SOLID WASTE COLLECTION AND DISPOSAL SYSTEMS (COLLECTION, TRAITMENT, RECYCLING)

These guidelines relate to projects, project components and activities related to repair pipes for the collection and disposal of wastewater pumping stations , treatment facilities , conventional or innovative , to recovery and recycling of wastewater spills at sea; treatment facilities waste sludge to smaller networks and various waste- water in urban or rural areas, the urban stormwater drainage . In areas where the problems of water quality are particularly severe , as in urban areas with high population density , it should execute projects related to wastewater , in each case , these individual projects thus enable progressively achieve the objectives pursued by the programs against pollution , in principle , do not give results until ten or twenty years and sometimes more. The proposed fight against water pollution are often using measures of institutional capacity as well as components with the aim to formulate a national policy to fight against pollution of water.

## Potential impacts on the environment

Pollutants from municipal wastewater dissolved and suspended solids which consist of organic and inorganic substances, nutrients, oil and grease, toxic substances and micro-organisms. In urban areas, stormwater may contain the same pollutants, sometimes reaching remarkably high concentrations. Human waste that are not adequately addressed and which is removed from the place of origin or which are collected and removed pose risks of hepatitis, parasitic infection when there is direct contact with feces and gastrointestinal diseases, including cholera and typhoid are caused by contaminated water and food.

The wastewater collected but not submitted to adequate treatment before disposal or reuse pose the same dangers to the health of people living at the source of emissions. If these emissions are discharged into receiving waters , the effects will be even more damaging. For example, the accumulation of solid deteriorating aquatic and marine habitats , and the decomposition of organic matter causes deoxygenation of water , toxic substances can harm marine organisms and spread to the upper by means of bioaccumulation in the food chain organisms. The nutrients in effluent flowing into the confined waters of a lake or bay , for example , can cause their eutrophication and encourage the growth of algae and weeds that then disrupt fisheries and activities recreation. The wastewater can generate solid waste in the form of abrasive particles , oversize , primary and secondary sludge can pollute soil and groundwater if improperly managed

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Projects related to wastewater are performed to prevent or mitigate the effects of the pollutants described above have on the human and natural environment. Their impact on the environment is generally positive if done appropriately. Reducing inconvenience and risks to public health of a serviced sector , improving the quality of receiving waters and increased beneficial uses of these are part of the direct impact that is sought . In addition, the establishment of a service for the collection and treatment of wastewater contributes to better control industrial waters that reach the public sewer and pretreatment stations , on the one hand , and offer the other hand , the opportunity to recycle profit effluents and sludge treated . Indirect impacts include the availability of serviced land for development , increased fishery yields and income they provide , the increase in revenue generated by the development of tourism and leisure activities , improved agricultural productivity and forestry or less necessary to use

chemical fertilizers , provided that the sludge and treated effluent is recycled and finally , less pressure on water resources through the reuse of effluent

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Most of these positive impacts are amenable to quantitative assessment can be incorporated in the analysis of costs and benefits of alternatives during the development of a project related to the sewage . Can be measured , for example, the positive impact on human health by estimating the savings on health care costs and lost work days due to defective sanitation. In addition, a cost reduction in industrial water treatment and drinking water and increased revenues from fishing , recreation and tourism may partially contribute to the benefits brought by improving the quality of water receiving . In a region where housing demand is high, the benefits of having serviced plots can , in some way , be reflected in the cost differences there are between previously provide infrastructure or equip afterthought communities that have settled spontaneously

The construction and operation of networks in which wastewater or sludge is treated may be more expensive than those where these are considered waste to be removed. However, it is always important to give, in the evaluation of alternatives, on the one hand the beneficial effects provided: greater availability of water to serve the development of the region, the possibility of reducing the demand for irrigation with public services and the need for chemical fertilizers, the opportunity to gradually improve agricultural production and timber, how to restore the canopy low cost marginal lands or exploit for agriculture or forestry. It can also measure most of these positive effects by calculating the savings.

Unless they have been properly planned and well located, their design and construction carefully made and that their facilities are properly operated and maintained , there is reason to believe that the projects related to wastewater will in general , negative impacts and reach not provide all the benefits for which the investment was intended. In addition, they will have a negative impact on other aspects of the environment. The items listed can be explained for the most of themselves , they do not have , therefore, been examined in detail in the text. There are, however , aspects that many potential impacts share with many mitigation and which should be emphasized throughout the development , evaluation and implementation the project. These are:
- First, the importance of planning wisely calculated and overall service of sewage ;
- Secondly, the fundamental dependence of this type of project in respect of a holding and adequate maintenance (which require strong institutional support);
- Finally, the selection of appropriate technology; fourth, the need for a program of industrial wastewater pretreatment in all municipal services serving industries, and finally, the need to consider a number of impacts likely to affect the socio-cultural environment and which are not always taken into account when developing the project (see Table 9.8 at the end of this section, which summarizes all potential impacts and recommends measures mitigation)

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specific problems

planning

It is important not to take any decision regarding effluent, where they will be discharged and the level of selected treatment without first having any sufficient data. Knowing the volume of wastewater currently produced and composition is

essential in the planning, in the same way that realistic calculations of projected volumes are essential to estimate the magnitude and distribution over time of collection needs and treatment. It would be important to consider other development plans, when establishing and updating the projections, so that the increase in equipment capacity programs are in agreement with them.

