# Sustainable waste management and urban sanitation programme

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**Summary of lessons learned from the programme on sanitation**

# A different approach to sanitation

*Summary by Ta Thu Tuy*




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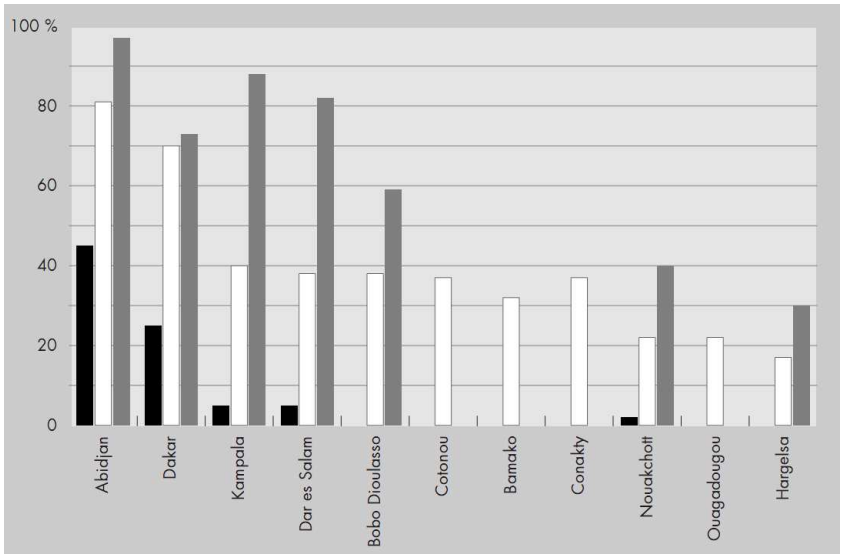
# 1. For an overall approach to urban sanitation

## 1.1. The African context: the overwhelming predominance of on-site sanitation

Sewers are the first organised form of urban sanitation that appeared in Africa along with the towns of the colonial times. They are part of the town planning imported from the colonisers and were unable, as a single sanitation approach to respond to the rapid and uncontrolled urbanisation that Africa underwent after independence. Of all networked urban services, sanitation is the most neglected.

As the decades passed, the gap widened between, on the one hand, politicians and engineers who see sewers as the ultimate form of modernity and on the other, the general populations who, isolated and faced with a pressing need, developed other, innovative forms of sanitation more adapted to their technical and financial capacities.

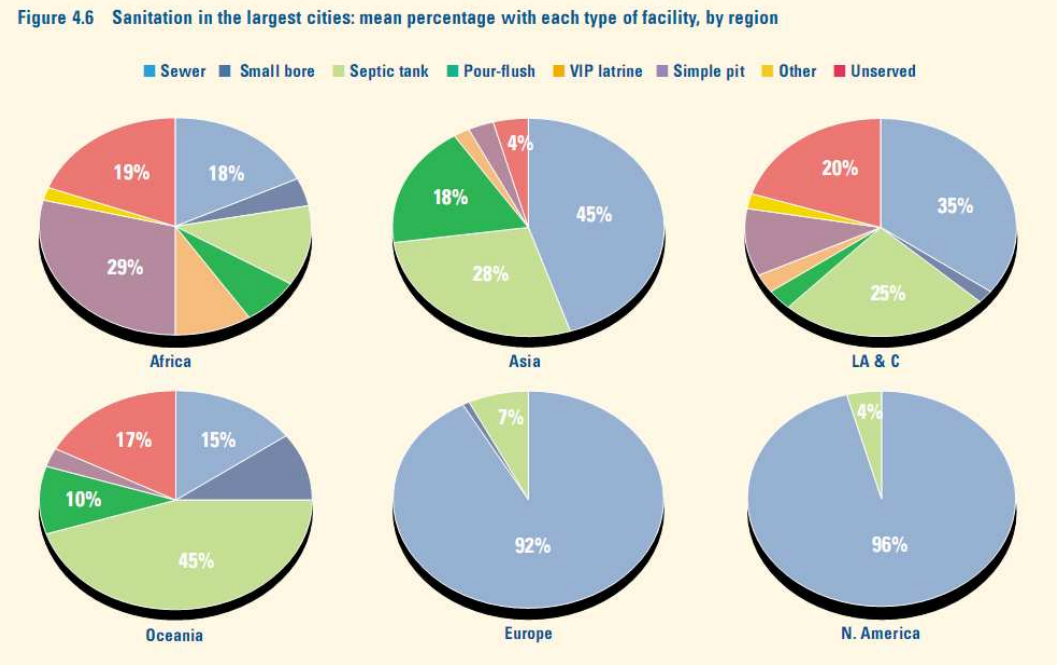
**Rate of household connection in some African cities**




**Source: Hydroconseil-A01 Research Programme**

With the rapid growth of African towns, on-site forms of sanitation were to become the main solution that could be afforded by most people. However, the technical, financial, environmental, organisational and institutional questions raised by these forms of sanitation are of a completely different nature to those posed by the installation of a sewer system.

More than on any other continent (as shown in the tables on the following page), if we are to tackle urban sanitation improvement in Africa, we must recognise our lack of understanding of popular practices and solutions adapted to local capacities (both of the physical environment as well as of the inhabitants). We must also encourage research programmes specific to this continent, in order to develop know-how and processes that focus both on improving and diversifying on-site forms of sanitation as well as on having these included in public sanitation policy. Finally, it requires constructing a new way of viewing all these issues when the usual ways of doing and thinking are no longer effective.




**Source: Global Water Supply and Sanitation Assessment 2000 Report, JMP WHO-UNICEF, 2000**

## 1.2. Combining research on "sanitation" and "solid waste"

Between 1995 and 1998, in the context of international cooperation, French stakeholders led a research programme entitled "Drinking water and sanitation in peri-urban areas and small towns". During the final seminar of this programme in Ouagadougou, the inadequacy of actions and impact in the field of sanitation was highlighted. This finding is recurrent in all programmes that deal with both water and sanitation, as had already been revealed by the International Drinking Water Supply and Sanitation Decade, 1981-1990.

In response to requests by seminar participants to step up research in sanitation, French cooperation players chose to combine the topic with another theme essential to the urban environment; solid waste. It is thus that the new programme brought together the themes of sanitation and waste management, proving to be very fruitful.

From the outset, this approach opened research opportunities up to more innovative and comprehensive investigation. Indeed, approaching liquid and solid waste together raises the more general question of a dirty urban environment, both in terms of household behaviour and practices, as well as attitudes to the general public service of keeping the town clean.

Rather than the conventional approach, which is too often over-technical and hygiene-focused, sanitation is analysed as both a sociological issue in terms of neighbourhood relations and urban living, as well as a political issue in urban power plays and urban management.

Bringing together research and experiments led in the fields of sanitation and waste encourages the analysis of sanitation results according to a different conceptual framework from that usually used, based on the approach to drinking water.

