding of these practices and underline the opportunities. This led to the identification and agreement to work on the legal and institutional framework that would encourage integrated wastewater treatment and use for productive and recreational purposes.

The focus thus was on use of water for urban agriculture and for green spaces. The selection of key institutes with experience and networks for facilitating and participating in the project, as well as involving the right people from these institutions, was important in the process.

In earlier work on urban agriculture, linkages had been established with those who were active on the issues of agriculture and city planning. In starting SWITCH in Lima, IPES sought to establish win/win situations by the facilitation of joint analysis and action planning with these and with new institutions from the wastewater reuse and (urban) agriculture sectors. The most important institute in that respect was the Ministry of Housing, Construction and Sanitation (MVCS). SWITCH fitted well with the mandate of MVCS, the time was also right, since it allowed joint work on policy guidelines, the strengthening of linkages with public and private partners and was of help to MVCS in their strategic planning on linking treatment and productive use and on the implementation of guidelines, which was a real challenge to the Ministry.

At a later stage, SUNASS (responsible for tariffs/prices of services in water delivery and sanitation and already participating in the national learning alliance) saw SWITCH, and specifically the development of policy guidelines, as highly interesting. As these would assist in developing prices for treated wastewater and its use, and would be an incentive to develop and improve treatment plants since there would be regulation of use, and hence payment for guaranteed quality.

### ***Motivated and experienced facilitation***

IPES had built its credibility and experience in facilitation of multi-stakeholder processes related to environment and urban agriculture over 10 years. When the SWITCH programme started in Lima, and based on its experience with the multi-stakeholder process under the RUAF Cities Farming for the Future project

([www.ruaf.org](http://www.ruaf.org)/[www.ipes.org](http://www.ipes.org)), IPES develop the methodology for research, training and demonstration, starting with key persons from the university (La Molina) and MVCS, assisted by IRC and ETC. The main stakeholders, some of whom did not previously have joint meetings, gradually became involved in SWITCH with considerable success as a Learning Alliance at two levels and later with a third informal group active at the level of the demonstration plot, as described in 2.3.

*“The input of IPES is valued as tremendously important by the Ministry. Relations with NGOs (and the Ministry) have not been that good in the past, but through SWITCH it is shown that collaboration with NGOs and other institutions was not only possible, but also led to improved results”*

**Interview with MVCS**

The team at IPES consisted of six members: a coordinator, two facilitators, one person responsible for process documentation and communication, and two thematic experts – one of them a professor of the National Agrarian University, La Molina, with extensive experience of urban agriculture, and the other who had expertise in wastewater treatment and reuse and who had worked with CEPIS/WHO/PAHO.

IPES participated in all three platforms and facilitated the linkages and communication between the institutes and the platforms, including adequate process documentation. IPES was involved in all activities and ensured that there was monitoring of follow up and results, including two publications disseminated at the PERUSAN conference, and a video on the demonstration project.

Facilitating the learning alliance, in terms of meetings, agreements and transparent decision-making processes, is demanding but crucial in assuring full participation and inclusion of different members’ viewpoints and the institutionalisation of achievements.

IPES sees it as part of their mandate to continue this participation in and support to the platform, but there is a necessity to acquire sufficient funding to do so.

***The importance of Government support and commitment***

The selection of the Ministry of Housing, Construction and Sanitation (MVCS) as the main partner and co-facilitator in this process was a key decision, first and foremost, because the ministry is responsible for policy issues related to the treatment of wastewater and for the management of parks in Lima. The process that SWITCH (IPES) proposed in Lima was very relevant to the Ministry agenda, especially given that the guidelines give a prominent role to MVCS, in treatment and reuse in green areas

IPES and the MVCS suggested a wider group of stakeholders specifically to focus on the formulation of policy guidelines for the use of treated wastewater for

urban and peri-urban agriculture and for irrigation of green areas. The Ministry's Office of the Environment (OMA) was assigned to do this.

