

Problematic and feasibility of sustainable development of urban sewerage in Algeria

Problématique et faisabilité du développement durable en matière d'assainissement urbain en Algérie

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RESUME

La gestion des réseaux d'assainissement urbains en Algérie a toujours été faite au coup par coup, souvent pour répondre à des objectifs et des besoins localisés immédiats sans considérer la durabilité des systèmes et leur impact sur l'environnement à moyen et long termes

L'étude présentée ici met en évidence le constat alarmant de la situation actuelle des réseaux d'assainissement algériens, souligne les aspects prioritaires à intégrer en urgence dans la nouvelle politique du développement durable adoptée par le gouvernement algérien, et fait ressortir une première perspective sur les actions nécessaires et les résultats attendus pour un DD des systèmes d'assainissement (SA) en Algérie.

ABSTRACT

The urban sewer networks management in Algeria has always been done punctually, often to answer to objectives and urgent local needs without considering the systems durability and their impacts on the environment at middle and long terms.

The survey presented here shows in evidence the alarming report of the present situation of Algerian urban sewerage. This survey underlines the important aspects to integrate in emergency in the new sustainable development policy adopted by the Algerian government. It makes highlights a first perspective on the necessary actions and the results waited for a sustainable development of sewer systems in Algeria.

KEYWORDS

Algeria, methodology, sustainable development, urban sewer system.

1 INTRODUCTION

The urgency of urban planning and the rapid demographic growth (threefold increase of the population since 1962) have led the different actors intervening in this development process to act quickly and independently from the others. This has always been done without efficient coordination and without taking care of the preservation of the urban infrastructures quality and the one of the resources and the natural environment. The problem is also complicated by the absence of an effective political strategy of development in this sector (insufficient regulations, absence of national standards and technical documents, dilution of the responsibility in many undertakings...).

This development processes has led to many lacunae and failings in the sewer systems operation (§2.2). However, the investments carried out in the sector of the urban hydraulic infrastructures (water Supply and sewer systems) are not negligible (approximately 3.8 billions US\$ for the 10 last years and about 12.2 billions US\$ since 1970 (CATE, 2001)). The importance of these anomalies varies from one city to another, even from one district to another, in function of the management policy and the means of the local communities.

The survey presented here shows in evidence the alarming report of the present situation in spite of the important efforts (notably financial efforts) made by the Algerian government in this field. This survey underlines the important aspects that should be quickly implemented in the new sustainable development policy adopted by the Algerian government. It highlights a first perspective on the necessary actions and the expected results from a sustainable development of sewer systems in Algeria.

2 PROBLEMATIC

The development based on the centralized planning used since three decades to face the intensification of the urbanization due to the demographic growth certainly improved the quality of life of the citizens, but it also led to important ecological and socio-economic unbalances which threatens the future development of the country. The analysis of the current situation of urban sewer system reveals that the impact awaited through the different projects realised in this field does not really correspond with the amount of realised investments (Toumi & Chocat, 2004).

2.1 The realizations

To catch up the lateness in the field of housings construction, most of the projects are realised in urgency. This working method prohibits deep reflections taking into account the different aspects of the problem. As regards sewer systems, the only objective of public authorities is to connect the population to networks using a logic that gives preference to investment instead of maintenance. Many aspects as wastewater treatment, design rules and standards, capacity of the existing systems, runoff drainage, management and maintenance of networks, and efficient management of information are fully neglected.

Today, the linear of networks constructed in all the country has reached 33000 km at the end of 2005 (DAPE, 2006). The national middle connection rate, excluding scattered population, is about 85% (fig 1). The total urban population connected to sewer systems is estimated to 22.762.000 inhabitants, and about 4% of the total population uses an autonomous system (CATE, 2001).

