Urban Wastewater:

Livelihoods, Health and Environmental Impacts in India

PROJECT MANAGER

Mr. Vinay Tandon (Natural Resource Management Specialist), Program Manager, Winrock International India # 7, Poorvi Marg, Vasant Vihar, New Delhi-110 057, vinay@winrockindia.org

PRINCIPAL INVESTIGATORS (more details in Annexure-3)

1. Mr. Shashikant Chopde (Water Resource Management Specialist), Senior Program Officer, Water Resources Unit (WRU), WII, shashikant@winrockindia.org
2. Ms. Radhika Gupta (Sociologist), Program Officer, WRU, WII, radhika@winrockindia.org
3. Ms. Anjali Bhardwaj, Independent Consultant (Urban governance, water and sanitation), anjali_bhardwaj@hotmail.com
4. Ms. Soma Dutta, Independent Consultant (Rural livelihood systems), somadutta@vsnl.com
5. Ms. Venessa Nazareth, Head, Institute for Studies and Transformations (IST), Ahmedabad, vananaz@hotmail.com
6. Mr. Bharat Kakade, Joint Director, BAIF Development and Research Foundation, Pune, mdmtc@pn2.vsnl.net.in
7. Dr. Gautam Gupta, Reader, Department of Economics, Jadavpur University, Kolkata, gautamju@yahoo.com

COLLABORATORS & PARTNERS

1. **Winrock International India (WII):Overall coordination, dissemination, literature review**

   Winrock's expertise lies in project planning and monitoring; training and capacity building; and technology transfer facilitation. Its experience is backed by long-term field presence in diverse regions with a range of partnerships and implementation of diverse projects.

2. **BAIF Development Research Foundation: Assessments and utilization of findings for Kanpur field study**

   BAIF an NGO is into multidisciplinary rural development programmes covering livelihood development and NRM. BAIF has experience on industrial/domestic wastewater use in plantations and agriculture. It has also carried research on effect of wastewater use on the ground water quality, soil quality and the plantation growth. BAIF's Central Research Station has also carried on trials and tests on the effect of (domestic) sludge on crop growth.

3. **Institute for Studies and Transformations (IST): Assessments for Ahmedabad case study**

   IST is an Ahmedabad based NGO, involved in action-research on the situation, problems and perceptions of people living below poverty line. Its Sabarmati Pollution Monitoring Project, undertaken in 1992 reported important findings related to health and environmental hazards of using polluted water.

4. **Jadavpur University (JU): Assessments for Kolkata case study and possible use in university courses**

   JU is a premier teaching-research institute in Eastern India actively involved in research on a range of environmental issues including air and water pollution, arsenic contamination, and the study of the Sunderban Delta. The university conducts several courses on environmental study and is supported by excellent infrastructure including laboratories.

ABSTRACT

Wastewater has high potential for reuse in agriculture, an opportunity for increasing food and environmental security by avoiding direct pollution of rivers and surface water; conserving significant proportion of river basin waters, and disposing of municipal wastewater in a low-cost, sanitary way. However, wastewater for irrigation poses a number of health and environmental risks at various levels. Though wastewater use in agriculture is an age-old practice, there is lack of systematic information on the subject, particularly on issues such as farmer's needs and preferences and health and environmental risks. This proposal would contribute to existing knowledge on urban wastewater use for agriculture in India by: (i) undertaking primary research on current practices, cost/benefits of wastewater use in agriculture vis-à-vis social, economic, health and environmental parameters, through in-depth case studies in four locations; (ii) identifying best practices for mitigation of negative impacts; (iii) assessing replicability of potential cost-effective technologies, and (iv) carrying out nationwide assessments of the extent and significance of wastewater use. The project will sensitize stakeholders at different levels about the negative impacts of urban wastewater use in agriculture and possible mitigation strategies with the purpose of helping water users, development organizations, governments and research organizations make sound investments in water for agricultural development. The study will use a combination of research approaches, including secondary literature review, in-depth case studies, and analyses of secondary and primary data.

