

Concepts on Sanitation in Rural Areas, applied to the Specific Conditions of Romania

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Abstract

This paper summarizes key strategic information about Romania's water, and wastewater sector, and health related risks, focusing on rural areas. The paper is aimed to guide the decision makers and other interested parties in improving the present policy and management practices, giving priority to the participation of local communities in the decision making process. It is also aimed to be a support paper for developing a consistent portfolio of mature projects, well prepared technically and institutionally, with the participation of rural local communities, to be submitted for various financing mechanisms. The paper could also be used as an education and lobby tool.

Keywords: sanitation in rural areas, water supply, water related diseases, involvement of local communities, management and educational tools

Introduction

Access to safe water and basic sanitation, along with adopting good hygiene practices are vital to the life of each person. Halve the population without sustainable access to clean water and sanitation till the year 2015 it is one of the targets of the Millennium Development Goals (MDG). The promotion of water, sanitation and hygiene (WASH) is one of the most popular UNICEF's programs, as a measure to support the development and in some cases the child survival in countries where infant mortality is high and coverage with water and sanitation is low [UNICEF]. Access to these services is a pre-condition of a better health, better education and economic development. If such services are not sufficiently developed, the consequences are economic costs related to the treatment of water-related diseases, pollution of water resources, which generate additional costs for the provision of clean water at home, loss of productive land for agriculture and loss of productive time because the access to water and sanitation is difficult or at long distance. Improving education, increasing the number of employees by increasing agricultural productivity and extension/ rehabilitation of infrastructure, should be important elements in the development strategy of each rural

community. Improved water and sanitation services may have an influence on public consciousness to recognize the role of government, and public institutions in responding to people's needs, supporting the legitimacy of the state. Including all citizens - women, youth and other vulnerable groups - in decision-making on water and sanitation infrastructure, can strengthen the government's role in ensuring the delivery of quality services and creating a connection between the population and governmental institutions

Frame for the development of sustainable sanitation in rural areas

1. General concepts regarding rural sanitation

Current forms of sanitation are different in urban areas compared to rural areas. In cities, centralized systems are used with or without treatment plants, while in rural and peri-urban poor areas are used toilets of pit latrines type, which ensure the retention of solids (fecal matter) but allow the infiltration of liquids (urine) [Water Management Toolbox].

The main disadvantages of centralized public systems are: water consumption, investment costs, energy consumption, operating costs, infrastructure maintenance, social acceptability of services' cost, mixing different waste water, and vulnerability. 90% of the effluent collected by this type of sewer systems is untreated or inadequately treated, contributing to the pollution of water resources (Corcoran, 2010).

The disadvantages of using latrines are:

- Infiltration of liquid fraction of dejects into the ground, and its entry into hydro-geologic water cycle
- Incomplete protection barriers between dejection and human activities
- Nutrients' infiltration into the soil and penetration in aquatic systems, leading to the likely occurrence of the phenomenon of eutrophication
- Penetration into water systems of pathogens and parasites that can generate water-related diseases, which actually have a fecal-oral transmission route.

Comparing conventional systems of sanitation with sustainable sanitation, we can say that first have to overcome technical problems, while the latter adopts a holistic integrative approach, by seeking solutions to social, environmental, economic and technical issues. Sustainable sanitation must be acceptable socially and culturally, and economically viable (Figure 1).

The basic principle of ecological sanitation is that wastewater should not be considered a waste, but a valuable resource.

Fig. 1: Basic principle of conventional sanitation



Source: Conradin, 2010

The objectives of sustainable sanitation are:

- Providing health and hygiene: (i) the existence of effective barriers between the user and the environment; (ii) prevent exposure to dejects at all levels of sanitation process;
- Respect the environment and natural resources: (i) protection of natural resources; (ii) recycling, low energy consumption and low emissions;
- Ensuring appropriate technology and operation: (i) adapt to local conditions; (ii) robustness against any incidents (floods, blackouts, water shortages);
- Considering the financial and economic aspects: (i) cost estimation throughout the project cycle;
- Respect for socio-cultural and institutional specificity: (i) the level of acceptance from the community (Windblau, 2004).

Sustainable sanitation approach is based on an integrative, holistic principle with respect for water and nutrient cycle (Figure 2).

