



**Joint FAO/ UNW-DPC/UNU-INWEH
Capacity Development Project on
Safe Use of Wastewater in Agriculture
Stage I**

Concept Note



July-2011

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Introduction

The Food and Agriculture Organization of the United Nations (FAO) together with the UN-Water Decade Programme on Capacity Development (UNW-DPC), and the United Nations University Institute on Water, Environment and Health (UNU-INWEH) have joined forces to promote the safe use of wastewater in agriculture in developing countries and countries in transition. As a result, a Capacity Development Project on Safe Wastewater Use in Agriculture is being launched.

This concept note has been prepared by FAO to guide the participants by providing them with the (i) background, (ii) the objectives, (iii) the stages, (iv) the implementation mechanisms and (v) the timeline, along with other useful information about this project.

1. Background

1.1. Wastewater use in agriculture

Population growth and rapid urbanization are intensifying pressure on fresh water resources. The lack of quality water and high level of local water demand are leading to increasing water scarcity and stress and is consequently driving the use of non-conventional waters, such as (treated) urban wastewater.

Agriculture irrigation is the greater wastewater user and is especially important in urban and peri-urban areas where wastewater can serve as a new source of water and fertilizer that have to be properly managed to minimize environmental and health risk.

Box 1: Types of wastewater

Wastewater used for agricultural irrigation covers wastewater of different qualities, ranging from raw and diluted, generated by various urban activities (Raschid-Sally and Jayakody, 2008):

- Urban wastewater is usually a combination of one or more of the following:
 - Domestic effluent consisting of black water (excreta, urine and associated sludge) and **greywater** (kitchen and bathroom wastewater)
 - Effluent from commercial establishments and institutions, including hospitals.
 - Industrial effluent where present.
 - Storm water and other urban run-off
- Treated wastewater is wastewater that has been processed through a wastewater treatment plant and that has been subjected to one or more physical, chemical, and biological processes to reduce its pollution of health hazard.
- Reclaimed (waste) water or recycled water is treated wastewater that can officially be used under controlled conditions for beneficial purposes, such as irrigation.

Greywater is particularly suitable for reuse. Greywater is generated from households not connected to sewerage system and can be treated and used for irrigation of home gardens and trees such as olives. Greywater is an important component of water conservation and comprises 50-80% of residential wastewater and offers a great potential as an economic and resource conservation component of the integrated water resources management in dry areas.

Box 2: Categories of wastewater Use (Raschid Sally and Jayakody, 2008 & Jimenez and Asano, 2008):

- Direct use of untreated wastewater from a sewage outlet occurs when it is directly disposed of on land where it is used for cultivation.
- Indirect use of (un)treated urban wastewater occurs when water from a river receiving (un)treated urban wastewater is abstracted by farmers downstream of the urban centre for agriculture. This happens when cities do not have any comprehensive sewage collection network and drainage systems are discharging collected wastewater into rivers
- Direct use of treated wastewater occurs when wastewater has undergone treatment before it is used for agriculture or other irrigation or recycling purposes.
- Planned use of wastewater refers to the conscious and controlled use of wastewater either raw (direct) or diluted (indirect). However, most indirect use happens without planning.

The resulting schemes for wastewater use can be very heterogeneous but still common patterns can be detected among different countries:

- Lack of quality water, freshwater scarcity, and poverty driving **untreated wastewater use** in urban and peri-urban agriculture is a common pattern in poor regions where there is no or little economic capacity to afford conventional sanitation and wastewater treatment facilities. This poses high health and environmental risks if no additional measures are applied.
- Water scarcity together with health and environment protection is the main driver for **reclaimed wastewater use** in high income countries. This is a common pattern in countries such as Israel, Australia or USA (California and Florida) where highly effective sanitation and treatment technology can be found in planned reclamation facilities. This is a costly approach but reduces risk to the minimum.
- Water scarcity driving **partially treated wastewater use** in middle income regions is a common pattern in areas where low cost technologies are applied providing partially treated wastewater for irrigation purposes. This approach poses moderate risks on health and environment if no additional measures are applied.

The total land irrigated with untreated, treated or partially treated wastewater, both directly and indirectly, is uncertain but estimations indicate that it can be as high as 10% of total irrigated land (Lazarova & Bahri, 2008).