TOTAL COST OF PROJECT: 74,901 USD

DURATION OF PROJECT: One year

LOCATION OF PROJECT: India including peri-urban and rural areas around the cities of New Delhi (Yamuna river basin), Ahmedabad (Sabarmati river basin), Kanpur (Ganga river basin) and Kolkata (Kolkata Wetlands).

PROPOSAL

1. BACKGROUND

Development or research problem

Farmers have used wastewater for irrigation to compensate for scarce or costly freshwater resources. Roughly 10 % of the world's wastewater is currently being used for irrigation. In developing countries, especially China and India, an estimated 80% of wastewater may be used for irrigation (Cooper, 1991). It is estimated farmers irrigate an estimated 20 million hectares using partially diluted or undiluted wastewater, a practice that sustains the livelihoods of millions of poor people in Asia, Latin America, the Middle East and parts of Africa. In fact, in many countries there are more hectares under informal irrigation with polluted urban stream/drain water than in formal irrigation schemes. Nutrient cycling and a reliable water supply to farmers have been the predominant objectives of wastewater irrigation for centuries.

Increasing volumes of domestic, hospital and industrial wastewater are being produced in cities around the world. Cities in developing countries lack resources to treat wastewater before disposal. Institutional support and legislation for pollution control is weak. Even where expensive wastewater treatment plants are installed, only a small percentage of the total wastewater volume is treated before discharge resulting in rivers, lakes and aquifers becoming severely contaminated. Only 4000 of 17,600 MLD wastewater generated in India is treated. Approximately 30,000 MLD of pollutants enter India's rivers, 10,000 million litres from industrial units alone. According to the Central Pollution Control Board (CPCB), 16,000 MLD of wastewater is generated from class 1 cities (population > 100,000), and 1600 MLD from class 2 cities (population 50,000 - 100,000). Of the 45,000 km length of Indian rivers, 6,000 km have a bio-oxygen demand (BOD) above 3mg/l (milligrams per litres), making the water unfit for drinking.

There is growing concern about the quality of water available for irrigation due to the increased implication of wastewater use for the hydrology of many river basins. Rapidly increasing urban populations and industries lead to increased wastewater production with its contamination becoming more complex. It includes industrial wastes, such as heavy metals, acids and derivatives of plastics, and organic components characteristic of human wastes.

Wastewater has high potential for reuse in agriculture; an opportunity for increasing food and environmental security, avoiding direct pollution of rivers, canals and surface water; conserving water and nutrients, thereby reducing the need for chemical fertilizer; and disposing of municipal wastewater in a low-cost, sanitary way. However, wastewater use poses a number of health and environmental risks for users and communities in prolonged contact with wastewater; for consumers of such produce and for neighbouring populations due to contamination of groundwater and creation of habitats for mosquitoes and other disease vectors. Important health risks include the transmission of intestinal helminth infections to agricultural workers in wastewater-irrigated fields and to consumers of waste-water irrigated produce due to worms and the transmission of faecal bacterial diseases, like diarrhea, dysentery, typhoid and cholera.

Literature review and assessment of current initiatives

Wastewater use in agriculture is age old, but efforts to develop mechanisms to control its negative impacts are relatively recent. WHO's international guidelines on wastewater reuse in agriculture and aqua-culture and recommendations of wastewater treatment and crop restrictions, are considered by many governments as the legal framework, though they are not intended for absolute and direct application in every country. While focusing on treatment and crop restrictions, the WHO guidelines pay inadequate attention to the problems of high cost involved in construction and operation of treatment plants. Authorities are therefore faced with two difficult options: either treat rapidly growing volumes of wastewater and bring it within safe limits for agricultural use, or try to stop wastewater use among the users which would deprive many households of their livelihood. The result of this situation is often that wastewater use and users are ignored and the practice of untreated wastewater use is denied.

A survey of relevant literature on India indicates that some research on wastewater use in agriculture has taken place including on development of low-cost, appropriate, and decentralized treatment technologies for treatment of wastewater in the country. Decentralized, small-scale, community operated systems and stabilization tanks have been built for successful use for fisheries (Kolkata). A similar experiment has been carried out in Pune, where after pre-treatment through anaerobic ponds, lotus and water lily are grown in a maturation pond, which renders the water colourless and odourless and the treated water re-circulated to create a waterfall. Other countries have experimented with a few techniques like up flow filter and vermin-filter. Duckweed production in excreta or sewage-fed ponds has found increasing attention recently. Other experimental options include source reduction, reduction in degree of faecal contamination of water through use of environmental sanitation technologies (Peru and Mexico) and domestic filtering of soapy water for gardens. For addressing industrial pollution of surface water bodies, possible solutions that emerge include sound regulation, proper zoning, registration and monitoring of industries and financial and technical incentives for waste minimization.