Fig. 2: Sustainable sanitation



Source: SSWM

2. Legal frame in Romania

The Acquis Communautaire includes several Directives covering the areas of water and waste water: Water Framework Directive 2000/60/EC, Directive on Urban Wastewater Treatment 91/271/EC and Directive on the quality of water intended for human consumption 98/83/EC. Another relevant Directive in the context of access to clean water and sanitation in rural area is Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources. Romania transposed into national law, all EU legislative package. The integration of the two Directives into Romanian legislation - 2000/60/EC and 91/676/EEC - was achieved by amending Law 107/1996 and HG 964/2000. Following one specific approach included in the implementation of Directive 91/676/EEC, Romania originally designated nitrate vulnerable zones in 255 regions, representing 8.64% of the total area of the country, respectively 13.93% of total agricultural area. In 2003, the Romanian Government adopted the Millennium Development goals (MDG), including that of halving the population without access to water and sanitation by 2015.

Specific legislative references regarding the obligations related to sanitation in rural areas, are included in the Order no. 88 of 20 March 2007 approving the Framework Regulation

of Water Supply and Sewerage Services issued by the National Regulatory Authority for Public Services and Local Administration, published in the Official Journal no. 324 of 15 May 2007: „Art 152 (2) Users who are supplied with water from the distribution network or from own resources and are located in areas where there are no sewers, shall endow with watertight cesspools or local compact waste water treatment plant, built and operated under conditions imposed by environmental protection authorities, and water management authorities. Emptying and disposal of waste waters from such pits can be achieved either by the operator of sewage or by other authorized companies, which have already obtained the approval of the operator regarding the place and the technical conditions for discharge of waste water from the collecting process. (3) The emptying is prohibited in the areas where there is a public sewerage system in place, if the user accepts the service provided by the operator and has been notified about the takeover of wastewater into the sewage system and committed to make the connection". These provisions regulate basically just sealed septic tanks construction or local compact treatment plants, as rural sanitation solutions.

Sustainable Development Strategy of Public Services for Water Supply and Sanitation - Romania 2025, elaborated under coordination of Romanian Water Association (ARA), advocating the extension of centralized water and sanitation systems, and the increase of the coverage & access of the population to these services.

3. Institutional framework for investment promotion

ARA strategy takes into account two scenarios for estimating investment's needs for water and sanitation services: (i) a period of full alignment to the parameters required by the EU Directives of 15 years, starting in 2007; (ii) a negative growth for the total population evolving from 22,430,450 inhabitants in 2001 to 20,887,500 inhabitants in 2020, out of which in rural areas the development is from 10,146,564 inhabitants in 2001 to 10,079,000 inhabitants in 2020, with a population of 8.0 million people who will benefit from complete water and sewage services.

Specific investment for new infrastructure construction in rural areas was calculated assuming that the supply of water to the 8.0 millions people will be completely achieved by 2017, and the sewer networks will be achieved by 2022. For wastewater infrastructure in rural areas it was estimated a need of 528 Euro/capita, with a total of 4.2 billion Euros for the entire population.

Water and sanitation sector through Axis 1 of the Environment Sectorial Operational Program, will receive 60% of European funds allocated to Romania for the period 2014-2020. It promotes a balanced structure between urban and rural areas, between the extension and rehabilitation. Infrastructure projects will be based on the Master Plan and the revised list of priority investments approved by the Ministry of Environment and Climate Change.

4. Socio-economic situation

GDP per capita reflects the welfare, productivity and demand for goods and services and therefore is an important indicator of regional development. In 2012, GDP per capita in Romania was € 5.589, approximately 45% of EU-27 average percentage that is calculated taking into account purchasing power parity. There are large regional disparities in terms of GDP per capita. Bucharest - Ilfov region recorded a GDP more than double than the national average; only the Bucharest - Ilfov region and Western region exceed the national average.

In rural areas, the main problem is the traditional poverty associated with a low level of modernization, and economic life dominated by agriculture. The map of poverty in rural and urban areas shows a lower risk of poverty in rural areas that are close to a big city. In areas

where there are no urban centers or at suburbs of smaller or less developed cities, there is a tendency of a growing poverty (Stănculescu, 2004).

Significant differences can be observed at regional and interregional levels in terms of access to basic infrastructure and utilities. In 2011 at national level, 72% of municipalities had running water (11% more than in 2005) and only 30% were connected to sewage systems. 71.7% of the rural population and 14.5% of the urban population lived in households without access to hot water (*source Eurostat*).

National Center for Public Health Statistics and Information published figures on infant mortality in Romania in 2012, of 9 ‰ (decreasing) compared to 3.59 ‰ for Western European countries. Infant mortality by main causes of death in 2012 was of 0.2 ‰ by infectious and parasitic diseases, which are included in the category and fecal-oral transmitted diseases.