Indeed, discussing sanitation after having discussed drinking water naturally leads to a focus on "networks" (the infamous sewer system so criticised for its unsuitability for African towns)

and on “alternative techniques” (alternatives to a network of course). Indeed, “alternative” is how experts have long labelled on-site sanitation techniques.

However, discussing sanitation at the same time as waste management encourages the analysis of urban sanitation by breaking it down into three links in a chain:

- The upstream link that consists of the collection facilities for excreta and waste water, situated at the household level,
- The intermediary link that consists in transport (of effluent that is not treated on-site: faecal sludge and waste water),
- The downstream link, that is the treatment of the products transported from the source, which may or may not be re-used.

This is the relatively new point of view that will be developed to present the summary of programme results for the sanitation component.

## 1.3. Towards a renewed and comprehensive approach to urban sanitation

In the conventional approach to sanitation inspired by the practices of developed countries, collective systems (sewer systems) are often presented in contrast to on-site systems (such as latrines and septic tanks), the latter being considered to be temporary solutions while awaiting total coverage by the sewer system.

Inhabitants are considered to have access to sanitation once they are connected to a sewer system or to an on-site sanitation installation. However, the public sanitation service, when it exists, usually only concerns the sewers, it being understood that the other installations are called “on-site” for the two-fold reason that they deal with waste on site, and that the inhabitants can manage it themselves.

In fact, neither sewers nor on-site systems alone can respond to all the problems posed by liquid waste management in towns: sanitation is not just a matter of sewers and latrines. In a similar way to the management of household waste, sanitation must simultaneously respond to three families of problems, each of these families requiring different technical and financial solutions.

1. *Improve household sanitary conditions*: the upstream link in the chain that consists in collection facilities (of exreta and waste water), corresponds to matters of domestic hygiene.

2. *Improve hygiene in the urban environment*: this is the intermediary link that consists in the transport (of effluent that is not treated on the spot: waste water and faecal sludge) and concerns urban hygiene,

3. A*void environmental degradation*: this is the downstream link of treatment of the products removed from the town and thus, is a matter of environmental protection.

It can be seen that presenting urban sanitation in this way effectively summarises all concerns that a municipality would have in this field.

### *The upstream link: access to a sanitation system*

As is the case for solid waste management, the upstream link in the sanitation chain covers all aspects of the collection of liquid waste produced by the inhabitants and their activities, be they domestic or economic. The liquid waste concerned consists in household waste water and excreta as well as that emanating from administrative, commercial, artisanal and industrial activities.

The objectives for this link in the chain are health related (to isolate and control the risk of contamination), urban (as regards urban living, that is to say learning to live together particularly as regards both apparent and symbolic cleanliness) and environmental (to isolate and control the risk of different types of pollution).

To meet these objectives we need sanitation facilities that are on-site or connected to a sewer system. These facilities may be individual or semi-collective (*cf. Section 2.2 The upstream link in the sanitation chain: on-site forms of sanitation access*)

### *The intermediary link: transport*

Also as with solid waste, the intermediary link for sanitation consists in removing the products that are not treated on-site; waste water and faecal sludge. The objective of this link is to disconnect the "collecting" of liquid waste phase from the "treatment" of pollutants phase, in situations where it is recognised that treatment can no longer be carried out on the spot because the environment has no more capacity to absorb the waste.

Depending on the density or the liquidity of the effluent to be removed from the site, the transport method will consist either in a piped sewer system or a fleet of pit-emptying trucks (mechanical or, more often, manual).

### *The downstream link: treatment of liquid waste*

Finally, and still as is the case of solid waste, the downstream link consists in the treatment of sanitation products (waste water and sludge), which may or may not be reused.

These products can be treated to a certain degree on-site, but increasingly often they are being treated once they have been transported away from the point of collection.

With the considerable improvement in and large-scale spread of on-site sanitation facilities as well as the rapid development of mechanical pit-emptying companies, the quantities of sludge to be treated are growing significantly.

However, this final link in the sanitation chain remains, in reality, the most ficticious and theoretical both in technical investment plans and in budget planning. Too few sustainable installations have been built (treatment stations rapidly break down, treatment lagoons are to few to mention), each case is specific and it would not be advisable to try to extrapolate any generalisations from these experiences.

***Sanitation and artisanal and industrial activities***

With economic development, artisanal and industrial activities increase within and on the outskirts of towns. Their liquid waste, often uncontrolled, generates an ever increasing risk of pollution in the immediate neighbourhood. These discharges pose specific problems due to their chemical composition.

To limit the impact of such pollution and the cost of managing it, the three-links of a chain approach is instructive for designing pragmatic and comprehensive solutions:

- the upstream link corresponds to the concentration and pre-treatment of waste on-site,
- the intermediary link corresponds to the transport of concentrated and pre-treated waste away from residential and commercial areas,
- the downstream link is the treatment of these transported effluents, often by lagooning.

***Sanitation infrastructure or adequate access to sanitation services***

The objective of the public sanitation service is not to set up and operate infrastructure that is highly sophisticated but mostly inaccessible to the general population (technically or financially). On the contrary, its objective is to provide a satisfactory and sustainable access for all to sanitation, via imaginative and properly managed facilities, using capable and reliable service-providers.

This finding leads us to make the distinction between the notion of sanitation equipment and infrastructure and the notion of effective access of the people to a sanitation service.