Lessons, conclusions drawn from past or on going work

Other lessons from past or on-going work include IWMI action research with farmers (Mexico, Pakistan, Vietnam and Ghana) showing that most urban/peri-urban farmers, in spite of the risks involved, view the presence of domestic sewage in their water source as a benefit providing plant nutrients. In general, the common point of view of researchers, decision-makers, and service providers holds that the use of untreated wastewater in agriculture is unacceptable and that only appropriately treated water yields important benefits. Though it cannot be denied that treatment is extremely desirable, the approach seems to have resulted in a marginalization of poor wastewater farmers unlikely to benefit from treatment of the wastewater that they use or from alternative water sources any time in the near future. This to a great extent, can be attributed to (and therefore calls for further research) lack of systematically collected information, particularly on issues such as farmer’s needs and preferences, health and environmental risks, and economics of using wastewater for irrigation.

Research hypothesis/proposition/questions

The research would scientifically evaluate the benefits and costs of wastewater irrigation vis-à-vis its livelihood, health, social and environmental impacts and examine under what conditions the benefits of wastewater irrigation can be accepted without undue damage to the environment and public health. Specific questions that would be addressed are: What are the health and environmental effects (positive/negative) of using untreated, partially or unsuccessfully treated or diluted wastewater in agriculture? What are the socio-economic costs and benefits, including gender impacts, of use of untreated wastewater in agriculture? What strategies/technologies could be applied effectively to minimise the negative impacts of wastewater use in agriculture?

Process followed in project design

Based on existing literature and data, locations in key urban and peri-urban areas were selected, where a large quantity of urban wastewater is being generated and used for agricultural purposes. Relevant local field organizations were contacted. Consultations were held with relevant stakeholders to understand the nature and extent of the problem and to obtain inputs for project formulation and the project was developed in close coordination with partnering agencies.

Links and mechanisms for creating synergies with other projects within the CA

The proposed research is targeted towards the broader objective of aiding policy makers in better management of water to improve livelihoods of agricultural workers. Wastewater use in agriculture provides new sources of water for higher food production. This component of CA has close synergies with other issues being researched, especially those related to salinity, groundwater, river basin studies, and economic incentives. The proposed research will generate information which will need to be shared among the researchers to facilitate cross learning; record varied experiences, opinions, view-points and perspectives; undertake collective advocacy and dissemination of information and experiences within and outside the network. These include: publishing and circulating periodic project bulletins; sharing key outputs with other research teams and peer review; project holders workshops; participating and sharing the results of research in other project workshops; regular sharing of project information with Steering Committee and setting up of an electronic discussion group, constituting all the project holders under the CA.

Addressing cross-cutting issues of food security, poverty, gender, and environmental security

Indian cities do not have the necessary wherewithal to deal with the wastes that they generate, resulting in water bodies like rivers and streams becoming easy dumping grounds. The main disadvantage of using untreated wastewater for irrigation as discussed above, is the associated health risk. The negative health impacts resulting from use of wastewater in agriculture lead to reduced productivity and reduced time available for livelihood activities due to ill-health leading to adverse livelihood and consumption outcomes, especially for the poor. Even among the marginalized population, experience shows that women and children are often most vulnerable.

The project will contribute to the existing body of research on food security, poverty, gender, and environmental security in India by evaluating the benefits and costs of wastewater irrigation vis-a-vis its livelihood, health, social and environmental impacts in selected sites. Strategies/technologies to effectively minimize negative impacts of wastewater use in agriculture will be examined. Findings will be disseminated widely to relevant stakeholders including policy makers and urban planners with the final objective of poverty reduction and increased food and environmental security for the agricultural communities especially vulnerable sections such as women and children. The findings of the research will contribute towards: better investment decisions in water management in agriculture that will improve people's livelihoods, whilst maintaining environmental integrity; poverty reduction and greater sensitivity to the needs of the poor in designing and implementing practical solutions to water development and management

2. GOAL

Food security, sustainable livelihoods and poverty alleviation by mitigating the negative impacts of wastewater use in agriculture (please see log-frame in Annexure 1).