An important factor that makes wastewater valuable is that it is a reliable source of water and available all year round. Consequently, it permits higher crops yields, year-round production, and increases the range of crops that can be irrigated. Additionally, wastewater contains large diversity of nutrients than any commercial fertilizer can provide. The land application of wastewater for agricultural use constitutes a low-cost disposal method and a land treatment system. If carried out under controlled conditions can also recharge aquifers through infiltration. Reduced costs to society are also notable, in view of reducing the fossil fuel in fertilizer production (Qadir et al., 2007; Raschid-Sally and Jayakody, 2008).

Besides all benefits of wastewater use in agriculture, it can also have adverse impacts on health and environment depending on the treatment level, type of irrigation and local conditions. Untreated wastewater contains a variety of pathogens, many of which are capable of survival in the environment, on crops or in the soil, and pose health risks to farmers and their families, consumers, and nearby communities. Other contaminants present in untreated water that can pose serious health and environmental risks are chemical agents, salts and heavy metals. Managing these risks is a crucial issue that must be addressed from local and global perspectives.

In cities and other urban agglomerations and densely populated regions of the developed world where wastewater collection and treatment have been established over the years, wastewater is treated and used with proper attention to sanitation, public health and environmental protection. In many places in the developing countries and in countries in transition, this is not the case. It is important to underline again that in several developing countries raw sewage is still used for agricultural irrigation despite of the health risks.

To maximise opportunities and minimize risks related to the use of wastewater in agriculture a robust policy and institutional framework has to be designed. In many countries where wastewater use in agriculture takes place these frameworks are lacking. Responsibilities and jurisdictions among public institutions (health, agriculture and water) have to be clear and coordination mechanisms should be created to come up with comprehensive and effective policies.

Cost effective and appropriate wastewater treatment suited for the end use of wastewater is a fundamental action. But in most developing countries wastewater treatment is not economically feasible in the short term and interim solutions may be needed to protect farmers and public health. In these countries the focus should be on prioritizing affordable and easily adoptable risk management strategies. Adopting the multiple-barrier approach (WHO-FAO-UNEP, 2006) can reduce human and crop exposure to toxic compounds and pathogens.

In addition farmers have to be provided with the specific guidance to support their productions and to access markets, and proper dissemination and education campaigns have to be designed to facilitate the adoption of such guidelines by farmers.

An integrated risk assessment with maximum protection of human health and the environment as well as maximum use of the resource (water and nutrients) to support the livelihoods of poor farmers needs to be considered when using wastewater. Applications need to be monitored to ensure that wastewater is being used in a manner consistent with the intended applications and practice. Tested technologies and strategies for the safe use of wastewater in agriculture are available worldwide but capacities to implement them are still lacking in many countries.

1.2. What is capacity development?

Capacity development has been defined by the Organisation for Economic Cooperation and Development (OECD) as "...the process by which individuals, groups, organizations, institutions and societies increase their abilities to: i) perform core functions, solve problems, define and achieve objectives; and ii) understand and deal with their development needs in a broad context and in a sustainable manner" (UNDP, 1998). This definition has three important aspects, namely it: i) indicates that capacity is part of a continuing process; ii) ensures that human resources and the way in which they are utilized are central to capacity development; and iii) recognizes the importance of the overall framework (system) within which individuals and organizations undertake their functions.

Following on from this definition, capacity building in safe wastewater use in agriculture can be defined as the process through which relevant stakeholders, especially from sanitation, agriculture, environment and consumers sectors, improve their abilities to perform their core roles and responsibilities, solve problems, define and achieve objectives, understand and address needs, and effectively work together in order to ensure the safe and productive use of wastewater in agriculture.

Levels and dimensions of capacity

As illustrated in Figure 1, capacity for safe wastewater use in agriculture exists at three different but closely related:

- i) system level or context in which organizations, groups and individuals operate;
- ii) organization and group level within the system; and
- iii) individual level within organizations and groups.

