

AREA
ENVIRONMENTAL TECHNOLOGIES RELATED TO WATER (AND SOIL)- Working document

Research scope: 3.1: Promoting Sustainable Production and Consumption for Preventing and Reducing Environmental Risk, Pollution Control and Demand-Supply Balance

Description:

Multidisciplinary research is required to create, develop, improve, demonstrate and evaluate emerging, existing and alternative sustainable environmental technologies. To meet the sustainability requirements, the technologies need to address a water demand-supply balance, on the one hand, and reduce negative impacts on the environment (e.g., pollution control) on the other. Plans for sustainable production and consumption should be based on an assessment of environmental and economic risk, and involve plans for promotion of new technologies.

Rationale/justification:

Fresh water is becoming an ever increasingly scarce resource, requiring both the control of its use (demand and supply) and reduction of the negative impact of human activities. Especially nowadays, when standard of living and human aspirations continues to increase, the strategic importance of fresh water resources increases. The necessity of identifying technologies for the most efficient and water-saving production and consumption remains one of the crucial issues in sustainable water use and management.

Research issues to be addressed (examples):

- Assessing the total water-cycle, identifying specific problems in crucial areas (e.g., urban, agriculture) and closing water cycles;
- New technologies for production and consumption, including environmental and economical assessment;
- New technologies for pollution assessment;
- Water re-use in industry, for domestic purpose and rational use of water in buildings;
- Rainwater harvesting and grey water use for compensating water cycle instability in urban areas.

Research scope 3.2 : Improve integrated system technologies to resolve water problems, establish ecohydrology based technologies to eliminate water quality degradation and enhance remediation methods.

Description:
Integrated system technologies are required to resolve water problems and address issues of aquatic systems degradation. Their identification requires detailed analysis of human activities in relation to environmental characteristics (hydrology, soil, hydrogeology plant cover, biodiversity). The criteria for optimization of landscape patchiness in relation to biodiversity restoration, water retentiveness enhancement, and optimization of societal gains has to be addressed. The above factors, superimposed the area of high compensatory potential using such methods as satellite, infra-red and mathematical modeling provides a basis for the technologies identification including new remediation methods. These should reduce threats and enhance the opportunities to achieve sustainable water resources through enhancing the capacities of the environment by applying hydrology-biota dual regulation, as well as capacities of the economic systems.

Rationale/justification:
Water is a driving force for both ecosystems and human societies, which are impacted by increasing uncontrolled developments and uncertainty of the climatic processes. These negative impacts may be to some extent compensated by mitigation technologies, which should be based on a proper estimation of the capacities of the environment (hydrological characteristics, soil, vegetation, biodiversity), constructions/infrastructure, economic and social systems. Application environmental technologies and new, advanced remediation techniques increase the efficiency and decreases costs of measures.

Research issues to be addressed (examples):
- Improve integrated system technologies to resolve water problems and ecohydrology based technology to eliminate water quality degradation in aquatic systems;
- Improved and new remediation technologies;
- Enhancing soils environmental and ecological capacities by use of natural soil conditioners for ground water protection and increasing soil water storage capacity;
- New technologies, e.g.nano-scale particles and nanotechnologies for soil- and groundwater remediation;
- Identification of criteria for optimization of landscape patchiness in relation to biodiversity restoration, water retentiveness enhancement, and optimization of societal gains.

Research scope: 3.3: Novel approaches to the design, construction and operation of water infrastructure assets and their harmonisation with environmental technologies for mitigation of water stress and adaptation to extreme hydro-climatic events in critical areas (coastal zones, urban and industrial areas, agriculture).

Description:
Development of operation procedures of water infrastructure, new technologies and constructions related to water and their harmonization with environmental

biotechnologies for mitigation of water stress and adaptation to extreme hydro-climatic events are required, combined with the delineation of appropriate remedial measures and a strengthened control of new industrial installations, solid waste landfills and infrastructure development projects. Environmental risk assessment and risk management of water resource development need to be included impairing water quality and aquatic ecosystems in concerned areas, and development of compensatory measures .

Rationale/justification:

Introduction of the precautionary approach with a focus on pollution minimization and prevention through use of new technologies is crucial but not sufficient for successful water quality and aquatic environment management. Technological measures have to be harmonized with ecosystem biotechnologies, and altogether be integrated in a comprehensive planning. To mitigate water stress, there is a need to harmonize construction and operation of water infrastructure with environmental technologies, using organisms life traits and diversity of life strategies and adaptations for enhancement of technology and technical solutions in extreme conditions. There is also a need to identify and address catchment and ecosystem weak points - erosion, water level modifications, changes in land use intensity.

Research issues to be addressed (examples):

- Hydro - technical construction management;
- Harmonizing the ecosystem properties with hydrotechnical infrastructure for water quality and ecological status of freshwater & estuarine and coastal ecosystem;
- Mitigation of water stress in coastal areas;
- Sustainable water management in urban, industries and agricultural areas;
- Restoration of degraded water resources;
- Adaptation and mitigation of extreme hydro-climatic events;
- Enhancement of grey water use for agriculture and industry and improvement of urban environment;
- Development of environmentally sound aquaculture technologies adjusted to availability of water resources at local, national and regional scales.

Further proposed Research Scopes that need elaboration

Research scope 3.4 : Cost-efficient techniques, criteria and indicators for evaluation and improvement of water and soil status in Europe – biological, chemical and physical aspects

Research scope 3.5 : Developing and promoting technologies for assessing and reducing environmental risk and pollution control (concerning water and soil)