

WP3: drivers, barriers and strategies

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- By Category
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Analytical Framework



Builds on WP1 & WP2 Analysis of Technologies

Same Categories:

1. agricultural water management,
2. municipal water management,
3. industrial water management,
4. river basin management and flood control and
5. water for energy

Group by types of solution:

- Monitoring systems;
- Modelling and DSS systems;
- Control systems; and
- specific products, processes and technologies.

Analytical Framework



For each TWI an assessment is made of the commercial potential (CP) on a scale of 1 to 5 where

1. **No commercial potential** – basically just an idea that anybody could copy or no conceivable market / client,
2. **No commercial potential** – but some possibility that collaborative research funding could be found to develop to China specific needs, hard to avoid copying though – likely just publication of results
3. **Little Commercial potential** - But high chance for collaborative research that would produce outputs that would be valued in China and might be then commercialised, reasonable potential market
4. **Good commercial potential** – clear needs and patentable technologies with export or local manufacture possibilities – good potential market – some risk that could be copied
5. **High commercial potential** – A specific and developed technology that meets a pressing need in China and could be exported or manufactured / delivered locally at a premium rate and would be difficult to copy.

Drivers: Policy



Key Policy Drivers

1. **Five Year Plans (13th)**
2. **Water Pollution Prevention & Control Action Plan, 2015**

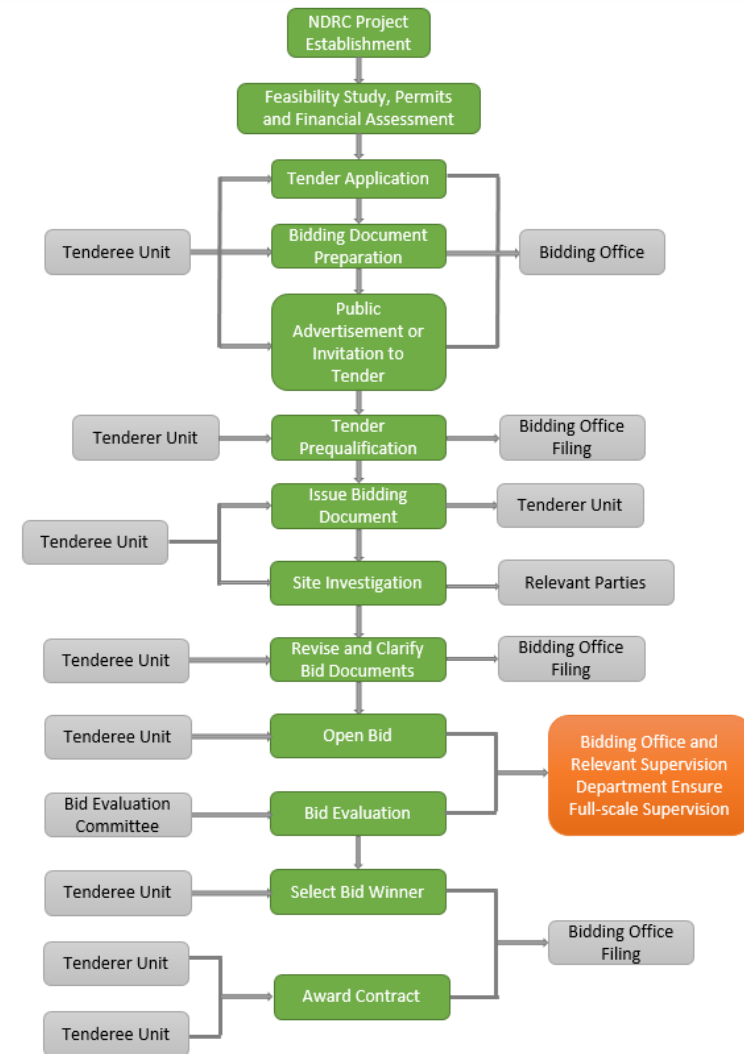
Barriers: General



- Market understanding / language
- Market / public acceptance of new technologies
- Promoted / Closed lists for imports and market access
- Localisation of technology
- Certification and approval of technologies
- Identification of Clients
- Procurement routes
- Business registration and Banking
- Reliable Partners for distribution, installation, training and operation.
- IPR Protection and copying