Study Case – Water Supply and Sanitation in Rural Localities of Nitrate Vulnerable Zones (NVZ)

A recent designation of areas vulnerable to nitrates from agricultural sources (December 2008) showed a considerably increased number reaching 1,963 communes, representing 60% of all the total territory of the country. Based on this background, the Ministry of Environment has initiated the project "Integrated Nutrient Pollution Control" (01/FBS/2011) funded by the World Bank and having the following main objectives: (i) reduce nutrients discharged into water bodies; (ii) promoting behavioural change at the regional level; (iii) support for strengthening the regulatory framework and institutional capacity to enforce it. Within the project were promoted investment in sewer systems and treatment plants, storage systems for manure and household waste, euro-bins for separate collection of garbage and protective forest belts.

Within the public awareness activities that were undertaken in 2012-2013, a total of 87 villages in 34 counties target audiences were informed and educated about the objectives and benefits of the project on integrated control of pollution by nitrates, were promoted behavioral changes of the target groups, emphasizing on the explanation of the link between the sources of pollution of water resources, water quality and the health risks to consumers.

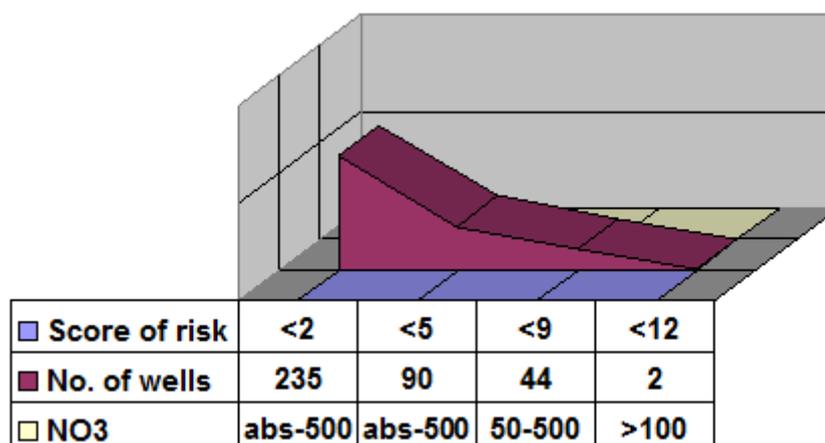
During field trips were conducted visits to individual households for assessing the status of the source of water supply - public or private fountain/well and sanitation, based on a standard questionnaire for sanitary inspection, with a risk score. The questionnaire included a total of 12 questions, and the risk score was divided into four categories, depending on which were established the actions to be undertaken: (i) score 0-2, low risk, water is good; (ii) score 3-5, moderate risk, water is acceptable; (iii) score 6-8 high risk, water should be sampled should be asked expert advice and should be temporarily used another source of water; (iv) score 9-12, very high risk, do not drink water until the causes of contamination are eliminated. Between June and September 2013 there were visited 67 villages, in which were carried out 371 completed questionnaires of sanitary inspection, the results being presented in Figure 3.

In 2012, the 41 counties in Romania reported a total of 2,187 small systems of water supply, supplying a population of 2,905,595 inhabitants, the rest were using private and public wells belonging to the category described above (Vartic, 2012).

Interpretation of the results of the sanitary inspections carried out on the field, highlighted the following issues:

- 63.34% of the investigated wells are in the range of a low risk score, it is considered that the water should be safe to drink; 24.26% scoring in a moderate range of risk, high risk for 11.86% and only 0.54% showed a very high risk score;

Fig. 3: The situation of wells' sanitary inspection



- When attempting a correlation of risk score classification derived from sanitary inspection, with the nitrate concentrations measured in well water, it appears that whatever the score is, the nitrate level is very high, exceeding in some cases 10 times the maximum admissible concentration under the laws in force (50mg NO₃/l water).

These results merely confirm that the villages inspected are located in areas vulnerable to nitrates from agricultural sources (mainly manure), with a background pollution (very likely coming from low sanitation), against which environmental interventions on long term for the decontamination of the aquifer have to be undertaken. At the same time, actions aimed at changing the mentality and behavior of the inhabitants living in nitrate vulnerable zones, to reduce and even stop the present pollution shall be undertaken.

To the pollution from agricultural sources is added at that coming from: (i) inadequate sanitation - dejects of human nature; (ii) lack of hygiene in the household; (iii) inappropriate location of the well, in relation to buildings/areas with different functionality in the household - animal barn, manure, latrine, garbage, vegetables garden, home itself; (iv) lack of organization of domestic and agricultural activities having a pollutant potential for the aquifer that supplies the well with water.

