Reuse options for marginal quality water in urban and peri-urban agriculture and allied services in the gambit of WHO guideline (REOPTIMA)

Ashwani Kumar
Director & Project Coordinator (REOPTIMA)
Directorate of Water Management
(Indian Council of Agricultural Research)
Bhubaneswar, India

Katarzyna Kujawa-Roeleveld
Wageningen University
The Netherlands

This event is co-financed by the European Commission through the involvement of several projects.

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"REOPTIMA"

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Directorate of Water Management
ICAR, India

Dr. Ashwani Kumar, Project Coordinator
Dr S. Raychaudhuri
Dr (Mrs) M. Raychaudhuri
Dr S. K. Rautaray

Wageningen University and Research Centre
The Netherlands

Dr Frans Huibers, European PC
Dr Jeroen Herman Jan Ensink
Dr Katarzyna Kuja-Woelveld (Ms)

National Institute of Occupational Health,
ICMR, India

Dr P. K. Nag, Project Partner
Dr Sunil Kumar

Universitaet Hohenheim, Germany

Dr Thilo Streck, Project Partner
Dr Joachim Ingwersen,
Dr Marc Lamers

CEBAS-CSIC, Spain

Dr. Juan Jose Alarcón Cabañero, Project Partner
Dr Emilio Nicholas Nicolas
Dr Francisco Pedro Salcedo
Dr Oussama Mounzer

Dr María Jesús Sánchez-Blanco
Dr Pedro Antonio Nortes Tortosa
Domestic requirement will be 30-40% more than present requirement with concomitant increase in domestic wastewater generation (to the tune of 58 and 82 BCM in 2025 and 2050 respectively)

With increased diversion of fresh water towards water supply in cities one can expect an increase in urban wastewater generation

‘strong political economic considerations are likely to lower future agriculture water allocations on account of rising demand for higher value urban water supply’
Urbanisation and wastewater generation

- Total present urban population in India 377 million (estimated) would be anywhere between 646 and 970 million by 2050.

Trends in water supply, WW generation and treatment

By 2030 India will have 68 cities with > 1 million, 13 cities > 4 million and 6 megacities > 10 million people (A report by McKinsey Global Institute)
Untreated or unmanaged domestic wastewater today constitutes the largest proportion of total wastewater generated (industrial wastewater volumes are smaller) and poses the greatest threat to water supply sources - surface water and groundwater.

27 cities have only primary and 49 have primary and secondary treatment facilities.

74% of generated wastewater is disposed of untreated.

Water pollution, in the industrial sector, is concentrated within a few subsectors mainly in the form of toxic wastes and organic pollutants.
Centralised treatment systems

Cost of centralised system is high in respect to construction and maintenance as well (Cost of treatment types vary hugely; construction $15 - $75 /person and O&M $1 - $10 / person/year. Variation depends on technology, population density, climate, end-use (Nelson & Murray 2008).

To treat all the generated wastewater in India today, it requires Rupees 40000 crores. (estimated)

A number of sewage treatment plants under various river action plans are created over the past two decades in India and many technologies like activated sludge process, trickling filter, waste stabilization ponds, UASB and other new technologies are used.

Sustainability of big centralized systems

• inappropriate and costly methods of collection and treatment;
• high-tech, large-scale, capital intensive, centralised treatment;
• Irrational, water-borne, extensive sewer collection system.

Other concerns are
contamination at downstream water; health hazards in case of low efficiency of treatment facility; loss of nutrients lowering fertiliser value of treated wastewater.
intervention should start at the point of generation

How to address the issue of treatment for huge volume?

Can we explore reuse options at generation points?

Low cost systems for onsite treatment?

What are the reuse niches we can look for in urban areas?
Urban wastewater - scope

Reuse options for wastewater - suitable niches inside urban territory

Reclamation within agricultural system – sustainable approach to lower off-site environmental impact
### Area and crops under wastewater use in India

<table>
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<th>City</th>
<th>Direct use (ha)</th>
<th>Indirect use (ha)</th>
<th>Vegetables</th>
<th>Rice</th>
<th>Other cereals</th>
<th>Fodder</th>
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A variety of food and non-food crops are irrigated with urban wastewater water supporting the livelihoods of the households of millions of farmers in India.
We need to understand

• Realistic figure of wastewater irrigation in India is still missing (?)