3. PROJECT PURPOSE

1. Contribute to the existing research/knowledge on urban wastewater use for agriculture in India by: (i) undertaking primary research on current practices, costs and benefits of wastewater use in agriculture vis-à-vis social, economic, health and environmental parameters; (ii) identifying best practices for mitigation of negative impacts (iii) assessing the replicability of potential cost-effective technologies in different agro-climatic and socio cultural set-ups (iv) developing the methodology for and carrying out nationwide assessments based on key cities, of the extents and significance of wastewater use in relation to volumes of wastewater generated, volumes used, areas irrigated, families benefited, crops grown, and its impact on the national or local economy.

2. Sensitization of stakeholders including policy makers/ officials on findings on negative impacts of urban wastewater use and possible ways of mitigating these to help water users, development/research organizations, governments, local level partners make better investments in water management for agricultural development. The purpose is to facilitate human capacity building to ensure better management of urban wastewater.

4. OUTPUTS

1. A peer-reviewed publication for dissemination, which would (a) quantify and document the significance of wastewater use in agriculture in selected sites including current use patterns, identifying costs and benefits of wastewater use vis-à-vis social, economic, health and environmental parameters and documenting best practices; (b) analyze and document select experiences with cost effective technologies and management practices to minimize the negative impacts of wastewater use in agriculture with the objective of assessing their replicability and (c) document the results of nationwide assessments, of the significance of wastewater use in relation to volumes of wastewater generated, volumes used, areas irrigated, families benefited, crops grown, and its impact on the national or local economy.

2. Data sets on parameters related to wastewater use in the sites selected and on the quantum of wastewater use at the national level.

3. Regional dissemination workshops/ meetings to share the results to better inform and sensitize decision makers in governmental and non-governmental agencies involved in regulating the use of the land and water, of the importance of wastewater for livelihoods of various groups of people and the need to address the negative impacts of wastewater use in agriculture and the options available to address the same.

5. ACTIVITIES

The cluster of activities corresponding to each of the outputs (4) are listed below:

(i) To document the significance of wastewater use in agriculture in selected sites the following activities will be undertaken: (a) for each site selected, formal and informal institutions (e.g. informal group of agricultural landowners that meet to fix rents on land and to fix labor rates as well as to organize the hiring of laborers to maintain irrigation channels) that play a role in wastewater management will be identified; (b) a participatory approach will be adopted for conducting in-depth case studies. The methodology to be adopted will be developed in conjunction with selected communities and NARES; (c) surveys instruments will be developed to carry out primary data collection in the selected sites; (d) community surveys and situational analysis will be conducted in the selected locations; (e) cost benefit analysis will be carried out by conducting an in-depth study of current practices of wastewater use vis-à-vis social, economic, health and environmental parameters within target communities

(ii) To analyze select experiences with cost effective technologies for minimizing negative impacts, the following will be undertaken: (a) An in-depth study of successful interventions in the selected sites in Kolkota and (b) Documentation of best practices adopted for mitigation of negative impacts of wastewater use in the study sites.

(iii) To document the results of nationwide assessments, a methodology will be developed in conjunction with collaborating partners, for carrying out nationwide assessments based on key cities or urban areas, of the significance of wastewater use.

(iv) To disseminate the results of the research the following activities will be undertaken: (a) Local and national workshops/ stakeholder consultations; (b) Information collection instruments to hold consultations with relevant policy-makers and government officials, with whom regular interactions will be held throughout the project period; (c) A peer reviewed research report documenting the research findings and the data sets developed and readied for dissemination; (d) dissemination workshops organized in conjunction with collaborating partners to better inform relevant stakeholders.

6. METHODOLOGY

The proposed research study will use a combination of research approaches, including secondary literature review, in-depth case studies by use of quantitative and qualitative tools involving participatory methods and analyses of secondary and primary data. A detailed timeline is at Annexure 2.