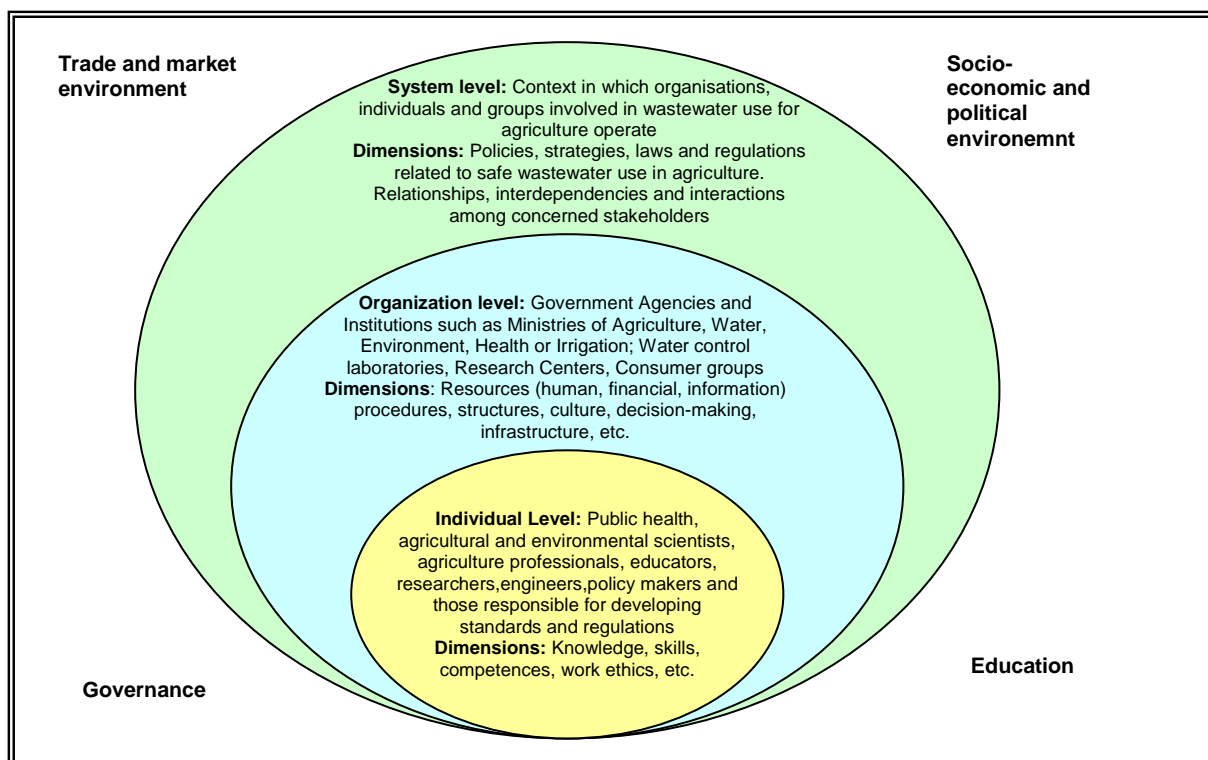


Figure 1. Levels and dimensions of capacity with respect to safe wastewater use in agriculture

Source: UNDP (1998)

At each of these different levels, there are various **dimensions** of capacity for the safe wastewater use in agriculture:

- At the system level, dimensions of capacity include the policies, laws, regulations and standards that provide a framework for safe wastewater use in agriculture, as well as the mechanisms for management, communication and coordination among the different organizations involved.
- At the organizational level, the mission, structure, operational procedures and culture of organizations involved in wastewater use in agriculture are important dimensions of capacity, in addition to their human resources, financial resources, information resources and infrastructure, etc.
- At the individual level, knowledge, skills, competencies, experience and ethics are all part of capacity.

These dimensions are the core characteristics or features of capacity. Some of these dimensions are cross-cutting and exist at each of the levels. For instance, the overall human resource capacity of an organization will obviously depend on the quantity (number) of individuals within the organization, as well as their qualifications and skills, and the external environment in which they operate.

Considering capacity in terms of these different levels and dimensions is useful because it takes account of the relationships between them, and allows for the possibility that the root cause of weak capacity at one level may be found at a different level.

2. Project objective

The proposed project aims at developing national capacities for the promotion of the safe use of wastewater (including greywater) in agriculture in developing countries and countries in transition.

3. Project Stages

Capacity building is a continuous process of improvements and can occur at different levels (individuals, organizations or the system in which they operate) and focus on different dimensions of capacity. Similarly, it can be targeted at different types of stakeholders. Given the complexity of a capacity building process the project is structured in two stages.