The level of treatment, i-e, the degree of purification treatment system achieve depends on the performance standards that apply to it. These standards are usually set out in terms of rate limits of concentration of the controlled substances in the treated effluent. If effluent is intended to be applied to crops, the standards are set so as to avoid contamination of crops and groundwater pollution. In case there would be no national standards for recycling effluent standards of the World Health Organization (WHO) or the Bank or we will build on established standards will be applied in other countries

The formulation of discharge standards in surface waters generally begins with the classification of the receiving waters to the intended or expected. Quality standards of the receiving water can then be derived from the literature to clarify the appropriate uses for each category.

Preferably, the effluent limitations for polluters to emit should be determined using a mathematical model that takes into account the current water quality and features that characterize the flow of receiving waters and calculate , then the maximum load of each pollutant can be absorbed in each segment or sector and without the standards are violated, depending on the particular state of the flow in the dry season statistically determined (eg . minimum monthly rate over a period of five years ) burden that would be then distributed among all those responsible for pollution. Such models require data on the quality of receiving waters and on the volume and concentration of all spills , according to

the seasons , and a register listing , long enough , hydrological data to establish the means of seasonal flows and calculate the dry season.

In fact, to simplify the method of preparation of discharge permits or establishing baseline or minimum national effluent limitations are often set to match the various categories of receiving waters. Mathematical models are reserved for situations in which these limits does not lead to quality standards that we seek to achieve and require therefore more stringent requirements (or in the case of projects prepared for countries that do not have regulations regarding water quality or discharge).

Limitations for discharges into marine waters are usually simple , they aim to fight against fading water pollution caused by oil and grease , debris floating on the sea surface and against the bacteria ( in the swimming areas and waters where shellfish is gathered ) . Planning involves selecting a suitable place for spills and where the effluent will not degrade important areas and will not contaminate shellfish beds and beaches. There are mathematical models that simulate the phenomena of dilution , dispersion , diffusion, stratification and reduction or elimination of pollutants. To do this, these models require recent data on temperature, salinity and water quality collected over a full cycle of twelve months, which must be added the detailed bathymetric and ecological information .

Data collection and simulation experiments are both expensive and time consuming. However, the fact remains that when compared to investment and operating costs on the one hand, and the expected life of sewage networks, on

the other hand, they both become insignificant especially if one considers the tremendous benefits they can have - facilities that maintain the desired quality criteria or do not require any unnecessary expenses. It happens sometimes that the data are collected at the same time as the design and implementation of the project when it takes place according to the phases described below.

The establishment of the progression and stages of a project is also part of the planning of each project on wastewater is part of pollution control programs in the long term that takes into account the activities of other sectors. For example, the establishment of a network of sewage collection without installing treatment plants will result in concentrating hazardous substances that almost always an obvious pollution of surface waters. The net effect will result in a worsening water shortages or increased costs of treatment of water intended for human consumption and other uses. Install a public water supply system designed for homes, commerce and tourism, without accompanying treatment infrastructure will lead to risks to public health and water pollution.

Several examples show that it is profitable to build treatment plants modular can expand their capacity as the collection expands and new connections are established. Stagger investments in sewage appears to be the only realistic perspective to grow closer to the task , ultimately , is to provide water quality in high-density populations or in seriously polluted areas , while a single project would exhaust all resources allocated to public works by disrupting the region's infrastructure . One project undertaken by step treatment levels or that part of the strategy of a sector is an effective way to respond to the urgent need to improve the environment where financial resources are limited or when scientific data to determine the amount of pollutants to eliminate missing. It is important

that a phased approach provides for future expansion work at the time of acquisition of the location and design of facilities .

The wastewater treatment generates sludge and solid waste, such as coarse particles and fatty substances obtained from screening. It is often difficult to find areas of landfill or incineration as well as opportunities for recycling. In the absence of solutions, a certain amount of these substances from sewage go pollute the land. The management of sewage sludge should be an integral part of a plan to sewage

.

Operation and Maintenance

Treatment plants and pumping will not work if they are not operated and maintained properly. The most common failure causes facilities are inadequate technology, lack of spare parts, technicians and workers, energy supplies and unreliable chemicals. . Most are due to institutional weaknesses when it comes to technical and management services, inadequate operating budgets and the surly wages (a water pricing that does not reflect reality and therefore does not cover the cost of water supply and sewage explain the state budget and low wages).