A. Case studies: In-depth case studies will be conducted in four locations in collaboration with local institutions working on areas of water quality, agriculture and land. These will focus on (a) quantifying and documenting the impacts and current dynamics of wastewater use and (b) documenting cost effective interventions for wastewater use in agriculture. Location details of the case studies are in section 8. For each, the following will be studied:

- Current agricultural practices: Factors influencing crop choice, productivity, diversification; wastewater source and extent of treatment; its economics vis-a- vis other irrigation options; methods of cultivation; change in fertilizer use; agro-economic aspects including produce quality and price.
- Poverty reduction and livelihood impacts: Different wastewater user categories and the worst affected, their needs and livelihood dependence on wastewater use; alternative options of using alternative means of irrigation; water availability for rural domestic and livestock use.
- Health Risks: from chemicals in wastewater, assessing the importance of pollutants –soil –crops –food –cycle; prevalence of diseases like hookworms/ bacterial infections caused by exposure to wastewater (disease incidence frequency in exposed and unexposed families); incidence of diseases like cholera and typhoid (transmitted by contaminated vegetables); diseases transmitted through cattle grazing on lands irrigated with raw wastewater; post-harvest contamination risks, farmers perception of wastewater quality and economic valuation of health impacts.
- Mitigation strategies: Indigenous knowledge regarding negative impacts of wastewater use and possible low-cost treatment options; hygiene practices to prevent worm infections and diarrhea.
- Environmental impacts: Impacts of wastewater use on land fertility and quality including salinity build up, irrigation induced crop intensification and contamination, increase in biological imbalances (weeds, pests) etc, water pollution, including toxic concentration of substances in surface and groundwater (salts, metals and pesticides).
- Gender impacts: Gender composition of those involved in each type of distinct activity that relies on the existence of wastewater. The socio-economic and health impacts of wastewater use on women and children.
- Institutional issues: Land-tenure issues including land values and land taxes; enabling environment, including the framework of national policies, legislation and regulations for water resources management stakeholders; the institutional roles of the various administrative levels, including formal and informal institutions that play a role in wastewater management.

B. Consultations with local policy makers/ planning authorities: In each case study site, the research team will identify various stakeholders in urban wastewater use for agriculture, to get information from and to share the research findings with. A *Consultative Group* will be constituted with whom research findings will be shared frequently to provide guidance and feedback. Pertinent issues include how governmental and informal institutions are responding to the growing needs of wastewater management in agriculture, what type of coordination exists between these institutions and with what implications.

C. Synthesis of results: The information collected will be synthesized to yield direction for the following issues: possible health and environmental risk mitigation strategies; policy recommendations on urban wastewater use in agriculture, based on a review of local policies and regulations (national level, city level) and identification of barriers for more effective policy development; development of flexible "response scenarios" for risk reducing strategies that are technically, economically, socio-culturally and politically compatible.

D. National assessment: Exact figure on the extent and quality of wastewater used for agriculture in India is unknown and only estimates exist. Shuval et al. (1986) mention an area of over 12,000 ha while in Strauss and Blumenthal (1990) the area is over 73,000 ha. Both estimates are likely to be on the very lower side. Based on (a) secondary data on quantities of urban wastewater generated, nature of treatment, and (b) primary data generated through surveys conducted as part of case studies, a nationwide assessment will be carried out, of the extent and significance of wastewater use (treated, partially treated, fully treated).

7. BENEFICIARIES AND IMPACT

As indicated over 73,000 ha is irrigated by millions of farmers using wastewater. In general, decision-makers have held that the use of untreated wastewater in agriculture is unacceptable and that only when the water is appropriately treated, significant benefits can be obtained. This approach leads to a marginalization of poor wastewater farmers who are unlikely to benefit from treatment of the wastewater that they use or from alternative water sources in the near future. This viewpoint can largely be attributed to the fact that there is a dearth of ground data and systematically collected information on the dynamics of wastewater use in agriculture. This study is aimed at addressing this research gap and better informing policy makers about the various dimensions of the issue.

