

Reuse of Wastewater, a Global Perspective

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Many cities in the developing world face a myriad of problems in providing water supply, solid and liquid waste management, and food security to their growing populations. Two-thirds of the urban wastewater generated in the world receives no treatment at all. In most cases, the wastewater is dumped in the most convenient surface water source, be it a river, canal, lake, or ocean. The costs involved in providing wastewater treatment facilities for all cities are astronomical. And even if the resources are available there is no guarantee that the situation improves. Many of the wastewater treatment plants are not functioning properly. This can partly be explained by the tendency of local authorities to request the 'best' and 'most modern' available technologies, rather than low-cost alternatives that might be more appropriate.

An alternative to the disposal of untreated urban wastewater in surface water is to reuse the water for agriculture. In this way wastewater may be seen as a resource, which provides an opportunity for increasing food security in rapidly growing urban areas. Advantages of reuse of wastewater in agriculture are that it:

- conserves water (by recycling and groundwater recharge);
- is a low-cost method for sanitary disposal of municipal wastewater;
- reduces pollution of rivers and other surface water;
- conserves nutrients, thereby reducing the need for artificial fertilizer;
- increases crop yields; and
- provides a reliable water supply to farmers.

However, there are a number of important disadvantages:

- health risks for the irrigators and communities who are in prolonged contact with untreated wastewater and the consumers of vegetables irrigated with wastewater;
- contamination of groundwater, especially with nitrates;
- buildup of chemical pollutants in the soil, especially heavy metals; and the
- creation of habitats for disease vectors such as mosquitoes in peri-urban areas.

The potential negative impacts on human health have always been the main concern in relation to wastewater reuse. However, there are many misunderstandings around this issue and it is helpful to review the history of wastewater reuse.

In the second half of the 19th century, when cities were growing there was a lot of public and official support for wastewater farming which was seen as a method to prevent pollution of

rivers and to retain nutrients. In the 20th century we became aware of bacteria and other microorganisms and people started to question the safety of wastewater irrigation. As a result water quality standards were set and included in new legislation to restrict wastewater irrigation. The standards had no scientific basis but were very strict and reached a level of authority, first in the USA and later in many other countries. Standards were very strict and could only be achieved with expensive treatment. Therefore most public health engineers in developing countries decided that it was better to do nothing than to get involved in something that was unable to meet the government quality standards. It was not until 1986 that a World Bank commissioned study (Shuval et al. 1986) reviewed all epidemiological evidence. The main conclusion was that standards had been overly restrictive because there was a difference between a potential risk when there are pathogens in the water and an actual risk of people falling ill, which depends on several other factors. They suggested a standard of < 1000 fecal coliforms per 100 ml for unrestricted irrigation, much more lenient than the previous guidelines. On the other hand, there was increasing evidence that worm infections were the major problem and the standard was set that wastewater used for unrestricted irrigation should contain no more than 1 worm egg per liter of water.

We seem to be back to the situation of a century ago. There is now increasing awareness that we have to prevent pollution of surface water and that we should recycle valuable nutrients. And the world now faces new problems: water scarcity, population increase, and mega-cities with sanitation problems that nobody can solve. For all these reasons it is quite likely that many towns in developing countries will expand irrigation with untreated wastewater. Governments may wish to regulate reuse but are unable to offer practical solutions to the users. Developing a framework for evaluating the different options and tradeoffs, for informed decision making is therefore an urgent matter.

Bibliography

Shuval, H.I.; A. Adin; B. Fattal; E. Rawitz; and P. Yekutieli. 1986. *Wastewater irrigation in developing countries: Health effects and technical solutions*. World Bank Technical Paper No. 51. Washington: The World Bank.