• What is their impact on soil/crop/environment? (needs more information)

• Impact on health of wastewater users and consumers.

• Perspectives of different stakeholders related to wastewater irrigation

• Do we have any policy issues to address?

What needs to be done? for safe use

To look for appropriate wastewater irrigation methods and guidelines, with low cost treatment options for urban and periurban agriculture
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Project commencement 26th April 2012

Action plan chalked out

Inception workshop in India
State of art knowledge, discussion field visits

Define missing insights
Understanding WW management in Europe
Indian scientists visits Europe (1st year)

Final workshop in India
Communication of results to stakeholders
Defining actions for further research collaboration (2nd year)

Workshop cum field visit at Murcia (Use of reclaimed water to address water scarcity) (2nd year)

Problem to be addressed by

Personnel recruited & works initiated

Initiated and continuing

Field research in India by scientists and European graduate students to gain further insight and quantification in the Indian situation. Use is made of existing documentation, complemented with field surveys, interviews and field measurements, case studies & impact assessment.

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REOPTIMA
Reuse options for marginal quality water in urban and peri-urban agriculture

Katarzyna Kujawa-Roeleveld, Frans Huibers
Wageningen University, The Netherlands
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Objective

To create preconditions for a sustainable use of wastewater in an environmental friendly agriculture, without compromising food quality and the ecological equilibrium of irrigated areas.
Aim

- Dissemination and transfer the various research project findings on productive use of *(treated)* wastewater in India and Europe

- Disseminate both state of the art research results as well as more traditional and indigenous technology on the use of city wastewater in agriculture

- Development collaboration among Indian and European experts in the relevant fields
Project outputs

1. Assessment of city wastewater generation for reuses in targeted niches
2. Identification of appropriate wastewater treatment technologies, including indigenous, for safe irrigation
3. Development of methodologies for wastewater application in agriculture
4. Assessment of impact of wastewater irrigation on soil, crop and human health
5. Development of a policy strategy for sustainable wastewater management
Project form

Expert consultation, series of workshops, with the aim to develop a roadmap for research on overall management of city wastewater

REOPTIMA will consider research issues with a comprehensive approach for exploring suitable niches for wastewater use (treated, partly treated or untreated) in the ambit of sustainable management of city wastewater.
Project team and their strengths

The Directorate of Water Management (DWM, India)
Improved water management technologies for sustainable agriculture and its dissemination amongst all the stakeholders.

National Institute of Occupational Health (NIOH, India)
Aims to help provide "Occupational Health" to workers engaged in all occupations to minimize deterioration of environment particularly due to industrial activities
Project team and their strengths

Wageningen University (WU, The Netherlands)
Ability to join the forces of specialised research groups and various fields of natural and social sciences.
Department of Environmental Technologies and Integrated Water Management – wastewater treatment technologies, agricultural irrigation, integrated water management
Project team and their strengths

The University of Hohenheim, the Faculty of Agricultural Sciences (Stuttgart, Germany)
Combination of agricultural, natural, social and economic sciences

The Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC, Murcia, Spain)
Public multidisciplinary research organisation in Spain. Irrigation Department of CEBAS-CSIC carry out scientific research and develop technology directed at improving agricultural development within a sustainable use of natural resources.
Specific outcomes of inception workshop
(Aug/Sep-2012 in Bhubaneswar)

1. **Assessment of city wastewater generation for reuses in targeted niches**
   - Mapping and identification of source of pollution and categorization of wastewater on the basis of restrictions in use in agriculture

2. **Development of methodologies for wastewater application in agriculture**
   - Use of furrow irrigation, drip irrigation system
   - Protocols and plans to be developed for efficient and safe use of wastewater for semiarid and sub humid regions of India

3. **Impact of wastewater irrigation on soil, crop and human health** *(secondary information)*
   - Location specific study on wastewater use options and impacts on soil crop and environment.

4. **Identification of wastewater treatment technologies**
   - Review of available information and database development
   - Base line survey of selected sites, analyses and compilation of information

5. **Policy paper/strategies for sustainable wastewater use**
   - Protocols and plans for efficient and safe use of wastewater
   - Identification of polluters and suggestion of appropriate strategy
   - Economic evaluation of treatment systems and social acceptability
**MSc thesis** (first ones)

- Feasibility to use industrial effluents for irrigated agriculture
- Scenario study on suitable technologies chains to upgrade urban effluents
Thank you for your attention