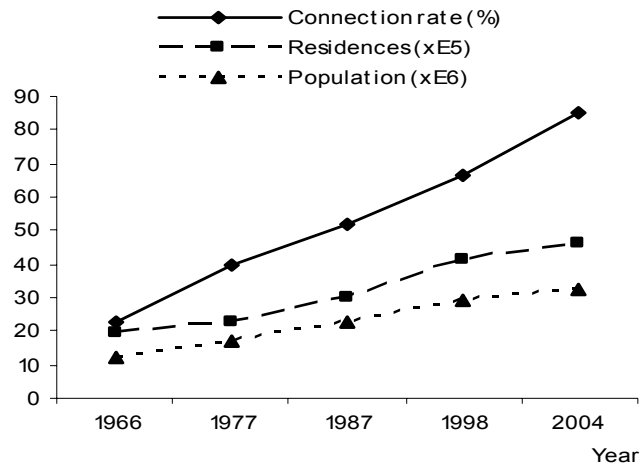


Figure 1 : Variation of the urbanization and the connection rate

Concerning wastewater treatment, about fifty WWTP are referred within the whole country ; among them only 22 are in operation (operating below their capacities for many of them); 3 are in design stage, 8 in rehabilitation process and 21 are waiting for rehabilitation. Therefore 32 are stopped. Their capacity ranges from 1 000 to 750 000 pe, with a total capacity of nearly 3.5 millions pe, meaning about 15% of the connected population (CATE, 1998 and 2001). Hence the situation of wastewater treatment is very bad knowing that the global annual volume of discharged wastewater is about 600 millions m³, of which 550 for only the north agglomerations. It is expected that this value would reach nearly 1 150 millions m³ in 2020 (CNES, 2005).

2.2 The dysfunctions of the sewer systems

The main problems are located at three levels:

- Pollution of the receiving waters (littoral, dam reserves, rivers) due to the direct or indirect discharges from sewer systems ;
- Frequent flooding due to rainfall because of the lack of conception standards and rules and insufficient maintenance of the sewer systems ;
- The risks of human contamination by wastewaters (through water supply) are paradoxically increased with the increase of the connection rates of the population to the water supply and sewer networks (CATE, 1998).

2.3 The institutions

The water supply and sewer systems have always been managed by a multitude of organisms. The diversity of their statutes, prerogatives, tutelages and sizes, constitute a complex organization that encourages the dilution of the responsibilities, the absence of the standards as well as an insufficient consideration of the technical aspects. The management of the sewer systems falls within the competence of the local authorities which have neither the statute nor the necessary capacities for an efficient management (for example they don't even manage to recover the sewerage charge of 20% collected by the water supply undertaking and intended to finance the maintenance of the sewer networks). Hence local authorities cannot take that

SESSION 2.1

responsibility because they don't have the necessary competences nor the financial means. Globally they are unable to support the weight that the principle of decentralization bestowed to them.

After the diagnosis made in 1995 by the public authorities about water supply and sewer systems services, a major institutional reform was launched. For the sewer systems, the ONA (National Office of Sewerage), created in 2001, should replace, in its mission, all the public undertakings.

Through its 5 regional agencies covering all the Algerian territory, ONA intervenes currently only on 5 wilayas (on 48), i.e 134 local authorities ; what only corresponds to 9% of the 1 541 local authorities existing in Algeria (table 1). The ONA manages only 20% of the total linear of the sewer networks, 79% located in the region of Algiers.

As regards the wastewater treatment, we are still very far from the objectives laid down for the various WWTP (mainly due to the lack of qualified personnel and defect of mastery of the technical and financial aspects).

Region	Sewer systems			WWTP					NPS
	NT	L (km)	Rate (%)	N TP	Lag.	Tot	IC (m ³ /day)	Treated volume (m ³ /j)	
Algiers	119	5248	79	10	0	10	239000	88978	53
Constantine	15	1163	17	04	0	04	111000	46970	08
Chlef	01	258	04	0	0	0	----	----	01
Oran	0	0	0	04	05	09	83203	32730	04
Ouargla	0	0	0	01	0	01	8900	4450	0
Total	134	6669	100	19	05	24	442103	172628	66

NT : number of local authorities ; L : length ; N TP : number of WWTP ; Lag. : Lagoons

IC : Installed capacity; NPS : number of pumping-stations; WWTP : Wastewater Treatment Plant

Table 1: Spatial distribution of the ONA intervening

Although the country made some efforts, the institutions involved remain under-framed and under-financed and they don't yet get the necessary credibility and capacity for the suitable execution of their missions.

2.4 Legislation, rules and standards

The evolution of the texts is intimately related to that of the institutions. From 1962 to 1994, a proliferation of laws, decrees and application texts (orders, circulars...) has arisen. These instruments were installed, modified, supplemented or repealed according to suppressions of structures or change of persons in charge. Actually, texts progressively elaborated with the creation of structures played no practical part. They even contributed by their profusion to make more complex and difficult the operation and the organization of the institutions.

The question of environment protection didn't begin to be taken seriously into account before the law n° 03-10 of July 2003 on sustainable development. This first law has been followed by the law of August 4, 2005, but sewer systems are always insufficiently.