3.1. Stage I: capacity building at the individual/organization level.

This initial stage will enable staff members in selected organizations to increase their knowledge and skills on the safe use of wastewater in agriculture. The target audience will be trained in the use of selected materials and methodologies to promote the safe use of wastewater in agriculture. Different tools and techniques will be discussed and selected to maximize knowledge dissemination in the selected organizations and related stakeholders. This new individual capacities will contribute to the improvement of the capacity and performance of the organizations as a whole.

Target Group

In the first Stage, the project will focus on individuals in key organizations and institutions with competences on the safe wastewater use in agriculture.

Potential institutions and organizations are Ministries of Irrigation, Agriculture, Food, Health, Water, Environment and Rural Affairs; Research Centers; Consumers Groups; Water Control Laboratories; National Farmers Unions and others that are linked with wastewater treatment and reuse for agricultural irrigation. Key departments and services will need to be selected within these organizations.

The target audience may include public health, agricultural and environmental scientists, agriculture professionals, educators, researchers, engineers, policy-makers and those responsible for developing standards and regulations for safe wastewater use in agriculture.

Capacities to be developed

A Capacity Needs Assessment (CNA) will be carried out at country level to identify the key institutions and organizations and the necessary staff capacities to be developed.

3.2. Stage II¹: capacity building at the organization/system level.

Stage II will aim to improve the organizational and system performance to enable trained individuals to make best use of their new capacities (acquired in Stage I). This will provide the conditions for a comprehensive and effective implementation of projects and programs related to safe wastewater use in agriculture. Special attention will be given to policies, strategies, laws and regulations and the relationships, interdependencies and interactions among concerned stakeholders.

Target Group

This second stage will focus on the whole system of wastewater production, management and use, and all the organizations and stakeholders involved. (see Section 3.1)

The project will address appropriate environment, opportunities and incentives, taking into account the organisational/institutional/political level as well as the societal level.

¹ The implementation of Stage II of this project is subject to funding availability and the involvement of more partners

Capacities to be developed

In stage II a broader assessment will be carried out to identify what other capabilities are needed/lacking in their public institutions and policy framework for an effective planning and implementation of the safe use of wastewater in agriculture.

This Concept Note is focussed on Stage I

4. Implementation Mechanism & Phases in Stage I

In cooperation with expert groups and research institutes, and by drawing on international expertise, standards and innovations, the project will enable the sharing of knowledge and technologies as well as planning and managerial bodies in developing countries and support these in applying and implementing innovative wastewater use technologies in their respective countries.

Cooperative links and a community of practise will be established especially with expert groups of the respective collaboration partners in addition to other UN-Water members and partners, reaching the public sector. This will enable the participants and beneficiaries to become more active in implementing innovative wastewater use strategies and concepts in developing countries and countries in transition. At the same time, it will enable the beneficiaries and participants to learn from experiences of best practise implementations as well as continuing exchange on recent implementation strategies and suitable indicators respectively from partners and water bodies who are active in improving wastewater management and reuse in their respective environment.

A number of successful approaches, tools and techniques as well as previous experience of FAO, UNU-INWEH and UNW-DPC staff are available to ensure the success of this project stage (see Section 9). The contents, proposed methodologies and tools for safe wastewater and greywater use will be introduced and disseminated in a form of training workshops and seminars in four phases (see Figure 3):

4.1. Phase I: Individuals Capacity Needs Assessment (CNA)

In the first phase of this project, key organizations in the selected countries were identified and a national focal point/coordinator was nominated. Formal links are being established with the focal points and other key participants through a formal communication from UN Water-DPC. The present concept note was developed and is being sent to the national focal points and key participants to raise interest and to explain the different dimensions of the project.

Country focal points, in collaboration with key national players, will need to **identify the most relevant organizations** in the country with competencies on safe wastewater use in agriculture. Subsequently, a **questionnaire** prepared by FAO will be sent to the country focal points as a supporting tool for the capacity needs assessment. These questionnaires will be specifically designed to help in the identification of the knowledge and skills that each organization needs to develop. The country focal points will be responsible of the circulation of the questionnaires to the selected organizations and the collection of these questionnaires once they are filled in.

The national focal points are encouraged to discuss the questionnaires results in a **national meeting**. If this is their decision national focal points will be provided with Terms of References to support the organization of this national meeting. The focal points are encouraged to organize this national meeting, involving other relevant stakeholders (relevant ministerial departments, NGO's, local institutions, universities...).