*The...Office of the Environment (OMA), was assigned to...promote urban agriculture in order to improve the quality of life of low-income residents, especially in peripheral urban areas, through training and support in income-generating activities. In addition, we are promoting the creation of sustainable green areas using treated wastewater...*

*Water is essential as a human right. So taking care of this resource is our civic duty. Wastewater is not just "waste" but it is a resource! And with proper treatment, enhanced awareness among citizens and industries, and a legal-regulatory framework, wastewater can be used...*

*OMA is working on necessary regulations already, such as a maximum level of emissions from wastewater treatment plants when discharging into receiving bodies, like the ocean, lakes, rivers, etc.; and for the reuse of wastewater in agriculture, green areas, aquaculture and reforestation... Other projects OMA is working on include the level of discharge into the sewer network (a controversial issue we have been working on for almost two years with CONAM),...regulations for solid waste management, an environmental classification system for projects in this sector, and guidelines for the preparation of environmental impact studies and environmental adjustment programmes for water and sanitation activities.*

**Interview with Ms Cardenas of the Ministry of Housing, Construction and Sanitation**

OMA-MHVCS has been a major contributor and facilitator, not only in the development of the guidelines, which were approved in November 2010, but also in facilitation of the LA process and in developing appropriate linkages to other governmental bodies and inviting to integrate them into the LA and linking the project to other activities such as the national PERUSAN event. Facilitation ensured that linkages were maintained with SUNASS, with Municipal corporations such as SEDAPAL, with the Ministry of Health and DIGESA and with new institutions that came into the National Learning Alliance, such as the National Authority for Water (ANA) and the Ministry for Environment (MINAM).

### **Learning Alliances at appropriate levels**

The project initially foresaw the active involvement of selected stakeholders in a working group on urban agriculture. IPES worked with ETC and IRC in the development of a first event to start the process, inviting the most relevant stakeholders. It was there decided to operate at two levels – with a national and local learning alliance (and later with a third informal learning alliance at the level of the demonstration Eco-Productive Park in Villa El Salvador). Initial mapping of stakeholders working on treatment and reuse of wastewater (private companies, NGOs, educational institutions, local, regional and national authorities, etc.), made it possible for all relevant actors to become part of this process and to share their knowledge and experience.

The strength of this set up was that each level of operation had specific members linked to the task it was to undertake. A group of stakeholders were involved in the development and direct application of the demonstration project. A second group, the local learning alliance, consisted of municipalities and institutions responsible for the coordination, execution, assessment and further dissemination of research, inventories, case studies and lessons from the demonstration project. The third group, at national level, made up the National Learning Alliance with representatives of ministries, national agencies, universities and NGOs, and were responsible for developing the national policy guidelines and for national scaling up.

This set up worked extremely well, as both formal platforms involved their stakeholders in learning and influencing policy and maintained adequate information flows within and between the learning alliance platforms, as part of the broader Lima-SWITCH learning alliance, fulfilling the SWITCH objectives:

- All major stakeholders were involved from the onset in planning, undertaking, and analysing research at appropriate levels.
- The national level learning alliance was seen as being instrumental in developing the policy guidelines, dissemination and validation of the SWITCH project research findings in Lima and validation of the research documents and policy guidelines.
- Research was put in use and further application was assured, under proper policy guidelines.
- Impact was increased.
- Findings were scaled up to national level, leading to the setting up of training modules.
- The process affected ways of thinking and operating of participants and their institutions.

Of course, interest in becoming involved in the activities and use of the results varies. There was a high interest by some institutions, such as MVCS, the Municipality of Villa El Salvador, ANA, MINAM and CEPIS/PAHO. However, other stakeholders who preferred a more passive Role remained involved and it is expected that they will be more active in putting the guidelines into practice now they have been approved, and setting operational strategies for the recently approved Water Law and its regulation.

The collective knowledge built at national and local level improved the efficiency and effectiveness of the design, and subsequent development and monitoring of actions.

Several institutions (MVCS, SUNASS) mentioned that links with other institutions have improved, some of which did not exist before SWITCH. Policy development has always been very vertical and sectoral in Peru and water, treatment of wastewater, and productive use for parks, gardens and urban agriculture are issues that covers the mandate of several ministries and national agencies.

SWITCH has facilitated an approach that made intersectoral work possible. There is interest in continuing this alliance and these processes elsewhere. Indeed, As part of the guidelines the National LA will be institutionalised as a permanent committee for the implementation of the guidelines.

*“SUNASS would be interested in seeking to repeat multi-actor processes in the provinces, building capacities of the major actors. So after the training, of EPS (Sanitation Supply Enterprises) and city representatives, this could be one of the major follow up activities.”*

Interview with SUNASS

Joint analysis and discussion on treatment and wastewater use improved the collective knowledge in the main institutions about the experience available in Lima and Peru, and led to an agreed approach to the application of these practices, as well as the development of the guidelines.

The development of policy guidelines required a lobbying strategy to raise awareness at the highest levels of decision making level in institutions and with members of parliament to discuss possible changes to existing laws, and define clear responsibilities.