In the short term, a better understanding of wastewater issuss in agriculture would lead to better policy formulation, better investment decisions by Governments and donor agencies and mitigation of negative health and environmental impacts of wastewater through technological and other measures.

In the long term, the impacts would be a better institutional policy and incentive framework within which wastewater could be effectively used for agriculture with minimal environmental and health impacts. The mitigation strategies adopted, based on best practices identified, could impact positively millions of farmers forced to use wastewater and people consuming such agricultural output, by enhancing productivity, increasing livelihood and environmental security. Partner organizations in the four locations have been working closely with farming communities using wastewater. Hence, the proposed research would provide key insights helping to respond to the needs of the communities more effectively.

8. IMPLEMENTATION AND MANAGEMENT

Winrock International India, the coordinating agency will carry out an in-depth literature review for the purpose of the research. The partnering agencies, BAIF, IST and Jadavpur University will provide scientific inputs in environmental and health impacts for the project. In Kanpur, Kolkata and Ahmedabad the research will be carried out jointly by WII/ BAIF, WII/JU and WII/ IST respectively. For Delhi, the research will be carried out by WII with inputs from BIAF and IST. The contact details of the partner institutions are at Annexure 3. The organizational profiles of the four institutions involved are given under “Collaborators and Partners” on page 1 of this proposal.

Location of different components of the work

On the basis of data available on the quantities of wastewater generated, its treatment and mode of disposal in key urban centers and in major river basins, evidence of communities/farmers using river wastewater for agriculture, four sites – Delhi, Ahmedabad, Kanpur and Kolkata- have been selected. One of the case studies

(Kolkata) will specifically focus on documenting an innovative cost-effective approach to minimizing the negative impacts of wastewater use through aquaculture.

City	Total waste water generated (mld)	% of wastewater collected	Mode of disposal
Delhi	1270	80	Agriculture, Yamuna river
Ahemedabad	556	80	Sabarmati river
Kanpur	200	75	Ganga, sewage farm
Kolkata*	1432	75	Kolkata wetlands/ fish farms

* For documentation of successful intervention

<u>Case studies for impact assessment of wastewater use in agriculture:</u> The two most polluted rivers of the country are Yamuna and Sabarmati and the guilty cities are Delhi and Ahmedabad. Delhi generates more than 3000 MLD of wastewater. With sewage treatment plants functioning erratically, the wastewater enters the Yamuna partially/ untreated with a high BOD of 35 to 40 mg/l. Delhi alone generates 2,250 mld of sewage. Some 3.5 lakh people live in the 62,000 jhuggies (in slums) on the Yamuna riverbed and its embankments. A large number of these practice farming on the riverbed. The city of Ahmedabad pours sewage and industrial effluents in Sabarmati river, which has a BOD of 15 to 20 mg/l.

The third case study is in Kanpur, on the banks of river Ganga which is home to 47% of the total irrigated area in the country. The river is highly polluted and it passes alongside 29 Class – I cities; 23 Class-II cities and 48 towns of upto 50,000 people. It has been estimated that about 1.4 × 106 m^3 of domestic wastewater and 0.26 × 106 m^3 of industrial sewage are going into the river every day. The CPCB reports that three-fourths of the pollution of the river comes from the discharge of untreated municipal sewage, of which 88% is created in Class-I cities. Pollution is also caused by industrial wastewater, including effluents from tanneries, especially in Kanpur and from agricultural run-off containing residues of harmful pesticides and fertilisers.

Specific locations have been short-listed with the collaborating partners and would be finalized through wider community participation at the time of project commencement.

<u>Advantages of Kolkata Case--documenting cost-effective interventions</u>**:** Kolkata uses sewage water productively, by diverting a large part of the city sewage to the wetlands that forms the basis of extensive fish rearing. Kolkota handles approximately 3 m3/s of wastewater in 3,200 hectares of ponds to produce 2.4 T/ha/yr of fish. Three projects in the peri-urban areas of Kolkata have been taken up with the participation of local people, fishermen and the village council/ municipal government. The Kolkata Wetlands, consisting of some 30 km^2 of fishponds are the world's largest sewage-fed fish production site. The effluent from the wastewater-fed fishponds is further used to grow non-monsoon paddy, a recent innovation compared to garbage vegetable gardens and wastewater-fed fishponds. However, there has been evidence that industrial pollutants such as chromium and cadmium find their way into the wetlands, which are causing adverse health impacts that are yet to be measured.