**M. Seidl**
**Station de lagunage à Niamey (Niger)**

***The limitations of this summary***

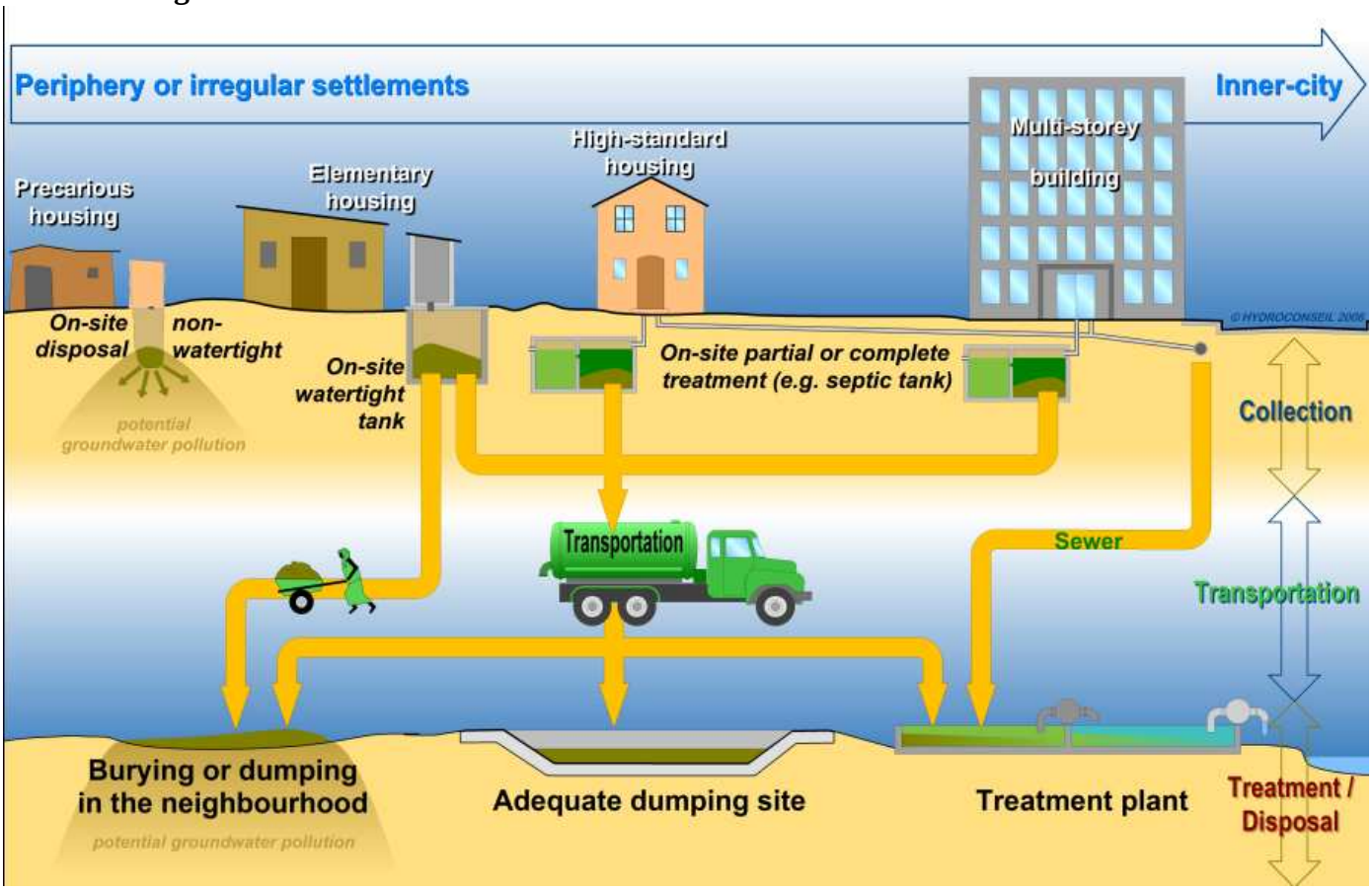
The aim of this research programme was not to cover all aspects of urban sanitation and make comprehensive operational recommendations for new sanitation policies. It simply aimed to bring more in-depth analysis to some emerging ideas and innovations.

In particular, directly reflecting the variety of urban situations, the upstream link in the sanitation chain is that which today raises the most questions and invites the most innovation, and constitutes the focus for most research and experimenting. This explains why the majority of the programme research contributed to shedding light on this link from various stand points, and why the summary focuses particularly on on-site sanitation (*cf. Section 2.2 The upstream link in the sanitation chain: on-site forms of sanitation access)*. Ideas for innovative systems besides on-site sanitation are discussed at the end of Section 2.3 *The intermediary link in the sanitation chain: transport*.

Certain aspects were not covered by the scope of the programme, for instance everything concerning economic activities (sanitation of artisanal and industrial activities), which by no means diminishes the importance of these aspects in the overall picture.

This summary has, above all, attempted to highlight and organise the essential lessons learned from the research and pilot projects. A reflection of an evolving scientific approach, it will certainly raise more questions than it answers among sector professionals.

**The diagram below illustrates the three links of the urban sanitation chain.**



# 2. The links in the urban sanitation chain: inventory and innovation

## 2.1. Sewer systems: from dreams to reality

The distinction between the existence of a sanitation infrastructure and effective access of people to a satisfactory service is most vivid in the case of piped sewer systems. Such networks seem so modern, that one could be lulled into thinking they would eliminate all sanitary problems posed by the population's former habits. In reality, having a sewer system does not automatically resolve the difficulties of access to sanitation. This is highlighted by ENSP-A08 research, which assessed the functioning of sewers constructed in the housing allotments of Yaoundé, by observing the inhabitants practices and how they reacted to the deterioration of the network. In particular, this research is an example of the "mirage of White man's technology" and the disappointment of leaders when they "unexpectedly discover" the need for maintenance.

Access to a sewer system raises at least two sorts of problem which disturb network operation: on the one hand, the slow pace at which individual households are actually connected explains why the presence of sewers does not automatically mean a high rate of sanitation coverage and, on the other hand, when no educational campaigns are carried out, the haphazard use by the inhabitants of the facilities connected to the network speeds up its deterioration (for example solid and liquid waste are often found together in the sewers).

C. Le Jallé
Latrine ventilée à double fosse sèche à Yaoundé, quartier de Melen IV (Cameroun)

Therefore the existence of a high-quality sanitation system does not ensure large scale and permanent access for the populations to a sanitation service. The research shows that faced with increasing malfunctioning of the sewer system, people who are connected become dissatisfied and will even disconnect and return to using on-site facilities. It thus concludes that "*suppressing attempts to disconnect from the sewers will only reinforce the inhabitants' conviction that the so-called collective group in the urban and global sense is coercive and not cooperative and that household solutions are best. This is not the way to change their opinion of collective action.*"

## 2.2. The upstream link in the sanitation chain: on-site forms of sanitation access

In rapidly-growing African towns, where many populations are still making the shift from rural behaviours to learning the more restrictive conditions of urban living, developing sanitation means first of all developing satisfactory access to sanitation. To do this, the spontaneous practices and behaviours of the inhabitants must be understood in order to understand their needs. Then, depending on the local context, supply must be generated or increased through imaginative technical and financial soluions as well as by encouraging and organising new stakeholders.

Many actions of the programme contributed to clarifying these questions:

- the issues facing small towns, where the very beginnings of sanitation need to be encouraged, were covered in research programme Lasdel-A03 in two towns in Niger,
- through the testing of participatory strategic planning of sanitation in the medium-sized town of Debre-Berhan in Ethiopia, the action Gret A07 looked at the widening of the range of sanitation techniques available, by integrating them into the more general notion of “access to sanitation”,
- Research programme Cereve-A05a developed technical and economic statistics tools on the practices and the demands of inhabitants in terms of sanitation,
- Shadyc-A04 gave anthropological and sociological keys for understanding inhabitants’ behaviours as regards their waste and as regards those people theoretically responsible for urban hygiene.
- Ceda-D03 research programme presented a critique of the behaviour of experts and hygiene awareness programmes supposed to encourage the populations to clean up their environment
- Finally, research programme ENSP-A08 in Yaoundé demonstrated the link between badly functioning sewer systems and poor understanding of domestic practices as regards access.

The key lessons learned from the programme are divided into two themes:

- on-site forms of sanitation access: technological simplification of facilities and diversity of semi-collective systems (see below),
- behaviours, needs and capacities of inhabitants as regards access to sanitation (cf. Section 3.2. Financing access to sanitation).