## **Putting research into use**

### ***Integrated analysis of existing information***

Analysis of the technologies used in treatment and reuse of wastewater and of reuse production systems was important. IPES and the consultant of La Molina University developed the FIETS framework for analysis (see 2.1) to address issues of concern to a wide array of stakeholders, by looking at technical and policy guidelines from the perspectives of economic, environmental and social sustainability. The FIETS Framework is not new, but its integrated use for both technical and policy guidelines is new.

The SWITCH reports on case studies, the information on technologies, the typology and the framework, are highly appreciated and seen as important instruments by many institutions working on the theme, at national and local level, and for the private sector.

### ***Demonstrating centralised and decentralised solutions***

Several innovative methods were adopted to demonstrate existing knowledge to facilitate bringing research into use. The FIETS analysis of cases was itself a demonstration of projects, since these were all real cases (although not always legal or acknowledged) on which SWITCH increased awareness by involving all actors from both platforms in analysis and in-depth research. This analysis shared existing knowledge and resulted in new knowledge, as it showed linkages between cases and provided insights into new opportunities.

The MVCS is carrying out a number of pilots in one park where housing, sanitation, vegetation and aquaculture are all linked to reuse of wastewater. SWITCH experiences could become a useful input into these demonstration parks.

The SWITCH demonstration project, OGAPU, was based on the case studies, and acted as a showcase for productive reuse, and for decentralised technology. The latter is important, since every municipality/province in Peru has its own EPS (in Lima, SEDAPAL), responsible for water management, including treatment, but no institution responsible for bringing treated water to users or for further guidance of its proper use.

The demonstration project showed that a multifunctional green area, irrigated with treated wastewater, can meet the needs of the surrounding population for green recreational areas, and potentially generate income for neighbours. It should be valued as part of a longer-term development process. Although central treatment is currently practised, the longer term perspective is to have more decentralised collection and reuse systems in place. The policy guidelines will support this process.

The demonstration project further enabled validation of the policy guidelines with information to sustain their application in different practices. It allowed a methodology to be tested for adding value to the vacant areas of the city by using it productively, potentially benefitting the poorest groups of the community, including urban farmers.

The project and its participatory approach showed the potential and limitations of participative local management and maintenance and fostered ownership of multi-functional green areas. It also showed the potential to replicate this type of approach.

Lessons learned in the demonstration project were considered when preparing the National Training course, particularly the information about technologies, costs, and examples that combine centralised with de-centralised systems.

### ***Development of the guidelines***

In the first meetings with the Ministry, the lack of legislation and policies on using treated wastewater was identified as a major obstacle, and hence seen as a major task for SWITCH Lima. Research activities such as inventories of experiences and stakeholders, case studies, and a study on the legal framework were all very relevant for developing the guidelines.

The analysis of the case studies and the legal framework served as main inputs for the elaboration of the first draft of the policy guidelines. The guidelines were reviewed and finalised with members of the National Learning Alliance in October 2008 and presented in December 2008 at a special session of the National

Conference on Water and Sanitation (PERUSAN). They were formally approved in November 2010 by the Peruvian Government.

The process needed to be very flexible because the revisions and negotiations leading to its adoption and implementation took a very long time. It also had to deal with continuous political changes at the decision making levels of governmental bodies that slow the process and require the discussion process to restart.

The Policy Guidelines will act as a strategic agenda for the institutions involved. An inter-sectoral committee, led by MVCS began in December 2010 to develop a biennial work plan to implement actions identified in the Policy Guidelines and to facilitate the inclusion of these guidelines and the work plan into their own institution.

Although the policy guidelines constitute an agenda for future activities, a challenge is to broaden this agenda and make it more operational and practical so that other actors (NGOs, academic institutions, water enterprises) can participate and find their place.

## **Capacity Building**

Capacity building was seen as part of the facilitation of the process, both for the National Learning Alliance and for the local team involved in research and demonstration activities. A training package is being developed, as recommended in the policy guidelines, to build the capacity of authorities on available knowledge and practices and necessary changes in legislation.

Capacity building was important in the process at specific moments. Capacity was built of members of learning alliances on issues such as how to collaborate in multi-stakeholder processes, on the actual the issues involved in the reuse of wastewater (experiences, their sustainability and potential for Lima, etc.), and on policy development. A first training, jointly organised by IPES, ETC, and IRC was a key point, because here actors became enthusiastic, the programme was further designed and the decision was taken to work at two levels: the national level, focusing on policy guidelines, and the municipal/local level, focusing on the technologies and the implementation of the demonstration. Members of the local alliance received training on technical aspects of the cases and on undertaking action research.

