

## CHECKLIST #4 IRRIGATION

Irrigation projects include using surface water and/or groundwater, building canals or water distribution systems, pumping stations, reservoirs, water catchment areas, etc.

### **A. Questions relating to the site of the irrigation system**

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1. What are the uses, activities and existing infrastructures on the proposed site of project implementation? What is the land use master Plan? Is there much traffic through the site? Have people's needs, expectations, patterns of consumption and socio-economic activities been taken into account? Could the project lead to:
  - displacements of the population, changes in ways of life, housing and other cultural characteristics (by failing to consider existing positive aspects of environmental management, such as the use of agricultural residues to increase water retention in dryland soils, or by promoting cash crops over food crops, and so on);
  - the accentuation of social inequalities and/or the loss of land (for example, if there is no Plan for equitable sharing of the project's positive results among all specific groups of the population, or if the area's agricultural characteristics, such as subsistence crops and cash crops, family land, ancestral land, communal land and single ownership land, landowners and/or tenants (men and women) of agricultural land, and so on) have not been considered;
  - incompatible uses and/or social and value conflicts among the different users of the various water sources located upstream and downstream from the project site (between farmers and livestock herders, if priority use has not been subject to prior agreement, and so on);
  - a change in the visual quality of the landscape;
  - problems with water quality, water supply, energy supply, and/or additional pressures on other resources and services;
  - a decrease or an improvement in the quality of life of present and future residents;
  - optimization of water resources, by developing a multiple-use irrigation system (for agriculture, fish farming, energy and so on) depending on water availability and according to prevention principles;
  - improved access and equitable distribution of water, to foster the particular socio-economic activities of specific groups of the population and to promote food security?
  
2. What are the topographical features and characteristics of the soil (texture, composition, drainage, humidity, and so on)? What is the source of water to be used: surface water and/or groundwater? What are the characteristics related to the flow, volume and quality of surface water? What is the quantity, depth and quality of the groundwater table? What is the groundwater recharge rate? Could the project have effects on:
  - the characteristics of surface water and groundwater;
  - aquatic habitats, riverine habitats, and their food chains (migratory birds, fish, and so on)?
  
3. What types of environment, landscape, flora and fauna are present in the area? What is their specific importance? Are there bodies of water, wooded areas, sloping areas, coastal or riverine wetlands or other vulnerable sites nearby? Is the area prone to landslides, floods, drought, earthquakes or other disasters? What is the level of precipitation and how does it vary over time? Is evaporation high? Could the project have an effect on:
  - environments or sites of economic, ecological, cultural, archaeological or historical importance and the natural resources (wildlife, water and so on) they contain;
  - rare or vulnerable species and/or species of economic, ecological or cultural importance?

## **B. Questions relating to the construction of the irrigation system**

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1. What are the different activities associated with preparing the site and building the irrigation system? What are the components of this system and what surface area do they cover? What is the area to be irrigated? Will there be excavation, levelling, clearing of trees and/or brush, backfilling, diversion of waterways, flooding of land or wetland reclamation? What are the types, quantities and sources (natural environments, local markets, other markets, and so on) of the materials to be used? What equipment is required? How will they be conveyed to the site? Could the project lead to:
  - changes in, encroachments on and/or the destruction of environments or sites of economic, ecological, cultural, archaeological or historical importance and the natural resources they contain;
  - landslides, for example while canals are being built;
  - flooding, through the creation of reservoirs, and its associated problems, such as decomposition of organic matter;
  - erosion of thin and fragile soils, on sloping areas, areas close to bodies of water and areas that lack vegetation cover (either at a given time or permanently);
  - soil compaction, changes in soil texture, drainage, permeability and/or water-holding capacity;
  - changes in the quality, quantity and circulation of surface water and groundwater, such as by creating reservoirs and/or diverting surface water, and their associated problems, such as the creation of an imbalance in aquatic habitats;
  - nuisances (noise, vibrations, dust, traffic) and/or risks of accidents for workers and the local population (for example, while building and priming reservoirs);
  - soil, water and air pollution, foul odours and health risks, due to poor management of construction materials and waste;
  - increased involvement of the local population and work force in taking charge of their needs;
  - an effect on the local and regional economies?