Barriers: Procurement

- The Water Resources Strategy set out in policy by Central government and indications are given of the expected level of financing
- In consultation with the central ministry and technical advisors from research institutes, Projects fitting policy prepared by local government with initial feasibility studies and costs. Indicate how projects will contribute to the attainment of the various targets at national, regional and local levels and who will be responsible. Projects must match with specific plans such as Flooding, Irrigation, River rehabilitation.
- Province passes list to Central Ministry for initial review
- For selected projects more detailed feasibility studies done by Ministry approved institutes (paid by province), for example GIWP
- Projects then go to the Water resources planning and programming Department for technical assessment
- List of projects approved to proceed passes to NDRC for financial assessment.
- List passes back to provinces - If funding is available then projects can commence with bidding process



Barriers: Procurement



Identify potential difficulties for foreign competitors to win contracts in China

- The difficulty of obtaining timely, accurate information about upcoming projects.
- Liaison with various commissions, ministries, and departments.
- A lack of understanding of projects' evaluation criteria.
- Fail to link national and local development strategies to project opportunities.
- The trend towards decentralisation of tender information - leading to higher costs and less transparency.
- Potential unfair implementation of public procurement awards.

Barriers / Opportunity: Public Private Partnerships



Opportunity:

- Move away from direct government Procurement. More creative.
- Massive increase in available capital for investment
- Freedom from local government debt ceilings
- Massive national / international companies emerging
- Many regional and local companies
- New world / lack of experience
- Freedom to find most efficient solutions with less policy interference
- Negotiated rather than competitive tender routes

Barriers:

- Uncertainty of selecting method of concessionaire
- Prohibition of cross-border design and construction
- Right to select EPC contractor
- Ban on guaranteed rates of return
- Legal effectiveness of gov. guarantee
- Disallowance of long-term financing
- Restriction of refinancing techniques
- Low level of water prices
- Difficulty of price adjustment
- Local company's growth
- Gov. breach of contract
- Joint venture risks

Barriers: By TWI

- Monitoring
- Modelling / DSS
- Integrated management systems / Controls
- Products / Processes



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Monitoring

- Type approval
- Distribution, support and maintenance
- Copying by local competitors

Modelling

- Localisation – need Chinese language interfaces; fit to local standards and targets
- Data Access – Lack of data; poor quality data; data held in fragmented manner with many different institutions having part, not sharing and wanting to charge access fees; Security and confidentiality applying to foreign researchers.
- Communication of the meaning of results
- Local lower cost competition
- Hacking / copying of IPR

Preference for locally developed versions derived from free EPA or other core programmes. Don't want to be dependent on a foreign technology critical systems.

Barriers: By TWI

- Monitoring
- Modelling / DSS
- Integrated management systems / Controls
- Products / Processes



Integrated management systems / Controls

- Low cost local copies / IPR
- Local certification requirements
- Import and customs restrictions
- Distribution, support and maintenance