Based on the questioners' results, the focal points, in collaboration with the other key national participants, should produce a **concise report**, of a maximum of 15 pages (+Annexes). To ensure that it has the same structure and type of outcomes in all participating countries the following outline is proposed for the report: (i) current status and trends on wastewater production, treatment, and use in agriculture at national level, (ii) policy framework and national strategy and objectives on the safe wastewater use in agriculture, (iii) description of key organizations working on the safe use of wastewater in the country, and (iv) assessment of the knowledge, skills and competencies on the safe use of wastewater in irrigation needed by individuals working in these key organizations, (e.g.

capacities of the extension services of different ministries to promote health protection measures). The questioners will be the base for this last task and would be attached as annexes.

In the CNA, the targeted organizations will need to visualize their role in the current national strategy to promote a safe use of wastewater in agriculture. The main components when planning and implementing wastewater irrigation programs and projects should be well understood so that organizations can better identify on what component they are working and what individual capacities they need to develop. The WHO/FAO/UNEP guidelines for the safe use of wastewater in agriculture (2006) provide a comprehensive framework to understand these components. Figure 2 shows the first steps of a capacity needs assessment for individuals within a given organization.

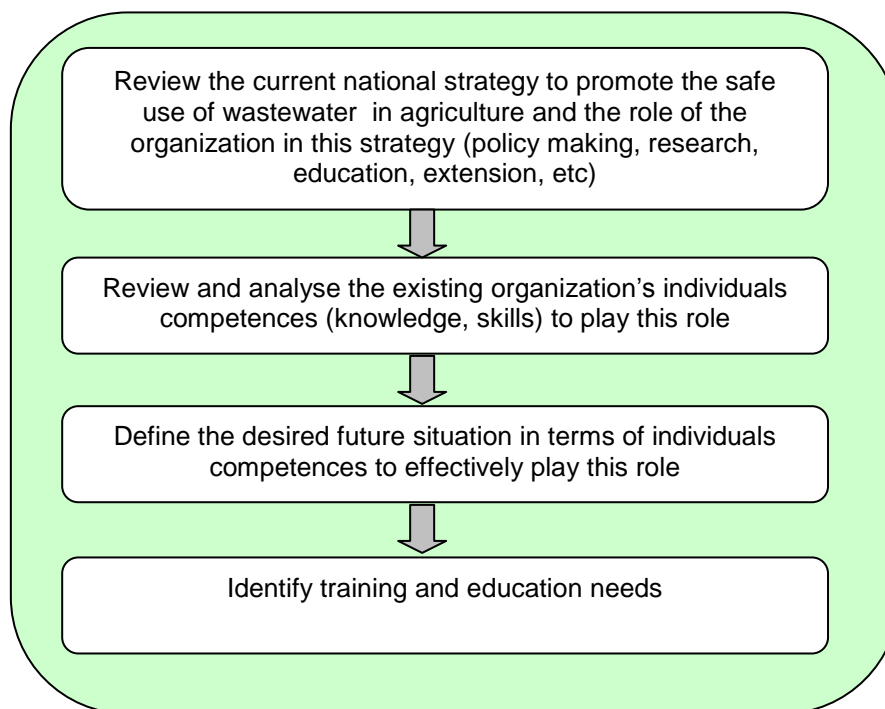


Figure 2. Stages of a Capacity Needs Assessment for individuals in a given organization

Each organization plays different roles within the national system, therefore, a capacity building needs assessment of individuals in these organizations will be an essential initial step in the overall process of developing and strengthening national capacity in promoting safe wastewater use in agriculture.

4.2. Phase II: International workshop

The main outcomes from the National Reports resulting from the CNA (at the organization/individual level) will be presented by the countries focal points in an **international workshop** coordinated by UNW-DPC in Bonn (Germany), for discussion and validation.

The main country capacity needs will be highlighted and common patterns between countries will be identified. Subsequently the project partners and collaborating experts will present the existing capacity development methodologies and selected training materials related to safe wastewater water use, for discussion.

This will allow:

- The clustering and prioritization of the capacity needs of the involved countries.
- The identification of the main **capacity gaps**, and therefore:
 - The identification of the necessary materials, expertise and know-how to fill these gaps and
 - The identification of the exact training and capacity development methodologies and the names of experts to be involved,

This international workshop will, at the same time, serve to raise awareness on the topic among the international community, to present current trends, challenges and activities, to exchange experiences and knowledge and to build a community of practice among participants.