## **C. Questions relating to the irrigation system's operational phase**

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1. Will there be an increase in population due to migration? Will the project promote human, agricultural or livestock herders' settlements or other unplanned spontaneous uses in the vicinity of the irrigation system? Will agriculture be intensified or expanded? Will environmental problems arise as a result (loss of natural environments and wildlife habitats, loss of biodiversity by introducing large-scale monoculture, deforestation, desertification, soil erosion and compaction, loss of fertility and soil degradation resulting from a lack of crop rotation and companion crops, changes in the water cycle, pollution, and so on)? Will agricultural, animal and fish production increase (see other pertinent documents)? Will there be a greater demand for natural resources? Can the water needs of the various users be met through the existing water supply? Is there a possibility of:
  - a decrease in the quantity and/or quality of water upstream and/or downstream;
  - socio-economic conflicts, conflicts over land ownership and land use rights, over resource harvesting, over the use of the irrigation system between farmers and other users, upstream and downstream;
  - the appearance of new social problems, for example, if the indirect effects of a potential increase in income have not been anticipated;
  - added or reduced pressures on natural resources (water, soil, arable lands, fallow lands, wildlife and so on), on infrastructures and local services (housing, schools, and so on);
  - an increase or decrease in local market prices (agricultural products, livestock products and so on) and an effect on the local and regional economies (financial

resource management system, credit system, access to markets, start-up of businesses, and so on);

- involvement of the population in water tariffication and user agreements, in economic decision making, and in maintenance and follow-up of the irrigation system and water resources;
  - the population taking charge of its own development, particularly the stated project recipients;
  - an improved quality of life resulting from a healthy environment, improved access to water needed to develop socio-economic activities particular to specific groups of the population, as well as food security, such as by irrigating small plots of farm land for women, or through a reinvestment Plan for the community, its socio-economic activities, and its service needs, and so on?
2. What type of water catchment and supply system will be used (gravity, pumps, canals, conduits, reservoirs, sprinklers, drip irrigation)? Is it simple, optimal and suited to the environment and available resources? Will there be changes in the flow of surface water and/or changes in the groundwater table? Have the particular characteristics of water, soil, drainage, topography, crops, socio-economic activities, water needs and the legal context been considered in developing the irrigation system? Could the project lead to:
- a substantial loss of water through surface evaporation in reservoirs or canals due to improper design of these structures;
  - changes in silting patterns and/or flood cycles downstream, especially if these patterns and cycles are important to the fertility of riverine soils;
  - sedimentation problems in waterways downstream, due to erosion upstream;
  - sedimentation problems in irrigation waters due to soil erosion, turbidity and silting risks in canals and reservoirs;
  - changes in aquatic and riverine habitats and their food chains;
  - a decrease in water flow which may cause water shortage problems, particularly during the dry season and downstream, a reduction in the capacity to dilute pollutants and changes in aquatic and riverine habitats;
  - a greater water flow which may cause accelerated erosion of river beds and an accumulation of sediments upstream, or in reservoirs and canals;
  - waterlogging in the rooting zone, due to a rise in the groundwater table caused by improper irrigation that exceeds the water percolation rate into the soil and lacks appropriate drainage measures, or due to the loss of water from canals and reservoirs that are not watertight, or if the soil is poorly drained (for example, in clay or lateritic soils);
  - water and soil salinization, especially in arid and semi-arid areas, considering that water input is low and evaporation high, when the level of the groundwater table rises (especially if irrigated soils have a rapid drainage, as in sandy, alluvial soils), or when the groundwater table is in contact with soil layers of high salt content, or when irrigation water is rich in salt;
  - salinization of water, through saline intrusion at the mouth of a waterway or in coastal or island areas where groundwater is in contact with seawater and its level is lowered;
  - changes in soils through the oxidation of sulphur compounds in humid coastal areas; changes in the depth, recharge rate and quality of the groundwater table;
  - drying up of the groundwater table, if the annual precipitation rate is low, if the evaporation rate is very high, if the rate of withdrawal exceeds the groundwater recharge rate, particularly in arid and semi-arid areas;
  - nuisances, risks of accidents (for example, navigation on modified waterways, risks associated with flash floods or risks related to equipment) and/or risks of diseases, such as malaria, schistosomiasis or onchocerciasis, associated with an increase in harmful species and disease vectors if water distribution systems are poorly covered,

- if canals and ditches are not deep enough or if grasses and sediments accumulate in them, if drainage is poor and/or if bodies of stagnant water are created;
- better management of water resources depending on the design of the irrigation system (water conservation measures coupled with soil conservation and anti-erosion measures, users' associations, and so on)?
3. Is there a risk that pollutants (for example, pesticides or fertilizers) could be released or seep into the soil, irrigation water, surface water or groundwater? Are these pollutants associated with nuisances (odours, dust), risks of accidents (spills) and health risks (poisoning) for the population? Does irrigation water require treatment? Is there:
- a risk of pollution by pesticides and fertilizers used on neighbouring agricultural lands;
  - a risk of algal growth, if irrigation water (canals and reservoirs) receives nutrients (eroded soils, fertilizers), is static, is in constant contact with light and becomes warmer;
  - a risk of eutrophication of bodies of water due to nutrient loading (phosphates and nitrates);
  - a risk of pesticide bio-accumulation in the food chain?