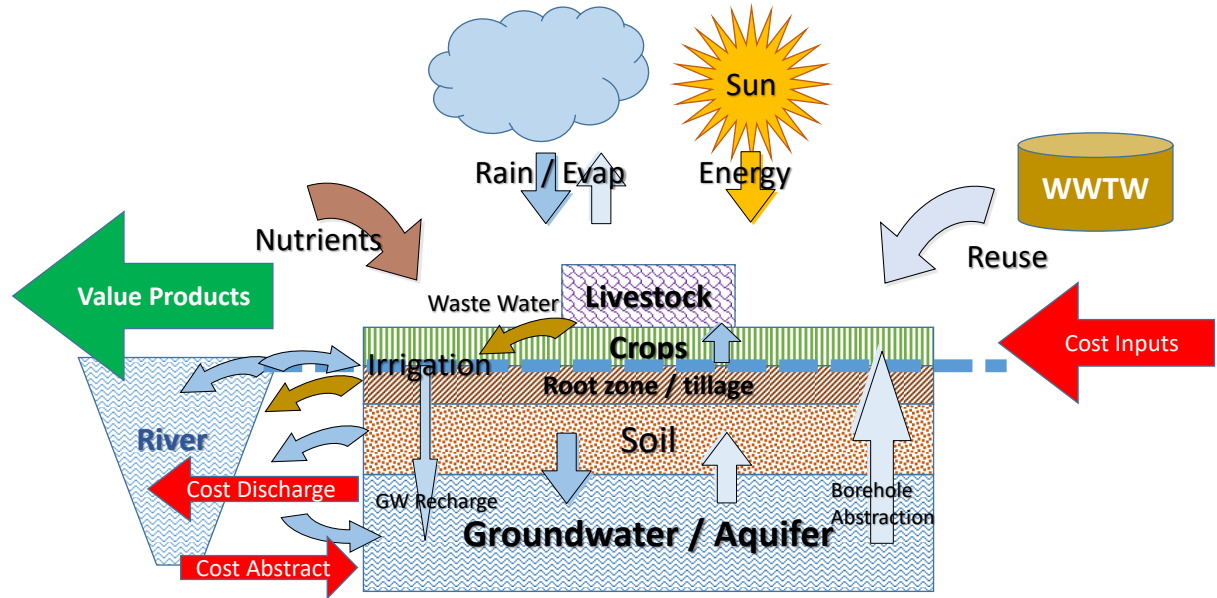
Technologies / Products

- easily copied by local manufacturers.
- Advanced treatment technologies struggle on cost
- Standards not high enough yet to drive the market

Agricultural Water

Identify how Technology adds value

- irrigation and fertigation efficiency
- reducing surface and groundwater water pollution
- reduction in groundwater overdraft



Agricultural Water



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Category 4 TWIs for Agricultural Water

Area / Type	Monitoring	Modelling / DSS	Control systems	Products
Irrigation and Nutrients		<p>A8 SCADA remote control system – CP 4,</p> <p>A16 Multi-sensory platforms for irrigation – CP 3,</p> <p>A24 Integrated water management system for forestry in arid lands – CP 3,</p> <p>A30 Software for crop nitrogen budgeting – CP 3</p>	A24	
surface and groundwater water pollution	A36	A36 Groundwater sampling system – CP 4		
reduction in groundwater overdraft	A16	A16		

Agricultural Water: Opportunities



- Moves to intensive and urban area farming - higher value horticultural crops on more complex rotations.
- Regulations on diffuse pollution reducing Nitrogen and Phosphorous runoff will provide additional drivers for such solutions. The MWR “Three red line, Red Line for total pollution is supposed to include Nutrient runoff, though not yet well defined (DRC??). Certain areas of the country include nutrient sensitive zones (e.g. Lake Tai) where additional controls to nutrient runoff apply or are being piloted.
- The crop’s need for water and for nutrients varies spatially and temporally. Correctly matching inputs to needs can increase yields, improve resilience to droughts and reduce the inputs required and the runoff and environmental impact of irrigation return waters and runoff.
- Geophysical parameters that are vital to evapotranspiration calculations and as inputs to water and nutrient balance models appropriate to crops, soil type and setting and meteorological conditions.
- More WWTW have tertiary treatment increasing availability of recycled water – Now in rural as well as Urban areas.
- The water companies can attain additional revenue by selling water to agricultural sector

Agricultural Water: Barriers



- Farmer understanding: Education of the problems of incorrect nutrient balance and solutions.
- Cost: The revenue from the market value of crops and the incremental improvement in Yield and reduction in input costs needs to exceed the cost of the system.
- Regulations that penalise excess nutrient runoff and provide subsidies for reduced runoff need to be enforced and understood.
- A weak Regulatory framework will not drive change
- Localisation of technology
- Scaling Market: sell to individual farmers, to village communes or to local government organisations / departments or at a province / national level.
- Implications of different tilling strategies on technology requirements – No Till may require expensive drilling systems. Low levels of mechanisation of farming can greatly limit options compared to approaches in EU.
- Public acceptance of the direct use of recycled water in irrigation.
- Cost of infrastructure of conveyance of recycled water to irrigation systems
- Reliability of supply of recycled water

Agricultural Water: Strategies



- Acceptance: The presence of monitoring and control systems will help ensure contaminants don't get through
- Cost: More intensive farming method – greenhouses, year round rotations, GM crops etc will increase the revenue that can be generated per area of land.
- Reliability of supply: Demonstrating compliance with standards, identifying problems early and fixing. Understanding of the sources of wastewater and continuing availability in times of drought.
- Farmer training supported by local government, integrated with training in sustainable farming practices and appropriate crop selection. Government assistance in conveying market information of suitable crop selections in areas.
- Pilot projects and examples to demonstrate the situations in which investment into different levels of such systems will yield significant savings.
- Strengthening of regulatory framework
- Technology manufacturers to work through Central government partners in China to find local partners (private sector and government) to help with the localisation of their technology, set up distribution and support networks.
- IPR issues through localisation process ■

Municipal Water



- Water treatment systems
- Water Networks
- Consumer water saving systems
- Desalination / water recycle to source
- Wastewater treatment
- Sludge management
- Sponge Cities – Decentralised treatments and integrated urban catchment / green infrastructure