***Towards simplifying the typology of on-site facilities***

A result of inhabitants being left to their own devices, as well as of their extremely diverse living conditions, on-site systems found in the field employ a wide and often confusing range of techniques. Now considered to be the immediate future for sanitation in Africa because they represent the only solution that can rapidly respond to policies calling for large-scale sanitation development, these systems are the subject of much research. The variety of questions and innovations directly reflects the variety of urban solutions.

Based on a considerable number of surveys, the Cereve-A05 research programme revealed that the most common on-site systems can be divided into five types, and that people do not improve their facilities in a gradual manner, but rather tend to make "technological leaps" from one type to the next. Careful observation of these choices and behaviours could simplify the design of sanitation programmes.

| Characteristics of the most common types of on-site sanitation facilities (Cereve-A05a) | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| External WC | External WC | Simple Hole | Turkish toilets | Inside WC |
| Simple hole | Simple hole | Roof | Flush | English style bowl |
| No flush | No flush | Lined pit | Roof | Flush |
| No roof | Dry pit | | Lined pit | Lined or septic tank |
| Dry pit | | | | Cesspool |
| No cesspool | | | | |

***Towards a diversity of semi-collective on-site facilities***

The survey carried out in the context of action Gret-A07, in Debre-Berhan, highlighted the potential diversity of types of semi-collective on-site sanitation facilities. For instance:

- public latrines located in highly frequented public areas,
- communal latrines, shared by large family groups in social housing in densely populated suburbs,
- family latrines: smaller and used by between five to eight families.

When financial capacities are limited, or in densely populated zones, having a wide range of technologies to choose from makes it possible to approach sanitation from different levels of collective or semi-collective action. Flexibility is ensured as regards design and initial investment on the one hand, and as regards maintenance and operation of the facilities on the other.

In light of these observations, it would now appear more pertinent for sanitation policy to aim at "sanitation access for all households" rather than the more restrictive objective of installing individual sanitation facilities.

## 2.3. The intermediary link in the sanitation chain: transport

The lessons learned from the programme concern two main aspects:

1. faecal sludge management, based on research programme Hydroconseil-A01, on companies offering mechanical pit-emptying services in African cities, and action CrepaCI-A02 which aimed at drawing up a municipal sludge management strategy in Bouaké (Ivory Coast),
2. the institutional conditions required for the sustainable management of sewer systems and possibilities for innovation, through a comparative analysis of the results of actions ENSP-A08 in Yaoundé (Cameroon) and Moshi-A05b in Moshi (Tanzania).

***Sludge management: the unveiling of a rapidly changing market***

Until now, the focus as regards on-site sanitation has been on the technologies available (improved latrine types, cesspools etc.) and on household behaviour in relation to these technologies. In a more innovative approach, research programme Hydroconseil-A01 concentrated on the link in the chain that comes once the waste is collected in the pit, and revealed some very recent changes (from the end of the 1990s) of an unsuspected magnitude.

The mechanical pit-emptying link in the sanitation chain can now be visibly identified as:

- A technical link (removal of liquid effluent from the on-site pit facilities and transport out of residential areas),
- An institutional link (with specific public and private stakeholders),
- And, above all, an economic market (with a clearly identified demand and supply, as well as market behaviour in terms of price setting and organisation of the economic sector).

A sign as much of the inadequacy of public operators as of changes in urban behaviour, this market, evaluated at one million Euros per million inhabitants, is in the midst of construction. It is growing at different rates in different towns, but certainly seems to be increasing at a much faster rate than the demographic growth rate. In those cases where it has developed significantly, there has also been a large-scale switch from the use of manual pit-emptying services to mechanical ones, even among poor families: *"people are not necessarily richer, but they can no longer do certain things because of what the neighbours would say with regard to the unpleasant and polluting practice of manually emptying pits and dumping the sludge nearby"*.

The fact that this economic market has developed despite the lack of any deliberate public strategy, is a sign of how the private sector can adapt and find socially innovative solutions (e.g. the creation of a pit-emptying market place in some towns).

While public intervention should remain minimal in a market that is able to organise itself, it could help to provide a certain degree of price regulation (which could stabilise the market and encourage innovation) and, above all, could help to test solutions for the "shady areas" and for the following link in the chain – waste water treatment. This is what Action CrepaCI-AO2 in Bouaké (Ivory Coast) attempted in elaborating a collective specification of the "rules of the game" within a municipal waste water management framework.

The "shady areas" identified by research programme Hydroconseil-A01 are small towns and the densely populated old areas of cities with narrow streets that are often inaccessible for trucks and which, nonetheless, are home to a little more than 10% of the population. Such situations, as well as the fact that mechanical pit-emptying trucks are sometimes unable to clear the very compact sludge at the bottom of the pit, explain why manual pit-emptying services will still be in demand for a while to come, as a supplement to mechanical services.

In conclusion, it can be seen today that in many towns the private sector is already able to organise the transport link in the chain in a reliable, independent and sustainable manner, with very little public intervention. In return, improvements in this area make on-site sanitation facilities more credible as adequate solutions for household sanitation and justify even further the presentation of urban sanitation as a succession of links in a chain.

***Institutional conditions for sustainability and innovative possibilities for sewer networks***

The emphasis now placed on on-site systems as major and immediate solutions to be explored for providing African urban populations with access to sanitation should not, however, stop piped sewer systems from also being considered as potential solutions for sanitation policy.

The difficulties encountered with regard to sewer systems are often due to the institutional organisational structure responsible for their management. For instance, in the case of sewers constructed at the same time as the housing developments they service (ENSP-A08 in Cameroon and CrepaCI-A02 in Ivory Coast), technical and financial responsibility for their upkeep has not been clearly defined legally or institutionally, leading to rejection of the service by the populations in the face of consistent and increasing malfunction.

On the contrary, the sewer system of Moshi (Moshi-A05b, Tanzania) is part of a joint extension of the water and sanitation networks led by an original and independent municipal tool for managing water and sanitation, the *Moshi Urban Water and Sewerage Authority* (MUWSA).

The transport link in the chain draws on two different categories of technical approach: periodical removal by pit-emptying and continual removal through a piped sewer system. As seen above, the first category is currently undergoing major changes, thanks in particular to entrepreneurial innovations. However, the second category is rarely the subject of innovative research. And yet possibilities exist, such as small-diameter networks, for which few large-scale experiences exist in Africa besides the network in Rufisque, Dakar.

Rather than opposing on-site solutions and sewers, innovation would seem to lie in their complementary nature (the “upstream link-intermediary link” connection) wherein ideas for solutions to certain restrictive urban situations could be found. For instance, the judicious use of certain parts of on-site systems (such as initial decanting or sifting) can create a protective interface between the user and the network. Another example, as is the case in Rufisque, is the construction of mini-sewer networks to which certain types of on-site facilities that already exist can be connected. This can help to cover areas where the environment is totally saturated due to the population density.