Among the different adopted measures, most important are :

- The widening of the concession to the national or foreign private sector (decree 97-253 of July 1997) ;
- Creation of the 5 water Agencies and Committees of Hydrographic Basins (decree 93-100 of March 1996) ;
- The obligation to consider environment quality preservation as one of the main objectives of the design and management of urban water systems (laws of July 2003 and August 2005).

Yet, we are still far from a complete, clear and objective legislative system supported by effective mechanisms of technical and judicial controls. It is necessary to reinforce the mission of public authorities by giving them an effective control and by promulgating efficient rules and standards. For that, several other decisions can advantageously support those already adopted :

- Urgent elaboration of rules and technical standards of conception (assessment, implementation...) and management ;
- Best sharing of responsibilities between the concerned actors ;
- Setting up a flexible and efficient mechanism of coordination between all the technical domains ;
- Control of missions by developing contractual forms ; Setting up a mechanism of control and real sanction of the quality of services and of the overtakings ;
- -Stabilization and best balancing of the financings (by giving more importance to the networks exploitation, by developing partial auto-financing strategies,...) ;
- -Setting up a strategy of sensitization, training and education of the different actors (especially users and staff of the institutions) to incite them to a behavior favorable to sustainable development.

Globally, regulation and judicial frameworks are defective, with fragmented regulation mechanisms which are little applied and with limited means for an effective action of public authorities.

2.1 Pollution and environment

Receiving waters pollution, due to direct or indirect discharges of urban sewer systems (stormwater and wastewater), begins to become very worrying. In inshore cities, the potential of sea fishing begins to decrease to such a point that authorities feel concerned. Table 2 shows the importance of the impact of urban discharges on Algerian ports. In many cases dam water reserves are also polluted (24% of the dams) (CATE, 1998).

3 FEASIBILITY OF A SUSTAINABLE DEVELOPMENT

3.1 Minimal conditions

A Sustainable Development needs to take into account all aspects associated to a project: operational aspects, environmental aspects, quality of life and many others aspects are linked to the concept of durability (Butler & Parkinson, 1997, Balkema *et al*, 2002, Matos *et al*, 2004). To achieve this goal, we must respect a set of minimal conditions which form the basic and departure platform towards sustainable systems :

- Qualified institutions at all levels of decision, design, management and control of the sewer systems ;
- Sufficient human, technological and financial means and corresponding tools ;
- Positive implication of users (consumers) in the context of SD ;
- A sufficient knowledge of the environment associated to the sewer system (mainly

knowledge of the site intended for the project).

The absence or the weakness of one of these conditions will have an unfavourable impact on the system sustainability. But, performances of the institutions remain fundamental.

Port	BOD ₅ (mg/l)	COD (mg/l)	N Total (mg/l)	Phosphorus (mg/l)	Susp. Solids (mg/l)
Ghazaouet	1 050	2 100	175	52	1 225
Oran	30 800	58 315	5 488	1 029	24 012
Arzew	3 522	6 457	578	117	3 815
Bethioua	856	1 570	143	21	990
Mostaganem	6 900	12 775	1 570	230	9 200
Tenes	1 700	3 460	315	63	1730
Algiers	140 000	280 000	27 000	5 100	168 000
Bejaïa	3 750	9 375	876	188	5 000
Jijel	4 824	24 797	850	170	6 720
Skikda	7 445	13 455	1 275	245	7 790
Annaba	17 665	34 209	3 595	822	22 806

Table 2: Impact of the urban pollution discharge on the Algerian ports

3.2 Case of Algeria

Algeria decided to invest in the sustainable development. The adoption by the state of the new strategy of environment through the NPAE-SD (National Plan of Actions for the Environment and the Sustainable Development) and the new politics of the water (laws of July 2003 and August 2005) proves it well. In spite of the efforts of the State (particularly financial efforts), it is obvious today that the main reasons of the current crisis are fundamentally institutional and are closely bound to the inadequacy of the past policies and programs. Therefore, solutions to bring must necessarily have an anchorage in the economic and institutional reforms in progress in the country. But it remains necessary to strengthen any decision adopted in this direction by an adapted mechanism for its efficient and effective application.

Table 3, which results from the analysis of the present situation, presents a first perspective of the different actions necessary to progress on the way of Sustainable Development. The objectives and/or expected results from these actions are also presented.