Area / Type	Monitoring	Modelling / DSS	Control systems	Treatment Technologies
Water treatment systems	B50 Colifast Bacteria and E Coli monitor - 4 C1 Optisense – Bio-Chemical sensor on a Chip, refractive index - 4			B59 Catadox combined ozone, peroxide and UV treatment. – 4/5 B46 Microdrop iron ppt Arsenic removal – 4/5 B47 Rosfilter Coagulation and direct filtration treatment of surface water 4/5 B70 Bio-Aqua Variable Pore Micro Filter.
Water Networks		D10 AZ100 Acoustic Leak Detection Data logger - 4 B62 DHI Water Distribution Networks, EPANet package - 4 D11 WONE – District Metering area data DSS for Leakage reduction - 4	B62	
Consumer water saving systems				
Desalination / water recycle to source				B39 Desalination by salinity gradient by coupling different technologies – CP 3
Wastewater treatment	B52 UV-Vis Multi sensor Nitrate Nitrite - 4,	D13	B41Stjernholm / DHI WWTP aeration Off gas monitor – 4 C18 Aquascan WWTP SCADA system C46 CEIT Activated Sludge N removal Control system CP 3 D13 Aquasafe WWTP DSS / SCADA / Control system - 4	B63 IMR SBR – CP 4 B59, B20 ACT Biofiltration of wastewater in SuDs setting B70, , B54 Ultraaqua UV treatment for fish farms – CP 3
Sludge management				B64 AVA-CO2 Hydrothermal Sludge carbonisation, CP5 B37 Cannibal Anaerobic Sludge treatment on RAS line to reduce Sludge volume -CP3
Sponge Cities				B20, B47, B58 Decentral Membrane Greywater treatment - 4

Municipal Water: Opportunities



- Water Treatment: rising standards, some investment via PPP, Mature market – Decentralised systems
- Networks: Leakage detection, water quality monitoring, modelling
- Desalination: Market static, limited growth in last 5 years. – more industrial, New tech could change
- Wastewater Treatment: rising standards, massive investment via PPP, Mature market – Rural and Decentralised systems – integration to green infrastructure and ecology.
- Sludge Treatment: Growing investment, developing regulatory framework, at take off – integration to energy systems and solid waste management.
- Sponge Cities: Moving beyond just pilots. PPP and land swap / urban planning drivers – integrated green infrastructure – Volume drivers, multiple benefits.

History Objectives and Actuality (million t/d)



Municipal Water: Barriers



- Water supply and wastewater mature - only in niche and specialised areas can EU companies stand out.
- SOE / Private sector companies are now fully established in the core Urban water and wastewater treatment and supply markets.
- As for the agricultural water section monitoring, modelling and design of control systems remains an area of opportunity and faces the same barriers as listed there.
- The integration of Green infrastructure into urban planning and design was pioneered in Europe and is now being implemented on a massive scale in China. Most of the actual Tech is quite simple though, hard to apply IPR. Planning, Modelling and design possible.

Municipal Water: Strategies



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- Partnerships with Major SOE water enterprises – Technologies and Consultancy.
- Acquisition by Chinese SOE.
- Planning, design, modelling
- Integrated thinking – part of wider urban infrastructure – water, energy, food, environment

Industrial Water



- Clean (source) water production, treatment, distribution and saving systems
- Water reuse, recycle and recovery systems
- Wastewater collection, treatment and disposal

Area / Type	Monitoring/ DSS / Control / efficiency	Treatment Physical / separation / heat	Treatment Chemical / oxidation	Treatment Biological
Clean (source) water production, treatment and distribution and saving systems	C58 AQUATRACK Laser pathogen detector – CP4 C62 DiveiSS pipe fouling monitor based on vibration – CP2			
Water reuse, recycle and recovery systems	C58, C62		C59, C53	
Wastewater collection, treatment and disposal	C62	C25 USO3 Ultrasound and Ozone Disinfection C29 Dynamic Vapour Recompression to concentrate salt, C13, C63, C30, C31, C37, C15, C53	C2, C60, C27, C53	C6, C11, C54, C55,

Industrial Water: Opportunities



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- Clean Source: rising standards, investment via PPP, Mature market – Decentralised systems
- Reuse: Tightening regulation on water use efficiency. Developing infrastructure to market
- Wastewater Treatment: rising standards, massive investment via PPP, Mature market but much scope for further innovation.