## 2.4. The downstream link in the sanitation chain: treatment of liquid waste

The programme did not cover on-site treatment, whether it be the effectiveness of on-site household purification systems or local purification of industrial waste. It looked only at the treatment of household excreta and liquid waste after its transport away from the town and this in the context of sub-Saharan Africa.

The main lessons learned from the programme can be divided into three topics:

- the now pressing issue of sludge treatment, based on the findings of research programme Hydroconseil-A01 and Action CrepaCI-A02 in Bouaké, as well as the results of a literature study, Trend-A06,

- the evaluation of waste water treatment techniques through the results from research programmes ENSP-A08 and Cereve-A10 (the latter having surveyed 16 lagoons in six African countries), which reveal in particular, the gap between the actual needs on the ground and the subjects that interest researchers in matters of lagooning,
- and the utopian assumption that re-use of treated waste will be financially viable in the sub-Saharan African context, with the results of Action Iwmi-A09 and research programme Cereve-A10 (cf. Section 3.4 Financing the treatment of sanitation products).

***The now pressing issue of sludge treatment***

With the large-scale spread and improvement of on-site sanitation systems, with the rapid development of mechanical pit-emptying services, the quantities of faecal sludge that need to be managed properly are becoming colossal.

While the private sector is sometimes able to propose sustainable solutions on the technical and financial levels (for instance the profit-making lagooning service, Sibeau, in Cotonou, Benin, presented in Hydroconseil-A01), only the centralised involvement of the municipality and a strategy led in conjuction with all stakeholders can really lead to an overall solution on the city scale (CrepaCI-A02).

Despite the extent and the urgency of the problem, research in the field of treatment is still at the embryonic or experimental stages. Nonetheless, with the programme:

- Action CrepaCI-A02 announced the testing of treatment via drying beds,
- Action Trend-A06 demonstrated the feasibility of basic sludge treatment through UASB technology after initial treatment and dilution,
- Action Iwmi-A09 shows that the option of co-composting with household waste can be achieved with very basic means (little mechanisation).

More generally speaking, research programme Hydroconseil-01 reiterates that: few towns have proper disposal sites, that sludge treatment is practically non-existant and that illegal dumping remains wide spread almost everywhere.

In conclusion, the downstream link of the sanitation chain, treatment, remains the aspect of on-site sanitation approaches that still requires considerable work. There is now a need for private sector imagination, public commitment and international aid to develop household sanitation in African towns and cities.

We should also underline that such treatment could be designed together with the network sewerage treatment systems (e.g. disposal sites are located at regular intervals along the sewers that lead to the general Dakar lagoon site), along with the possibility for re-use in agriculture for instance.

The treatment of waste water and, in particular, lagooning: a disparity between needs on the ground and subjects that motivate professionals.

In presenting the catastrophic evaluation of the sewer system in Yaoundé and the associated treatment stations (essentially activated sludge), research programme ENSP-A08 makes the

following comments: "*the choice of a Western method is not simply the result of cultural influence. It is sometimes due to policy agreed upon with the financial and methodological support of international aid. (…) The first signs of dysfunction or breakdown in the stations must have completely perplexed local managers – how could a modern, virtually new station break down? It is not just a disappointment for the technician; it is a whole cultural edifice that crumbles.*"

At the end of the day, thanks to their basic maintenance requirements, the only treatment stations that have continued functioning in sub-Saharan Africa are the lagoons. Or should we say what *seem* to have continued functioning, because the survey led in the context of Action Cereve-A10 on 16 lagooning stations in 6 countries shows that: "*there is no control of the quality of waste discharged into the receptors nor of the impact of these discharges on the environment. Similarly, no institution is interested in evaluating or monitoring the impact on the local populations of these stations and their discharges.*"

The research in Youndé (ENSP-A08) explains this lack of technological and scientific interest in lagooning: "*it represents a departure from reassuring Western modernity, for an alternative and unattractive but economical model. The fact that it is so cheap means that local leaders must envisage it but at the same time distrust it: for them, cost guarantees technical performance*".

The programme also notes that this waste water treatment technology that is the only one that works and has proven itself over many years in sub-Saharan Africa, remains little-known (very few lagooning stations have been constructed in this region despite their suitability for the concentrated pollution of industrial and administrative establishments), which begs the question of what it will take to increase their number.

Furthermore, despite the basic maintenance needed, the few lagoons that exist are usually poorly maintained. This finding, while noted by the research programme Cereve-A10, does not seem to strike the researchers as a fundamental problem for which explanations and solutions must be found. Apart from theses on lagoons developed for scientific research, no station has in any way been monitored. Nobody seems at all interested in monitoring how these lagoons respond to their primary vocation of sludge treatment, nor in identifying potential improvements for their design or maintenance. For example, research programme Cereve-A10 revealed many interesting findings in its research on current lagooning stations in Africa, but does not draw any lessons for the future from them, whether it be as regards design, financing, project planning, location, construction, maintenance etc.

Finally, these researchers ask questions regarding the re-use of the waste water treated by lagooning, and make recommendations which are, unfortunately, unfeasible for the moment.

In conclusion, in sub-Saharan Africa, treatment lagoons seem to work, and some have been doing so for over 25 years, but what use are they? Who uses them? Is the matter of waste re-use the only issue here? For whom?

# 3. The links in a chain approach and the polluter pays principle: a pragmatic strategy for planning and financing

The overall and sustainable financing of sanitation has always seemed an elusive concept for municipal and national leaders. However, potential solutions have been revealed recently:

- a clear demand has been shown to exist at household level, disposing them to making a financial contribution,
- an effective and profitable experience with the application of a sanitation fee in certain countries (Burkina Faso),
- the emergence of a dynamic market of goods and services with regard to certain demand.

The approach to sanitation as links in a chain thus offers simple and logical perspectives for funding the sector, facilitating the formulation of various innovative ideas for financing each of the links individually. Indeed, each link corresponds to specific services which respond to identifiable demands, each capable of mobilising different financing sources which complement each other.

## 3.1. A proven financial tool: a fee for sanitation included in the water bill

In a similar approach to that of polluter pays, a fee for sanitation has been added to water sales in Burkina Faso since 1985. Amounting to around 5% of the water bill, this fee generates a stable and sustainable source of financing which enabled the water and sanitation authority (ONEA), to design and implement its first Strategic Sanitation Plan for Ouagadougou (PSAO) from 1990.

The PSAO remains to this day an almost unique experience of a sanitation strategy led in an African capital and which has shown itself to be just as sustainable after several years of application. So why is the PSAO such a major innovation?

The vast majority of sanitation strategies produced for African towns never leave the drawing board, as they are financially infeasible.

PSAO is not just original because it centred its technical proposals on technologies that were suited to household financial capacities. Its originality lies particularly in the fact that it identified operational and financial mechanisms that actually made it possible to gradually install facilities in the majority of households of the town.

The methods used and results obtained from the PSAO are covered below in Section 3.5. "*Towards total sanitation coverage of urban populations: an economic market of goods and services to be identified, built and structured*".