Through this sequence of training, which included the continuous bilateral and group facilitation (informal on-the-spot training) the capacities of the stakeholders were strengthened. They were also continuously informed about progress and results, which allowed them to adapt their approaches when necessary. This has been appreciated by most stakeholders.



“Capacity building in joint development of the guidelines was seen as important, as is the capacity building of staff of municipalities and EPSs as is being prepared at the moment.”  
“As a follow up, and with the guidelines, SUNASS would be interested in seeking to repeat multi actor processes in the provinces, building capacities of the major actors. So after the training, of EPS and city representatives, this could be one of the major follow up activities.”

Interviews with MVCS & SUNASS

Capacity building while developing the guidelines was appreciated and a request came for additional training for key institutions and persons involved in further implementation, like the municipal sanitation corporations (EPS). These experiences also need to be tested and repeated in other regions of Peru.

The policy guidelines for the assessment, selection and further enhancement of wastewater collection, treatment and productive reuse, have been developed into a training package for officers of the EPSs and Municipalities. A decentralised National Training Course was organised (jointly financed by SWITCH and the Ministry) to train 100 representatives of EPSs, local and regional governments, producers association, local water authorities etc. It is expected that this training will be repeated for the Andean and Amazon cities in Peru.

## **V. CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusions**

SWITCH Lima did not take a general approach to water management, but focused on a single major issue that has been identified as responding to real and urgent needs in the city: the shortage of water. The focus was on alternative sources of water and their potential for productive reuse, in order to save clean water for domestic purposes. SWITCH Lima researched and presented experiences and developed a knowledge base regarding the sustainability and potential application of these practices, technologically and institutionally. The programme also influenced policy, and facilitated the development of policy guidelines, to further develop necessary legislation.

SWITCH Lima did not participate in all the options offered by SWITCH internationally (training on process documentation, etc.), partly due to language barriers and partly to the costs of travel from Lima to Europe. Nevertheless, through regular contact with other SWITCH partners, and to a large extent because of the experience with similar processes by IPES, the project outcomes have been achieved.

SWITCH has contributed in Lima to the scientific basis for more sustainable water management. The project created a better understanding of available treatment and reuse practices, provided an innovative framework of analysis, and facilitated

a greater understanding of the potential use of these practices. It also brought the major stakeholders together, to support the use of treated wastewater through adequate legislation. These contributions are highly valued by the stakeholders and now that the guidelines have been approved, they are being put into practice. All documents were published in Spanish, to make them easily accessible in Latin America. However, language barriers hindered the experiences with a wider audience outside LAC.

Existing linkages could have allowed for a broader approach incorporating other issues tackled under SWITCH in other countries, such as eco-sanitation or the use of wetlands for treatment of wastewater (which has been done to a certain extent).

However, the research on contextualising available technologies, both for wastewater treatment and for reuse, did succeed in raising awareness on the feasibility of these options in the local context, generating interest from the Ministry and others. The demonstration project was chosen to fit a future perspective for a more decentralised approach to collection, treatment and reuse of wastewater, involving major local and national stakeholders. The challenge now is to continue supporting the municipality and the citizens in further developing the demonstration site and bringing the lessons from it to the EPS organisations responsible for water treatment in every other Municipality.

SWITCH has contributed to research and knowledge in use in Lima. It widened perspectives and provided the opportunity for various stakeholders to jointly learn and strengthened collaboration.

It was essential to include the right individuals, but also to assure institutional involvement and commitment. The planning process fed into formal municipal and national planning processes. The LA approach allowed for a broad platform and flexibility, involvement of all stakeholders at the right level of intervention and competence, and allowed for changes in line with institutional changes, as for example when the Ministry of Environment took over certain responsibilities from MVCS during the SWITCH lifetime. As a spin-off, the MVCS has developed linkages to other public authorities, while trust and interest in further collaboration with NGOs (such as IPES) has been a major outcome.

There is a high degree of appreciation for the SWITCH Lima project, both in terms of the quality of its products, as well as in terms of methodology and process followed. There is an explicit demand for continuation.

## **Recommendations**

While this assessment of the SWITCH project was being done, IPES was developing training for municipal authorities, ministry staff and others as part of the Policy Guidelines, funded by SWITCH and the MVCS. As part of the review, It was

recommended to consider paying attention to knowledge developed under SWITCH in other cities, and to include these in the training. This has been partly done and it has been agreed to organise a separate event on the findings of Resource Recovery and Reuse including eco-sanitation and water sources for urban agriculture.