Industrial Water: Barriers



- Water supply and wastewater mature - only in niche and specialised areas can EU companies stand out – But lots of Niches
- SOE / Private sector companies are established

Industrial Water: Strategies



- Partnerships with Major SOE water enterprises – Technologies and Consultancy.
- Acquisition by Chinese SOE.
- Planning, design, modelling. Clean Tech Auditing.
- Integrated thinking – part of wider urban infrastructure – water, energy, food, environment – **Circular Economy**

River Basin Water



1. Urban Flood Management
2. River Basin Flood Management
3. River Training at Basin Scale, including water resources surface / ground and soil plus morphology.
4. River basin Monitoring
5. River Basin water quality / pollution management

Area / Type	Monitoring	Modelling / DSS	Control systems	Preventative Technologies
Urban Flood Management				D5 – Floatec Polystyrene foundation 3
River Basin Flood Management	D1 Space based technology 1	D15 Recharge basins with crowdsource DSS 2		D2 Smart / Bio Dike materials 2 D16 Eco Dams 1
River Training at Basin Scale (Water Resources)		D23 IWRM Tools 5 D22 Stochastic simulation in data poor areas 3 D15 Recharge basins with crowdsource DSS 2		
River basin Monitoring				
River Basin water quality / pollution management	E14 Smart Buoy 4 D8 Crowdsource mobile app 1 D9 Algae bio Sensors 4	D15 Recharge basins with crowdsource DSS 2		

River Basin Water: Opportunities



- Water resources shortage and regulation – Quantity Red Line
- Water quality. – Total Load Red line and Pollution control action plan
- Modelling and monitoring systems
- Nutrient management
- Long distance transfers – have encountered problems – looking for technical and PPP advisory support

River Basin Water: Barriers

- Government controlled, incumbent institutes and organisations
- Low revenues



River Basin Water: Strategies



- Partnerships with Government institutes or SOE water enterprises
- Monitoring and Modelling
- Integrated thinking – Integrated River Basin Management.
- Urban Rivers – Black River restoration

Water for Energy



1. Small Scale Hydropower
2. Preserving Natural Ecosystems – minimise impact of hydropower on environment
3. Novel Energy Production systems – Thermal, Wave etc

Area / Type	Monitoring	Modelling / DSS	Control systems	Products and Technologies
Small Scale Hydropower		E15 Earthquake Risk - 3 E17 Dam Concrete Stress 3 E9 Hydropower simulator 2		E23 micro-hydro pipes 2, E5 low head turbine 4 E3 Screw Turbine 4 E4 Vertical Pelton 4 E6 Small Turbine existing structures 4
Preserving Natural Ecosystems – minimise impact of hydropower on environment				E12 fish curtain 4 E13 Water Bearings
Novel Energy Production systems – Thermal, Wave etc				E19 Geothermal heat pump 5 E20 Wave Power 3

Water for Energy: Opportunities



- 13th Five-Year period, water to energy sector RMB 500 billion
 - large and medium-sized conventional hydropower stations RMB 350 billion,
 - small hydropower stations RMB 50 billion ,
 - pumped storage power station RMB100 billion
- For EU small hydro power technologies may have potential.
- Wave, wind, geothermal integrated renewable solutions
- Large Revenues on Hydropower.
- Conventional on main streams, small scale and ecological on tributaries

Water for Energy : Barriers



- Government controlled, incumbent institutes and organisations
- Need contacts at local levels
- Central only for very big or international projects

Water for Energy: Strategies



- Partnerships with Government institutes or SOE water enterprises
- Partnerships with local and regional companies
- Monitoring and Modelling
- Integrated thinking – Integrated River Basin Management.
- Ecological restoration, fish passes etc

Workshops



- agricultural technologies: Lead Chinese partner would be DRC of the Ministry of Water Resources)
- Municipal and industrial technologies: Lead Chinese partner would be FECO of the Ministry of Environmental Protection. Also discussed with Tsinghua University who had offered to potentially host the workshop at their university.
- River Basin Management: Here we had discussions with our partner CAEP (Chinese Academy of Environmental Planning) to organize a regional workshop in a river basin where would be actual demand for such technologies.

Workshops to plan in November / December 2017

Case Studies



- Looking at case studies of EU companies who have developed successful water sector businesses in China.
- Follow up on the cases of EU-SME Water sector report 2013 – Greentech, Mixel, MicroLan. Contacts with other companies attempting to enter market.

Other Technologies



- In addition to the Technologies assembled in WP2:
- Talking with companies form EU Partnership project
- Additional technologies via UK Isle Group
- Additional Technologies of PIANO Partners
- Technologies through EU SME Centre and Other EU Innovation promotion projects in China.

Thank you

Q&A