## 3.2. Financing access to sanitation

In the short term, more than 90% of access by urban African populations to sanitation will consist in on-site systems. Socio-anthopological and technico-economic surveys show that these populations easily understand the direct link between sanitation and improving their

living conditions based on a “marketing” discourse more focused on personal comfort and neighbourhood relations than on health risks.

***Behaviour, needs and capacities in terms of sanitation***

Having for a longtime focused their efforts on defining and improving the various forms of access to sanitation (working on the supply-side), experts in the field realised that the scaling up of the service and development of the market could not progress unless the inhabitants’ needs and capacities and above all their spontaneous practices, were better known and understood (work on the demand-side).

Several actions aimed to identify these issues, which form the foundation for a future sanitation goods and services market. Shadyc-A04 focused more on the socio-athropological aspects while Cereve-A05a took a more technico-economic stance.

***Motivating the population***

Sanitation projects and the associated awareness-raising campaigns tend to emphasise the health-focused advantaged of sanitation (Ceda-D03). It is not certain that this is the most effective and pragmatic way of meeting the desired objectives.

Shadyc-A04 research showed that shame with regard to one’s neighbours is an important factor in motivating households and their strategies for installing sanitation facilities. The logic of the economic argument is reinforced here by another argument, that is socio-cultural and less immediately visible and yet which clearly influences decisions: “*people are careful only to show in their own waste what is acceptable. It is less about health risks (fear of pollution or contamination) and more about the social issues (honour) or moral issues (shame) which motivate these people and what they do as a result*”.

*Hydroconseil*
Station de dépotage de Sibeau à Cotonou (Bénin)

By comparing these results to criticisms put forward in research prograprogramme Ceda-D03 of health awareness-raising campaigns, the programme gives specific suggestions for developing a new form of communication in sanitation policy. However, this requires above all a change in attitude in those initiating the campaigns (see Section 4.1. *Knowing how to reconsider approaches and change attitude*).

***Household capacity to pay***

Based on technico-economic statistical analysis of behaviour, practices and expectations of inhabitants with regard to the services they wanted and the possible financing they could mobilise, research programme Cereve-A05a revealed the potential of a real "marketing" approach for the upstream link in the sanitation chain, an approach which now seems indispensable for any future large-scale sanitation development programme.

This research on demand and "willingness to pay" reveals the sheer scale of the needs as well as the people's capacity to fund improvements in their sanitation facilities. It also shows that, while shortcomings and a lack of organisation of the supply-side have tended to hinder such moves for improvement, technical and financial support from public authorities provides strong impetus.

One of the conclusions is reassuring: "*the total average willingness to pay of households on a multi-family plot is, on average, sufficient to cover the real cost of each of the improvement options, without subsidies*".

This is also the major lesson to be learned from the continuing success of the strategic sanitation plan in Ouagadougou, which has induced large-scale improvement of sanitation on tens of thousands of plots each year over the past decade.

With the instigation of the sanitation fee on the water bill and the careful use of the money generated to implement municipal sanitation strategies, along with the direct efforts made by the populations who contribute three quarters of the financial investment, Burkina Faso has shown for more than ten years that it is possible to gradually finance the entire upstream link in the sanitation chain without international aid.

In situations of extreme poverty or population density, semi-collective on-site sanitation systems mean that collective investment and maintenance solutions can also be envisaged.

## 3.3. Financing transport

When more than 90% of the access to sanitation is provided via on-site systems, the question of financing transport away from the residential and business areas amounts, more or less, to the financing of pit-emptying and sludge transportation. It can be seen that with the combined effect of population density and gradual improvement of buildings, more and more families, even the poorest, now call upon the services of private pit-emptying companies.

Research programme Cereve-A05a showed that there is a cost threshold that can be borne as part of regular household expenses for sanitation (primarily pit emptying), which is estimated at 1% of revenues (expenditure on drinking water is estimated at five to ten times this amount). This explains the existence of a mechanical pit-emptying market estimated at one million Euros per million people, as discussed above, which is directly financed by the inhabitants without any public intervention or incentive.

The size of this market and its high potential for growth also explain that, where such a market has emerged, the private sector does take the risk of investing in the necessary equipment.

The question becomes more complex when the link concerns a sewer system. Again, a distinction should be made between the case of mini-networks and tertiary sections and the case of primary and secondary sewer system sections. For the former, beneficiaries are easy to identify, which facilitates the design and negotiation of co-financing mechanisms involving their contribution.

For the primary and secondary sections of a collective sewer system the situation is slightly different. This concerns major and costly infrastructure, and its installation usually stems from the political image the town wishes to project. Therefore their financing can also be negotiated in other political arena than pure urban management. We should however recall that this collective municipal network will usually only provide sanitation services to a small proportion of the population, and usually in administrative or industrial parts of town.

## 3.4. Financing the treatment of sanitation products

Hydroconseil-A01 research programme indicates that when disposal sites are available, mechanical pit-emptying firms do not seem to be discouraged either by the distance they may need to travel to these sites, or the fee requested to dump sludge there. The firms are above all satisfied that an adequate site is available at all – something that remains all too rare. Remember the surprising case revealed in Cotonou where the paying sludge lagooning centre built by Sibeau, while insufficient, was nonetheless making a profit.

Treatment stations, whether for sewerage or sludge are few in number in Africa, and their life expectancy remains hypothetical. Therefore, they are yet to be proven as regards the technical and financial solutions they can provide. This is why it would appear judicious that international funding for sanitation be particularly targeted to this distasteful link in the chain, the utility of which local leaders and inhabitants are slow to recognise.

***The financial utopia of re-using waste water and treatment products***

Experiments are regularly carried out regarding the re-use of waste water, and always conclude that it is technically feasible and controllable as well as hypothetically economically viable. This is also the case with two of the programme actions: Action Lwmi-A09 with experimentation of co-composting of sludge and solid organic waste, and Action Cereve-A10 with recycling of water treated in lagoons.

However, spontaneous practices involving re-use of waste water or faecal sludge by urban populations are widely developed (as evidenced with the large urban market gardens located at the ends of the Niamey storm water and sewer pipes) and are clearly identified sources of major health risks (cholera in particular). Would it not be more pragmatic, in sub-Saharan Africa, to work on improving existing re-use techniques, gradually introducing modest health innovations within established systems, rather than trying to create a hypothetical market of recycled sanitation products from scratch?

With regard to waste re-use, whether it be liquid or solid waste, it is above all essential to make sure that a credible economic message is passed, because all experiences show that it is illusory to hope for a short or even medium term economic benefit. While it is true that waste re-use can be productive, and popular practice demonstrates this on a huge scale, it must not be ignored that this is always achieved at considerable health cost. However, re-use methods that are acceptable in terms of health risk, or waste purification techniques with re-use of the

products, are very expensive because they aim to produce material that is both safe and acceptable to the economic system. However, in sub-Saharan Africa, people are not yet ready to pay for using recycled sanitation products.

In conclusion, research on re-use of treated waste water or sludge can be encouraged for scientific resons, but the focus on re-use should not outweigh the primary interest which is to have an effective and sustainable system for treating liquid waste.