Firstly, we must install the different necessary mechanisms for a sustainable development. It is the starting point from which we can conceive sustainable systems.

Proposal of actions for a SD	aimed objectives (waited results)
1. The state	
- To improve the regulation of SS - to assume the mission of public power fully	- To decentralize the operational functions bound to SS (to consolidate the local institutions) - Effectiveness and credibility of the regulation
- to encourage the intersectorial cooperations	- To exploit national expertises - To take in charge the interactions between SS and the other urban infrastructures
- To stabilize and to balance the financings	- Budgetary Effectiveness; - Financing of the SS management.
- To target and to define the responsibilities	- to establish the roles and the management responsibilities - Effective control and sanction mechanisms
2. Public management undertaking	
- Intersectorial Dialogue.	- Integrated management of SS.
- To adopt the concessionary mode	- More effective management guarantee
- To develop the personnel and the equipments	- Trained Personnel and sufficient equipment
- To optimize the expenditures	- To aim the important investments
- Service of the human relations	- To improve the communication with the users
3. The consumers (users)	
- Equity of the made services	- To support the positive society implication
- Framing by the education, the sensitization, the incitement and the constraint	- To encourage the involvement of the individuals
- To fight against the defects of the infrastructures conception (watertightness...)	- To preserve the human security and health
4. The environment	
- Quality control	- Assessment of the SS impacts
- Adapted and reliable Methodology of measurement	- To improve the reliability and the accuracy of the environmental data
- Knowledge of the phenomena	- To aim the relevant data
- Control of the discharges	- To locate and to correct the defects - to correct and to punish the overtakings
5. The infrastructures	
- To improve the conditions of the contracts - Technical control of the realizations	- To avoid the conception defects
- diagnosis and auto-surveillance of the sewer systems	- Management in real time.
- Forecasting studies	- To take into account the future extensions
6. The information	
- collection and management of information	- To collect and to archive the necessary information - To perfect the analysis tools
- Objectivity and reliability of methodologies.	- Pertinence and reliability of information
7. The economy	
- To optimize the expenditures (study of scenarios)	- To target the important investments - To minimize the costs and to reduce the losses
- To invest in human resources	- To train and imply the users in the SD
- Economical evaluation of the impacts.	- To evaluate the ratio "Advantages/costs"; - To acquire data about future decisions
8. Technology	
- Technical and standardized framework	- Technical and standardized Documents (TSD) - Technical control Institutions
- To benefit from expertises of private or foreign undertakings (contacts)	- To acquire the necessary competences
- Methodologies of study	- reliability and accuracy of the methodologies of measurement and of calculation

Table 3: Proposal of actions and objectives for a SD of the Algerian SS

4 CONCLUSION

About the sustainable development, we are still at the stage of the reflections. Some constructed approaches are already proposed and practical decisions begin to be taken. In this way, it can be said that the first steps are already done (reform of the institutions ...). Thus, three main questions are raised. Firstly, what are the necessary readjustments of the financing of sustainable development, whose burden must be distributed gradually and equitably between the various actors (federal and local authorities, users...)? Secondly, what are the required adaptations of institutional mechanisms necessary to conceive and develop public policies and to promote the development of competences within the specialized institutions? Finally, we must consider constructed environment as an ecological space, a recreational and usable space for citizens and an economic capital.

What are the priorities? First, we must mobilize and share the responsibility between the different actors (State, local authority, enterprises, citizens, etc.). Decentralization and improvement of the local financial resources constitute the indispensable levers of a sustainable development. It is also important to give rise to a dialogue between the different actors and to facilitate the communication between them in order to enable them to work together and to contribute efficiently to the financing of the sustainable development of the sewer systems.

Another aspect that should be taken into account seriously is the setting up of an efficient procedure of data collection and storage. A good knowledge of the existing systems and of their current functioning is required for their efficient improvement. Once the system is well known, we can consider and test different possible futures through the prospect. The exploration of the future can be achieved by using methods based on the study of scenarios (suggested solutions). Such methods enable to imagine possible changes of the system in the future by projecting both past and present trends. It is then possible to take into account the different hypotheses of specific evolution, and finally to identify the best set of actions that must be undertaken in order to progress on the way of sustainable development.

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Definition of the used symbols

CATE : Commission of the Development of the Territory and the Environment
CNES : National Economic et Social Committee
DAPE : Direction of the Sewer Systems and the Protection of the Environment
MRE : Ministry of Water Resources
RADP : Democratic and Popular Republic of Algeria