4.3. Phase III: Regional Workshops & Communication Platform

In order to fill the gaps identified in the international workshop, 3 regional workshops will be organised based on the clustering of the involved countries.

In the regional workshops the audience will be trained in the use of selected materials and methods for the safe use of wastewater in agriculture. Different techniques to disseminate these material and methods at country level will be discussed (e.g. promoting social learning methodologies).

Mentors will be assigned for the groups of participants whom they could address even after the workshop whenever there are questions and to whom participants should report about the progress of the further capacity development local actions on wastewater in their respective countries.

Also web-based communication platform will be available to facilitate networking and exchange of knowledge between different stakeholders involved in the capacity development process.

An important output from these regional workshops would be a **capacity development action plan** that should describe how the training material and learning methods should be disseminated at country level in the relevant organizations.

4.4. Phase IV: Implementation of Recommended Actions and assessment of organizational/system capacity needs

National counterparts in collaboration with other relevant stakeholders will implement this capacity development action plan in relevant organizations at country level. At the same time a new assessment will be carried out to identify now the organizational and system barriers for the trained individuals to make best use of their new capacities.

The different action plans and preliminary results from their implementation will be presented in an **international wrap-up workshop**. In this workshop, national experiences, key results and lessons learnt will be shared with a large audience of technicians, practitioners and policy makers.

This workshop will serve also to present the results of the capacity needs assessment at organizational and system level (e.g. laws, regulations, policies, culture, organizational structures, etc) and can serve as the inception workshop for the Stage II² of this project.

A final report and promotional materials will be developed by FAO.

² The implementation of Stage II of this project is based on funding availability and the involvement of more partners