As recommended by the assessment, interesting lessons from Lima, especially the technology assessment FIETS, the development of the policy guidelines, and the involvement of the learning alliance, have been developed into boxes in the SWITCH training package. This has been done by Local Governments for Sustainability (ICLEI), an international association of local government members committed to sustainable development.

It is further recommended to seek additional funding to support MVCS and other members of the National Learning Alliance for pilots or further involvement of private enterprise (linking public and private interests) in the provision of water and sanitation services, and adequate payments and service fees, in Peru.

Due to the current status of legislation which still prohibits the use of even treated wastewater on food crops, and the necessity to start implementation and keep public institutions on board, implementation of reuse focused on parks, gardens and ornamental horticulture in the demo. Nevertheless, it is recommended to continue to show the very positive results from other activities by IPES on urban agriculture in Lima and in the region, and to continue to seek to develop adequate frameworks and legislation to allow wider productive reuse, especially by making linkages to opportunities for community and private sector income generation. Linkages should be made to improve access to food, to alleviate poverty and for effective governance.

Further institutionalisation of the guidelines could be facilitated in two ways:

- Continuation of the process, by coordinating and guiding the implementation of the policy guidelines in Lima and other municipalities in Peru. This needs to be led and facilitated by the MVCS, but the Ministry indicated it would also need the input of IPES.
- Broadening the agenda to include other integrated urban water management issues. There is a need to involve and build the capacity of other institutions and persons, especially within the new National Water Authority created in 2008 and responsible for water management at national level. One complication is that the competencies in different ministries and sections varies and staff positions may change.

Further exposure will follow as papers are developed, and the case is presented (as at the international conference in Zaragoza), but will also be sought in initiatives elsewhere in the region. IPES will take the lead in these efforts.

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## RELEVANT INTERNET SITES

National Authority of Water: [www.ana.gob.pe](http://www.ana.gob.pe)  
SUNASS: [www.sunass.gob.pe](http://www.sunass.gob.pe)  
SEDAPAL: [www.sedapal.com.pe](http://www.sedapal.com.pe)  
SWITCH Lima <http://www.ipes.org/au/switch>

## LIST OF INTERVIEWEES

- Julio Moscoso, consultant, IPES
- Tomas Alfaro, consultant, National Authority of Water
- Ricardina Cardenas, Director of the Environment Office, Ministry of Housing, Construction and Sanitation.
- Sandra del Aguila, Member of the Direction of Policies and Regulations, SUNASS

## ACRONYMS

<b>ANA</b>	National Water Authority (Autoridad Nacional del Agua )
<b>CEPIS</b>	Pan American Center for Sanitary Engineering and Environmental Sciences
<b>CFF</b>	Cities Farming for the Future Programme
<b>CSA</b>	Lima City Strategic Agenda on urban agriculture and urban forestry
<b>DIGESA</b>	General Directorate of Environmental Health
<b>EPS</b>	Municipal Service Providers (for Sanitation)
<b>Ha</b>	Hectares
<b>ICLEI</b>	Local Governments for Sustainability
<b>IDRC</b>	International Development Research Centre
<b>IPES</b>	IPES - Promocion del Desarrollo Sostenible
<b>IRC</b>	IRC - International Water and Sanitation Centre
<b>LA</b>	Learning alliance
<b>LAC</b>	Latin America and the Caribbean
<b>MVCS</b>	Ministry of Housing, Construction and Sanitation
<b>MVES</b>	Municipality of Villa El Salvador District
<b>MINAM</b>	Ministry of the Environment
<b>OGAPU</b>	Optimising Water Management to Combat Urban Poverty
<b>OMA</b>	Office of the Environment (in the MVCS)
<b>PAHO</b>	Pan American Health Organization
<b>PERUSAN</b>	Peruvian Conference on Sanitation
<b>REGAR-LAC</b>	Network for the Management of Wastewater in Latin America & Caribbean
<b>REP</b>	Peruvian Energy Network

<b>RUAF</b>	Resource Centre on Urban Agriculture and Food Security
<b>SEDAPAL</b>	Enterprise responsible for water and sewerage in LIMA
<b>SNIP</b>	National Public Investment System
<b>SUNASS</b>	National Superintendency of Sanitation Services
<b>SWITCH</b>	Sustainable Water Management Improves the Health of the Cities of Tomorrow
<b>SWOT</b>	Strengths, weaknesses, opportunities, threats
<b>UNALM</b>	Universidad Nacional Agraria La Molina
<b>WHO</b>	World Health Organization