Strengthening China Europe Water Innovation Cooperation:
results of the project PIANO

*Recommendations for R&I cooperation: the proposed PIANO Strategic Research and Innovation Agenda*

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Policies, Innovation
And Network for enhancing
Opportunities for China-Europe
water cooperation

中欧水源合作机会增进政策，创新和联网

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Alessandro Lotti
ISPRA – Italian National Institute for Environmental Protection and Research

ISPRA
Istituto Superiore per la Protezione
e la Ricerca Ambientale

Sistema Nazionale
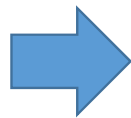per la Protezione
dell'Ambiente

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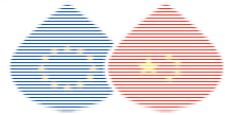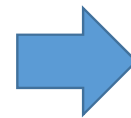
Domains and challenges

Domains

1. Agricultural water management
2. Municipal water management
3. Industrial water management
4. River basin management and flood control
5. Water for energy

Challenges

1. Water scarcity
2. Water pollution
3. Extreme events: floods and droughts
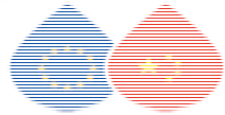4. Ecosystem degradation
5. Water infrastructures

Actions e.g.

1. Develop water conserving farming and forestry;
2. Tools for assessing water costs, modelling;
3. Reducing soil and water pollution;
4. Emerging polluttants;
5. Analytical technique;
6. Remediation strategies and technologies
7. Etc.

Definition of RIA and IA

RIA (research and innovation actions): R&D to establish new knowledge or explore the feasibility of a new or improved technology, product, process, service or solution (including basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment);

IA (innovation actions): innovation activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services (including prototyping, testing, demonstrating, piloting, large-scale product validation and market replication)

Domain 1 - Agricultural water management:

• In 2013, the agricultural water sector used 63% of the total 618 billion m3 water used in China.

• It has been estimated that ca. 60% of the groundwater in China is unsuitable for drinking water supply.

The main impact will be in terms of providing a more sustainable management of water resources in rural areas affected by water scarcity and various types of pollution. An improved water management will lead to more social welfare of people living and working in these areas, decreasing the probability of conflict between different interest in that domain.

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Domain 1 - Agricultural water management

Research and Innovation actions	Type of actions (*)
CHALLENGE 1 - WATER SCARCITY	
Irrigation technologies and irrigation management: DSS and modelling for water resources assessment	RIA & IA
Water reuse: new technologies (e.g. cascading systems); Safe reuse of treated wastewater reuse	IA
Efficiency of water use; Groundwater efficiency in irrigated agriculture	IA
CHALLENGE 2 - WATER POLLUTION	
Nutrients and pesticide technologies management; Technologies for pollution remediation - manure separation; manure treatment technologies	RIA & IA
Water-related soil degradation technologies (salinity, erosion, degradation, clogging, oxidation)	RIA & IA
Technology for pollution monitoring;	RIA & IA
CHALLENGE 3 - EXTREME EVENTS: FLOODS AND DROUGHTS	
On-line monitoring and forecasting of floods and droughts;	RIA
Early warning system, forecasting of extreme events; floods control; DSS	RIA
Remediation technologies	RIA & IA

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Domain 2 - Municipal water management:

• Water supply covered ca. 90% of domestic water demand in cities.

• The average water loss due to leaks in the urban supply system network was reported at 15%, which overtakes national standard limits of 12%.

• The rate of recycled water utilization has been targeted at 15% and the rate of harmless sludge disposal to 70% in cites and 30% in both counties and towns.

The main impact aims to reduce water scarcity while increasing public supply coverage, reduce water pollution, control and manage flood and extreme events, reduce ecosystem degradation, increase water infrastructures.

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Domain 2 - Municipal water management

Research and Innovation actions	Type of actions (*)
CHALLENGE 1 - WATER SCARCITY	
Reducing leakage from pipe networks	RIA & IA
Drinking water production from wastewater and alternative water resources	IA
Data integration technologies to improve data availability	RIA
CHALLENGE 2 - WATER POLLUTION	
Technologies for emerging pollutants; technologies to harvest resources from wastewater and reused water; Wastewater treatment technologies (WWT)	RIA & IA
Monitoring technologies and methods to remove point and diffuse chemical – biological pollutants	IA
Real-time monitoring and control systems (wastewater network management): District metering areas	IA
CHALLENGE 3 - EXTREME EVENTS: FLOODS AND DROUGHTS	
Storm water management systems improve Sustainable Urban Drainage Systems (SUDSs)	RIA & IA
Natural hazards: Nature based solutions to mitigate urban floods	RIA & IA
Decision Support Systems	RIA & IA

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Domain 2 - Municipal water management

CHALLENGE 4 - ECOSYSTEM DEGRADATION

Methods to determine environmental flow needs	RIA & IA

CHALLENGE 5 - WATER INFRASTRUCTURES

Below ground assets: methods-technologies for identification and remediation of corrosion-aging	RIA & IA
Asset management tools for sustainable maintenance programmes	RIA & IA
Improve water systems: Monitoring technologies of water systems; Management technologies	RIA & IA

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Domain 3 - Industrial water management:

• Industrial water use in China is ca. 23% of the total water use and the industrial water consumption (water use minus return flow) rate was 23% of the industrial water use in the past.