## 3.5. Towards total sanitation coverage of urban populations: an economic market of goods and services to be identified, built up and structured

All public service provision strategies are struggling towards the objective of total coverage. In the field of sanitation, it can be seen that the approach of on-site systems and successive links in a chain give some keys for drawing up plans for total coverage within a controllable time frame.

Total sanitation access can be achieved when we propose satisfactory but different levels of access and service (individual, semi-collective or collective) that are adapted to the physical characteristics of the area and the habitat, and to the inhabitants' financial capacities. In many capitals, and even more so in medium-sized towns, the form of sanitation that is accessible to the inhabitants is often more than 95% on-site sanitatation, so this is what needs to be improved.

Total coverage of satisfactory access means thousands of on-site systems that need to be built or improved. "Willingness to pay" surveys and "social marketing" campaigns clearly show that the demand exists, it is just waiting to be discovered and taken into account by a corresponding supply of appropriate services.

In this way, a strong municipal policy aiming at total sanitation for the urban population could, by relaying this significant and increasing demand, create an economic market, that would be all the more dynamic in that the action plan for the policy in question could structure it with:

- a limited number of standardised technological models (see Section 2.2. The upstream link in the sanitation chain: on-site forms of sanitation access, on the simplification of on-site system types).
- Trained and regularly certified service providers (artisans, promotors, pit emptiers etc.)
- Social marketing campaigns that can really listen to inhabitants (on motivation of inhabitants, see Section 3.2 Financing access to sanitation)
- And proposals for financing facilities for the inhabitants

This is what Burkina Faso is testing with their strategic sanitation plans, where for instance total coverage of Bobo Dioulasso is envisaged within fifteen years (see box).

**Results achieved by the Ouagadougou strategic sanitation plan**

A total of 38 405 sanitation facilities were built on 29 343 plots from March 1992 (on-site sanitation promotion starting date) to September 2003. The total cost was almost 1.1 billion CFA Francs, shared between the ONEA (274 million CFA Francs) as subsidies of pre-fabricated materials and the beneficiary households (822 million CFA Francs)

| On-site Sanitation facilities constructed | | |
|---|---|---|
| Type of facility | Number installed from January to September 2003 | Number installed from March 1992 to September 2003 |
| Ventilated Improved Pit latrine (VIP) | 402 | 4 168 |
| Pour-flush toilet | 21 | 129 |
| Rehabilitations | 819 | 7959 |
| Cesspool-tray | 124 | 547 |
| Cesspool-shower | 3 829 | 13 927 |
| Cesspool | | 8 459 |
| Shower | | 3 846 |
| **TOTAL** | **5 195** | **38 405** |

According to the results of the report (February 2003) of the study ordered by ONEA on the analysis of the sanitation situation in the town, the coverage rate rose from 5% (March 1992) to 40% (September 2003).

The results obtained are based on more than ten years continual implementation of the PSAO, reliable demand development mechanisms and close monitoring of operations in the field by ONEA.

## 3.6. Total and sustainable financing of sanitation services: one of the objectives of participatory strategic planning for the sector

Financial analysis according to the sanitation chain links shows that market mechanisms can provide solutions for many services relating to sanitation and that public policy can clarify and stimulate this market.

By detailing the different forms of demand for quality urban sanitation (demand for access, demand for individual facilities, demand for pit-emptying, demand for protection against water pollution etc.) and comparing where this demand stems from (inhabitants, municipalities, business, international community), as well as their respective financial capacities, public policy can channel and combine different sorces and levels of financing for the different links.

Nonetheless, besides the financial structure of each link, it should not be overlooked that:

- the final objective remains the total and sustainable financing of all three links in the sanitation chain for all urban populations in the entire country,
- it is the service to be provided in the long term that must be financed, over and above the simple financing of sanitary facilities or collective sanitation infrastructure.

The financial plan for certain links (particularly the upstream link and that of mechanical pit-emptying) is easier to establish than for others (sewer networks and the downstream link in particular), because the direct interest is more clearly apparent to the users. As guarantors of the overall national vision, municipal politicians can instigate a certain level of cross-financing for the different links. For instance, pit-emptying companies could be convinced to pay for treatment services, and integrate this cost into the fees they charge users.

The sanitation sector in Africa channels various forms of international aid in the name of urban hygiene and combating poverty, as well as in the name of urban environmental protection and combating pollution. This aid would have even more of an impact if it was integrated into participatory strategic planning for the sector, in collaboration with local financial efforts arising from a dynamic market for sanitation goods and services.

This aid could be focused on the links in the chain that are the most difficult to finance locally, such as waste water and sludge treatment plants. Needless to say, a focus of external aid on the downstream link in the sanitation chain is only pertinent if the other links have firstly been correctly and sustainably financed.

D. Doulla

Caniveau d'écoulement des eaux usées à Douala (Cameroun)

# 4. Coordinating stakeholders for the wide-spread development of sanitation: the institutional framework

Past and current political difficulties with regard to sanitation are partly the result of a lack of ability and capacity on the part of sanitation promoters and professionals in Africa (that is to say local and international stakeholders) to innovate in line with the rapid growth of African cities and surrounding ad-hoc settlements.

In the overall context of rapid urbanisation in Africa, we can insist on the fact that progress in sanitation will not be achieved merely by extrapolating current practices, but via a sea change in approaches and perspectives.

## 4.1. Knowing how to reconsider approaches and change attitude

*C. Le Jallé*
**Latrine ventilée à fosse sèche**

Several actions of the programme (Ceda-D03, Shadyc-A04, IRD-D08) show that political and particularly technical leaders are completely out of sync with the populations. This can be seen in their analysis of inhabitants' behaviour and the messages they try to pass on via their awareness raising programmes.

***Mutual ignorance (who is ignorant?) and the size of the gap***

Research programme Ceda-D03 shows that one of the main obstacles to behaviour change is the populations' "ignorance" of good hygiene practices and the relationship between hygiene and health. But, while there is indeed "ignorance" at this level, technicians are just as ignorant of the population's daily hygiene practices. Different stakeholders' perceptions as regards the environment, hygiene practices and the resulting problems vary widely. The technician considers the population to be ignorant while the population often considers that technicians have no idea about the reality of their situation.

What is more striking is that this research shows that "*neither group is really aware of this gap. The technicians and decision-makers tend to take a directive and technocratic or administrative and political attitude, without actually asking the question of whether the populations understand what they are saying. However, the populations act according to determining factors that are a function of cultural,*

*social and economic constraints and opportunities, more often than not within a context of wide-spread poverty, a situation that technicians and decision makers do not always undersand. For instance, technicians talk about IEC (Information, Education, Communication) and the need to "get the message across" to the populations. But the information is not necessarily understood and, in the end, there is no education or communication. On the other hand, when the populations have the opportunity to express themselves, they talk about services and means and ways of living – without necessarily being understood either".*

***Changing attitude to lead policies focused on sanitation access***

Having detected the need to change the attitude of people working in the sanitation field, research programm Ceda-D03 tested new forms of IEC programmes, where the outreach workers are taught first to listen and learn from the inhabitants, to better understand the people and their relationship to their neighbours, how they feel about a dirty environment and how they deal with urban living, in order to find ways to work together to improve access to sanitation.