Choice of appropriate technology

Appropriate technology to a network of sewage includes aspects of both technical, institutional, economic and social. Technical and institutional point of view, a poor choice of technology has been identified as the main cause of failure. Wastewater is a hostile electronic equipment, electrical and mechanical maintenance activities are endless, needing parts, laboratories, certified

technicians, technical assistance and specialized areas of sufficient budget . In developing countries where a number of aspects oppose a successful maintenance program, it is this element that should be taken into account when choosing a technology for water treatment and pumping

The choice of technology are generally simpler in the case of small communities or rural areas and yet , the fact that the institutional aspects are closely intertwined with the social aspects , these choices remain extremely important. Municipalities should be able to manage programs or networks of sewage , and community involvement can be critical to their success. Social preferences and customary practices are of considerable importance , and if some can be modified through educational programs , others, however, are so ingrained that they resist change . The economic sphere is involved in the decisions of two ways, it can be expected that the type of the simplest technologies , chosen because of a mode of operation and easy maintenance will also be less expensive to build and operate at a lower cost. However, these technologies are proving not to be as economical in the case, for example , where you have to acquire a substantial extent of land required for stabilization ponds , installation at a better price that fails will eventually be more expensive than which is more expensive but works well

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industrial water

Connecting industries to municipal sewer system is generally a delicate matter. It allows , first, to reduce the number of outlets , and thereby the complexity and expense of monitoring and enforcement , it provides the means to better manage industrial effluents and lower overall expenditures. It remains , however,

that are absolutely essential to the success of a program of industrial wastewater pretreatment accompanied by regulations specifying limits of toxic and hazardous substances or other that can be discharged into public and networks and means of monitoring and enforcement in application. Otherwise , the staff involved in the network and some components are at risk of being exposed to hazardous substances that disrupt the treatment process , pollute the land and receiving waters and contaminate sludge treatment facilities such a way that they can not be used, or even be removed without causing problems .

socio-cultural issues

Treatment plants need land and their installation can lead to displacement . Moreover , the activities of treatment and disposal may be responsible , at least from time to time , inconvenience to the neighborhood. Selected land and surrounding land are often occupied by "vulnerable groups" who can not afford to be dismantled and whose livelihoods are already quite compromised. Should provide special attention to the location of the treatment plants and landfills by ensuring that odor and noise are not inconvenience to residents and other users of the area and travel s ' perform as humanely as possible . In addition, it would be appropriate to include in the project support measures that would mitigate or neutralize the negative impacts on the human environment. If these aspects are not included in the development of the project, the risk of solving the problem of the human environment transpose is also very real .

Alternatives projects

There are a variety of solutions for the choice of location and technology when it comes to services for the collection, treatment, sewage and sludge management. A number of them can be applied to all situations.

(a) **(a)**

(b) Collection Systems

- on-site treatment;
- Individual septic tanks and drain by truck;
- sewer pipes of small diameter, operated by gravity or under pressure or vacuum;
- shallow sewers;
- Sewer "flat";
- Simplified drainage systems;
- Conventional gravity sewer or pressure;
- collection of regional networks;
- Community networks or sub-regional

.

**(b)** Disposal Systems

- community facilities on site;
- pits oxidation;
- stabilization ponds;
- aerated lagoons;
- Constructed wetlands (or constructed wetlands);
- filtration soil;
- conventional biological treatment;
- physico-chemical treatment;
- preliminary or primary treatment and disposal at sea.

**(c)** evacuation

- recycling in agriculture, forestry, aquaculture and landscaping;
- groundwater recharge;
- rapid infiltration;
- injection into the basement;
- recycling in industrial activities;
- discharge into the sea;
- discharge to surface water;
- treatment plants fecal waste

.

**(d)** Management of sewage sludge

- composting;
- adding composting municipal waste;
- recycling in agriculture and forestry;
- development of marginal lands for agriculture and reforestation;
- Energy recovery (biogas);
- incineration;
- discharges;
- disposal at sea

.

Management and Training

Institutional support is essential for a service wastewater to work conclusively . Such support requires first a personal contribution . Indeed , a major sewer system and treatment can not move from a technical and administrative

director, environmentalist engineers, foremen and workers responsible for the operation of facilities , personnel trained in the maintenance of sewers and treatment plants , chefs and laboratory technicians and managerial staff in accounting, budget and administrative services. If the project has planned disposal facilities on-site septic tanks or pipes of small diameter sewers equipped with sedimentation tanks , personnel shall establish and implement standards for these facilities, and that function will be to inspect and approve them by ensuring that arrangements are made for their maintenance. A customer service listening to the users to meet their claims , inform the public and conduct educational programs on services such as health and sanitation , maintenance of on-site facilities is also essential . If the service itself is responsible for the collection of bills , it will consider establishing a team of billing and collection . The employment status of employees and their wages must be attractive enough to accommodate a qualified and not to encourage them to leave, once they completed training.