Policy and institutional environment within which project will operate

In India, issues related to wastewater use in irrigation involve many governmental agencies, directly or indirectly, in different aspects of wastewater use. These institutions are the city municipal corporations (responsible for water supply and collection and disposal of solid waster and wastewater), the revenue departments (responsible for the land tax in peri-urban areas), the state urban development agencies (regulate the space in cities), and the State and Central Groundwater and Pollution Control Boards. Besides a number of informal institutions play a role in wastewater management, including social and market networks related to land rental/ labour sharing, moneylenders, caste associations. The existing institutional environment suffers from (a) incomplete understanding of the issues involved, especially the livelihood related ones, and (b) inadequate coordination among the agencies involved. In the absence of reliable information on existing practices on management of untreated wastewater irrigation it is difficult to make informed judgments about the costs and benefits, and therefore the trade-offs, associated with different practices. Interaction with the project partners clearly indicate that at the field level these gaps are being reflected in the kind of practices being adopted by wastewater irrigators and the environmental and health hazards faced by them. The proposed project, by creating local consultative groups and through regular interactions with them, will (a) sensitize policy makers (at local-city, state and national levels) to the issues related to wastewater use, and (b) provide a forum to facilitate knowledge and information sharing between the various stakeholders.

Specific milestones

Please see annexure 2.

9. DISSEMINATION STRATEGY

The stakeholders at different levels include: (a) cultivators, consumers of agricultural products produced using wastewater, the Municipal Corporations, Urban Development Authorities, Pollution Control Boards in the four cities; (b) central ministries and donor organizations.

A dissemination strategy will therefore operate at different levels, simultaneously and/ or in sequence. Methodologically, since the main thrust is on personal or group meetings and interviews with different stakeholders, it would be important to adequately engage key stakeholders, especially Government officials and policy makers over sufficiently long periods. To do this continual interaction will be maintained through regular meetings, group discussions and through e-mail.

As pertinent information is gathered and analyses generated, it will be shared through discussions and workshops with senior bureaucrats/ management, NGO groups and researchers. Interim reports would be shared with relevant stakeholders for feedback particularly for inputs into making research more relevant to policy making. At the policy making level engagement of policy makers (including donors) and politicians would be secured through an iterative process and followed up by clearly written and simple to follow agenda notes, minutes and briefing notes. In several cases relevant vernacular versions would need to be used to elicit better response.

People inhabiting similar agro-climatic, socio-economic conditions, especially from other cities from South Asia, Latin America and Africa can benefit from the results of this research. The findings and other interesting insights would be posted on websites (e.g. on IWMI and Winrock India websites) for wider access to researchers, academia and those engaged with policy processes.

10. MONITORING

Please see log-frame in Annexure 1.

11. BUDGET

Indicative budget in Lakhs INR

Name of Project: Urban Wastewater: Livelihoods, Health and Environmental Impacts in India
Project Leader: Winrock International India
Theme: Wastewater Studies

S. No.	Line Item	Total	Contribution by WII	Amount Requested under CAWMA
1	NARES (Scientific Testing Laboratories: for testing environmental parameters and toxicity in crops)	6	0	6
2	Consultants	2.6	0	2.6
3	WII Staff Salaries & Benefits	4.5	0	4.5
4	Office & Research Supplies	1.5	0	1.5
5	Workshops/ meetings (8 nos; 2 per location)	3.6	0.6	3.0
6	Publications & Disseminations (One national level workshop; one publication on findings of study)	5	0.6	4.4
7	Contract Research (for Ahmedabad, Kanpur and Kolkata partners)	7.5	0	7.5
8	Contingency (approx. 5%)	1.8	1.8	0
9	Travel (Vehicles and equipment) /local and domestic conveyance of WII and consultants	6	1.45	4.55
	Total	38.5	4.45	34.05
	Requested by WII (1 USD = 45.46 INR)			**$74,901***

Note: The project budget would range between $60,000-$75,000, depending on the number of field locations and parameters covered.