• Wastewater discharged from industrial sectors was 21 billion tons in China, corresponding to 30% of the total wastewater discharges.

• The rate of recycled water utilization has been targeted at 15% and the rate of harmless sludge disposal to 70% in cites and 30% in both counties and towns.

The main impact is reduction water scarcity with the aim to reuse industrial waste water, close the water cycle and reduce water pollution

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Domain 3 - Industrial water management

Research and Innovation actions	Type of actions (*)
CHALLENGE 1 - WATER SCARCITY	
Technologies aimed to develop sustainable use of resources and to close the water cycle	RIA & IA
Water saving technologies (energy efficient systems) and water reuse technologies	RIA & IA
Recovery energy and raw material technologies from sludge and wastewater - energy and nutrient recovery technologies	RIA & IA
CHALLENGE 2 - WATER POLLUTION	
Monitoring technologies to improve water quality control and discharges	RIA & IA
Advance water treatment technologies - energy efficient systems: small scale systems technologies to specific pollutants removal	IA
Wastewater Treatment technologies: Membrane technologies; Advanced, biological, treatment, solid separation	RIA

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Domain 4 - River basin management and flood control:

• Rapid urbanization, uncontrolled land-use and development of industrial zones have increased both urban and river flooding risks and increased water pollution in Chinese rivers.

• In an effort to avoid the huge economic, social and humanitarian damages caused by flooding, the Chinese Central Government called for the widespread adoption of "the sponge city" approach.

The main impact is optimization of water uses, water saving and management, reducing water pollution, mitigation of extreme events, developing tools and new technologies for adaptation to floods and droughts, reducing ecosystem degradation through research on ecological flows, nature based solutions and integrated river basin management tools

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Domain 4 - River basin management and flood control

Research and Innovation actions	Type of actions (*)
CHALLENGE 1 - WATER SCARCITY	
Optimization of water uses and water saving; water balance modelling systems	IA
Monitoring system to assess GW abstraction and recharge; Managed Aquifer Recharge Technologies	RIA & IA
Freshwater bodies classification and matching alert system; Freshwater overexploitation	IA
CHALLENGE 2 - WATER POLLUTION	
Technologies for contaminated areas remediation	RIA & IA
Survey the state of degraded water resources systems; Studying and modelling the transfer of contaminants	RIA
Data integration technologies - hydrological parameters, pollution loads, water quality	RIA

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Domain 4 - River basin management and flood control

CHALLENGE 3 - EXTREME EVENTS: FLOODS AND DROUGHTS

New remote sensing technologies (satellite, Doppler radar, wireless sensors etc.)	RIA & IA
Risk Based decision making and planning tools	RIA & IA
Develop tools and new technologies for adaptation to floods and droughts - Early Warning Systems	RIA

CHALLENGE 4 - EXTREME EVENTS: FLOODS AND DROUGHTS

|	
Develop new Water Management schemes - policy, regulations, monetary model, governance	RIA & IA
Ecological engineering and Ecohydrology: research on restoration methodologies of aquatic systems	RIA & IA
Nature Based Solutions: use of new natural materials	RIA & IA

Domain 5 - Water for Energy

• China is world leading in the construction and operation of large hydroelectric dams with hydropower accounting for 944 TWh or 17% of the annual power production.

•Small-scale hydropower plants generate 220 TWh of these

•The Chinese government is now focusing on environmental impacts mitigation. Optimal river basin management and cascade power stations can safeguard the required base-flow and, at the same time, meet the objective from water and electricity demands.

The domain aims to reduce water scarcity through industrial water reuse and water-energy nexus

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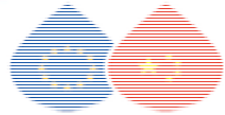
Domain 5 - Water for Energy

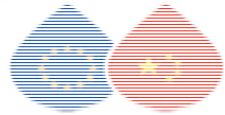| Research and Innovation actions	Type of actions (*)
CHALLENGE 1 - WATER SCARCITY	
Improve industrial water reuse through water reuse technologies	RIA & IA
Water-energy nexus: energy is needed for water supply and water is crucial in power production	RIA & IA

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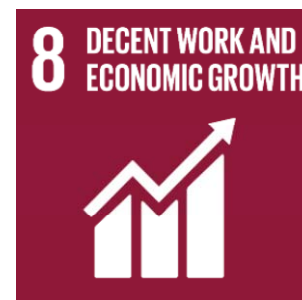
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Thank you for your attention!

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Alessandro Lotti – alessandro.lotti@isprambiente.it
ISPRA – Italian National Institute for Environmental Protection and Research