A number of various organizations can carry out the operation of a service of wastewater, municipal service, for example, a local or regional department or a concession. Planning, operations and administrative functions required by conventional drainage systems can fall into one of these structures. In the case of projects on-site facilities for individuals or small communities, it would be better to centralize responsibilities. The development of the areas to be served by these types of facilities, the establishment of standards of construction, installation and maintenance should more or less remain centralized

.

Issuing permits for installations and inspection should be the responsibility of the government. While it makes sense to delegate this power to local authorities, it should be exercised by a centralized where the network is a hybrid version of a

settlement and a conventional installation service . Technical assistance required for installation work and educational activities designed to inform users on the operation and maintenance of the network are services that can be better performed at the local level by local authorities or NGOs . Service maintenance , including pumping septic tanks, should definitely be privatized and operate under the control of local authorities. If there were no agencies can perform maintenance operations , it should then consider whether this task is undertaken by a centralized service. It would be important that the disposal of waste from septic tanks is regulated according to the norms established by the government and controlled by the agency that would administer the location , facilities and recycling program.

It would be good to start giving training courses , with the assistance of the consultant responsible for the network design , prior to starting operations . The purpose of these courses is not only that staff become familiar with the network and has an understanding of its relationship with the environment and the fundamental principles governing the rules of occupational health and safety , but also receive instruction on how to operate and maintain equipment . The personnel of industrial waste will receive specialized training in sampling procedures and implementation. Employees in industries related to it will require training on the operation and maintenance of pretreatment equipment . Every employee is expected to enter confined spaces , working in deep trenches , to ensure the proper operation of the electrical equipment to handle hazardous chemicals, such as chlorine , must be equipped accordingly and receive training on emergency measures. "Train the trainers" is a good formula to be adopted to enable staff to pursue training throughout the life of the facility

The total cost recovery must be provided by a service of wastewater to ensure its reliability . To do this, the service must have or be able to acquire the means

to determine costs and develop pricing . In general, rates include fixed costs calculated on the recovery of investment costs and added at rates that vary depending on the consumption of the user administrative expenses. A surcharge is an effective way to recover the additional costs represent services for industries discharging far exceed the average concentrations emitted by the waste water . If the service provided preferential rates to certain groups of users , as part of government policy , the government should then make the necessary steps to ensure that the operating budget is cut , having , for example, use cross subsidies to intercity

.

Starting a project on wastewater of a certain size should be prepared to meet the conditions just described. The project should provide for the establishment of personnel, maintenance equipment and spare parts, as expected needs, training of all employees and the establishment of financial resources and budget

.

Local, regional or national public health agencies and the environment will require resources and training to monitor the construction and operation of the network and, if necessary, the use of coercive force to enforce standards of performance. These agencies may need to provide support to the service that it is able to implement industrial pretreatment regulations. It would be important to include a program of institutional capacity to prepare projects for wastewater, if national standards against pollution of water agencies and procedures were not sufficiently developed

Monitoring

Insofar as it is talking about projects to improve the environment , good work inspection procedures ensuring that the network is built according to the requirements are similar to the practices of environmental management . It should especially ensure that mitigation measures are used to protect waterways , beaches and wetlands. Monitoring operation should be programmed to allow to examine the volume and concentration of effluent to detect toxic substances entering treatment facilities ; strengthen regulations for pretreatment of industrial materials, to control processing operations , to evaluate and manage the operation of the station , to monitor the quality of the environment in places where the water is discharged and to ensure that sewage sludge and reclaimed water meet recycling standards.

The frequency and complexity of sampling depend, among other things, the size of the network and the nature of the treatment processes. In general, control operations are expensive and require laboratories, equipment and technical personnel. For this reason, it is advisable, in general, to measure only the parameters that will manage facilities ensuring the safety of personnel and equipment as well as environmental protection

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The design of a monitoring program should primarily seek to encourage satisfactory operating practices. To do this, should establish standards of performance, collect data indicating that they meet these standards, interpret and then disclose promptly to responsible operations and decisions. It is also necessary to those responsible for improvements in the design of future projects for surveillance data. Too often, control programs are considered only as

coercive. While enforcement action may sometimes be necessary for the application of standards, a report in a timely conscientious treatment plant may better serve the environmental manager.

Table 9.8 Data collection, treatment, recycling and disposal of wastewater, Page 260 of the BM RF, vol.2

| Negative potential impacts | Mitigating Measures |
|---|---|
| | |