Several technical alternatives for reducing nitrate contamination of well water which can cause acute poisoning for newborn children whose food is prepared with such water are:

- drilling/digging a deeper well to be replenished from a clean aquifer;
- mixing contaminated water with clean water up to a dilution complying with maximum allowable concentration of water 50mg NO₃/l;
- giving up at contaminated water supply if there is another alternative;
- water treatment for the removal of nitrate excess by ion exchange resins or reverse osmosis, or any other technology suitable for small water supply systems;
- protecting water courses and water bodies against the future pollution by restricting or prohibiting the use of nitrogen based fertilizers within the hydro-geological protection zones;
- the adoption of new alternatives for sustainable sanitation to prevent groundwater pollution.

NVZ shall be addressed in a specific strategy with solutions to the problems of water and wastewater infrastructure. In building a long-term vision for these areas it must be taken

into account both the specific of the region, and of the village. Further on there are shown three typical situations identified in the field study (Table 1).

Păulești village is located in the center of Satu Mare County, in a plain area on the bank of Someș. Ground water level is at 5 m. Soil stratigraphy is represented by deposits of sand, loess, gravel, having generally 160-180 cm thick, over which, because of vegetation there were formed podzolic soils, thus creating favorable conditions for crops (cereals, vegetables, fruit trees). According to the 2011 census, the village has 4,909 inhabitants, with an increasing trend in comparison with the previous census since 2002.

Bocsig village is located in Arad County, in Ineu depression on the Valley of Crișul Alb. The soil is fertile, the agriculture being the main economic activity. According to the 2011 census, the village has 3,231 residents, with a decreasing trend in comparison with the previous census since 2002. The village has a water distribution network of 17.54 km, named micro-zonal Beliu-Bocsig. Central water supply is for 50% of the population, the rest of 50% using water from private and public wells, with no connection to sewer and waste water treatment plant.

Traian commune is located in the south of Olt County, in Caracal plain. The village has 3,300 residents, with a decreasing trend in comparison with the previous census. There is no water supply and sanitation system. The locality has a long tradition in animal husbandry. There is an interest in solving water supply and disposal of wastewater through local solutions.

Table 1. Examples of adequate sanitation solutions

County	Regional Operator/ Locality	Rural Locality	Distance to Regional Operator (km)	Sanitation	
				Existing Connection	Recommended Solution
Satu Mare	SC Apa Serv Satu Mare SA/ Satu Mare	Păulești	4	No connection	Connection to waste water treatment station of Satu Mare City
Arad	SC Compania de Apă ARAD SA/ Arad	Bocsig	69	No connection	Centralized local system <i>or connection to waste water treatment station of Ineu City located at 9km</i>
Olt	Compania de Apă Olt SA/ Slatina	Traian	62	No connection	Centralized local system <i>or connection at waste water treatment station of Caracal City, located at 20km</i>

In localities with clustered households and a significant number of inhabitants, where the investment is justified, shall be promoted the development of centralized drinking water supply and sewerage systems. If the rural locality is situated at short distance from a city where there are already centralized drinking water and sewage systems, the existing networks can be extended and connection can be established towards the particular commune/ village. If the distance is greater, it is recommended for the village to establish its own systems, with further

support from the regional operator to manage the situation. In small localities, with scattered households/individual buildings there are recommended the well/ borehole and pit latrine/ pit watertight cesspool for every household. For this case, the regional operators can develop services/ units specialized in the design, implementation, and operation of such individual devices, as well. Quality control of drinking water will be provided through collaboration between local structures of the Public Health Authority (DSP), National Administration of Romanian Waters (ANAR) and Regional Operators (OR). Cesspools will discharge wastewater to be treated in a station to be designated locally.

Summarizing, the recommended solutions to address sanitation in rural areas fall into three main types, considering the specific features of each situation: (i) the extension of the existing networks and the connection at the waste water treatment plant of the nearest city; (ii) local centralized system; (iii) solutions/ equipment for individual households.

5. Conclusions

Sustainable sanitation, especially in already vulnerable areas such as those under the pressure of pollution from agricultural sources, is the recommended approach because it is based on three simple principles:

- sewage and dejects are not considered wastes, but valuable resources that can be recycled
- sanitation systems are organized to be socially acceptable and economically viable
- there is no ideal solution for all situations, it has to be identified the appropriate option which takes into account the climate, availability of water resource, agricultural practices, socio-cultural habits, financial affordability, safety and technical conditions.

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