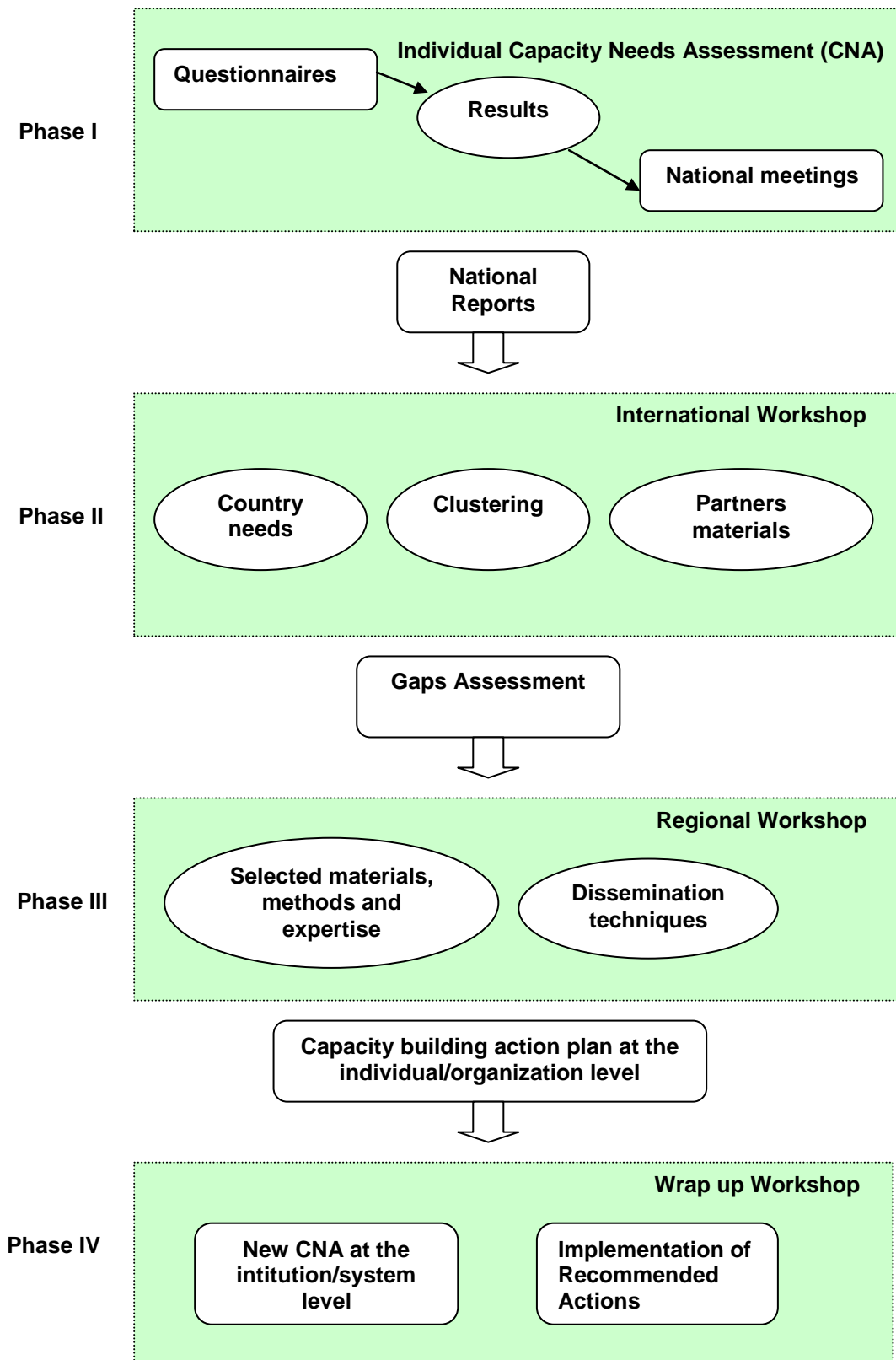


Figure 3. Phases in Stage I: Capacity building at the individual/organization level.

5. Timeline

Results and milestones	Responsible Org.	Deadline
1 Countries, national counterparts and focal points are identified	FAO/ UNW-DPC/UNU-INWEH	June 2011
2. A project concept note for focal points and participants is produced	FAO	July 2011
3 Focal points are formally invited to participate	UNW-DPC	July 2011
4. Questionnaires and TOR for the National Meetings are produced	FAO – with contribution from UNU-INWEH	July 2011
5 Country meetings take place and national reports are produced	National counterparts	Sep-Oct 2011
6. International Workshop	UNW-DPC	November 2011
7. Regional Workshops	FAO/UNW-DPC/UNU-INWEH	May2012
8. International Wrap up workshop (subject to raising funds)	UNW-DPC	Open

6. Language

The international workshop will be conducted in English, while the regional workshops will be more adapted to the regional dominant language (English, French or Spanish)

7. International Project Partners³

Food and Agriculture Organization of the United Nations (FAO)

The Food and Agriculture Organization of the United Nations leads international efforts to defeat hunger. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information. We help developing countries and countries in transition modernize and improve agriculture, forestry and fisheries practices and ensure good nutrition for all. Since our founding in 1945, we have focused special attention on developing rural areas, home to 70 percent of the world's poor and hungry people.

UN-Water Decade Programme on Capacity Development (UNW-DPC)

The UN-Water Decade Programme on Capacity Development (UNW-DPC) started work on 1 August 2007. The aim of the programme office is to strengthen the activities of the more than two dozen UN organizations and programmes already cooperating within UN-Water, and to support them in their efforts to achieve the Millennium Development Goals (MDGs) related to water. This is not just a matter of capacity development related to water, but also of education, training and institutional development. It also links the activities in the water sector to the broader efforts of the UN International Decade 'Education for Sustainable Development' and other relevant UN Decades.

UNW-DPC is hosted by the United Nations University in Bonn and financially supported by the German government. The Vice-Rectorate of the United Nations University in Europe (UNU-ViE) provides central services for all UNU entities in Bonn including UNW-DPC.

³ The project is open to other partners

United Nations University Institute for Water, Environment and Health (UNU-INWEH)

The UNU-INWEH has recently initiated a joint collaboration program with ICARDA addressing water quality and health in dry areas. Human activity and climate change effects on water and land quality, water quality-health nexus, economic dimensions of water and land degradation and improvement, and relevant institutional and policy level interventions are considered to be the cornerstones of this joint initiative. Capacity development will be an integral part of this initiative.

8. Potential participating countries

Middle East and North Africa: Algeria, Tunisia, Morocco, Lebanon, Egypt, Syria, and Jordan

Latin America: Mexico, Chile, Colombia, Guatemala

Others: Ghana, Kenya, Senegal, South Africa, Iran, India, Pakistan

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