Sanitation "thinkers" (operators as much as researchers) tend to focus on "fashionable" subjects rather than observing the real problems on the ground and seeking pragmatic solutions. The programme's research and pilot actions illustrate this phenomenon clearly. It can be seen in the very intellectual stance taken by the teams and is also evidenced in the attitudes of the different leaders and managers presented in the reports, for instance the attitude to lagooning or maintenance.

The sanitation landscape in Africa is changing considerably. However, these changes, particularly in the services offered to the populations, do not always stem from technological progress or political strategy. The role currently played by the private sector in the management of pit emptying demonstrates this well.

To respond to the challenges facing sanitation in Africa, sector experts will need to call themselves into complete question. This applies to everyone: technicians, financers, health and urban development professionals, from the North and South.

## 4.2. The importance of private initiative and the structuring of private sector dynamics

With sanitation policies recentred on the development of on-site solutions, urban sanitation services will spread as the corresponding economic market grows. The energy and the expansion of private sector initiatives are the keys to this market where demand exceeds supply for the moment, and total coverage is still a distant concept.

Public policy can speed things up, if they are careful not to replace private dynamics but seek to complement them in a clearly understood manner. The Burkina Faso-style strategic sanitation plan is one such example. A municipal pit-emptying management strategy is another example of how the private sector can be structured and motivated by the creation of an association of pit-emptying firms.

## 4.3. Participatory sanitation action and strategic planning

Coming after decades of directive public policy that was out of sync with the real practices of populations left to their own devices, the new policies praise participatory action among different types of stakeholder, the originality of each urban experience lying in the extent to which it is participatory or sustainable.

By involving all stakeholders, including representatives of the inhabitants, in the needs assessment and in the identification of solutions, "participatory planning" shows itself to be a tool that educates and encourages rapid buy-in – speeding up implementation for the following reasons:

- the participation of public authorities in the collective decision facilitates the overcoming of administrative hurdles
- reassured by a clear framework, the private sector can invest its efforts and take risks with innovation to propose goods and services to the inhabitants,
- the inhabitants benefit from a place to express their concerns and, in a more constructive fashion, their expectations and the ways they can contribute,
- that all stakeholders sign-up to the same overall long-term vision encourages financial support from external sources to supplement local efforts

## 4.4. The fundamental issue of the institutional sanitation framework and the role of municipal authorities

The accounts of actions ENSP-A08 in Yaoundé and CrepaCI-A02 in Bouaké demonstrated the disastrous impact of a weak institutional framework for sewer systems on their operation and sustainability. On the other hand, Moshi-A05b broke down the institutional context of a current network extension policy (cf. § 2.3. *The intermediary link in the sanitation chain: transport*).

The institutional framework for implementation of a sanitation policy is fundamental for its sustainability. Decentralisation laws generally attribute responsibility for sanitation to the municipalities. However, the most advanced experiences highlight the driving role of another institution, dedicated to sanitation, to which the municipality delegates its responsibility. This is the case of the ONEA, the national water and sanitation authority in Burkina Faso, which was one of the pillars of the emergence and then implementation of the strategic sanitation plans. It is also the case of the Moshi Urban Water and Sewerage Authority. These two experiences are worth a closer look both because of the extent of their success but also because of the current limitations of their action with regard to the overall question of sanitation.

***The conductor at national level***

Research programme Shadyc-A04 gives an interesting analysis of the current, rather conflictual, relationship between ONEA and the municipal authorities. For more than a decade and outside of any municipal dynamic, ONEA, a national parapublic institution, has been following a remarkably successful policy to develop the upstream link in the sanitation chain, leading to wide-spread coverage of improved on-site systems. This is quite a feat for an organisation shaped by the "drinking water" approach. This institution is now tackling the

construction of the first large-scale sewer networks and lagoon treatment plants in Burkina Faso. It can be noted that they have paid little attention to the issue of pit-emptying.

Thanks to its established presence, its success in the field and its financial independence, ONEA today holds a dominating position in the sanitation field, which does not facilitate the participation of other local stakeholders, including municipal authorities, in the general sanitation policy for each city.

***The conductor at municipal level***

Research programme Moshi-A05b presents the completely original experience of Tanzania, which set up 18 municipal institutions like the MUWSA of Moshi, with the following characteristics:

- its scope of action is the city or town, but it is answerable to the Ministry,
- it has legal status and financial independence, which is controlled a posteriori according to an innovative and precise performance evaluation mechanism
- it manages water and sanitation networks
- it is administrated by Committee made up of the Government (2 representatives), the Municpality (2), civil society (5) and the director of the Authority.

In this way, local stakeholders are regulated pragmatically via an institution:

- which is active across the urban domain without being subject to the whims of municipal figures,
- which represents civil society as well as the Government and the municipality (5 representatives out of a total of 10, 1 from the commercial sector, 2 consumers and 2 women's representatives),
- which benefits from significant financial autonomy, including the choice of pricing policy for consumption and network connections,
- and which is controlled according to a strict mechanism of performance indicators, the greatest strength and originality of which is being able to constantly call the level of financial autonomy into question (merit-based autonomy).

As nothing is perfect, the weakness of this institution is that on-site sanitation does not fall within its remit, remaining the responsibility of the municipality. This explains why, while the mechanism to extend and maintain the sewer system seems well developed, nothing is done to improve on-site sanitation which nonetheless remains the only solution accessible to the vast majority of the population. Indeed, as elsewhere, the municipality is unable to fulfil its direct responsibilities in terms of sanitation and has not undertaken any tangible action.

However, it can be noted that nothing prevents the municipality from eventually delegating its sanitation responsibilities to this institution, enabling it to develop a similar level of know-how as that of the ONEA. Tanzania would then have succeeded in developing an independent and municipal, technical and financial institutional tool capable of leading a complete urban sanitation policy.

# 5. Conclusion

## 5.1. Sanitation, a basic service poorly identified by municipal authorities

Sanitation is a basic service that is poorly understood as such by the populations and municipal leaders. Indeed, it is part of a wider concern for improving urban living conditions or the urban environment, or even for combating various forms of pollution and urban problems, among which inhabitants and municipal leaders include flooding (storm water management) and the management of solid waste.

The fundamental objective of sanitation is to control waste water, excreta and other liquid waste produced by human domestic and economic activity, so that the bacteriological and physico-chemical pollutants they contain do not spread health risks or degrade the environment. Technical answers, specific to urban sanitation differ from those used for storm water or solid waste management. It is imperative to clearly understand this.

Most often, urban sanitation is the municipal authorities' responsibility and more particularly falls within the remit of those responsible for public health and hygiene. However, it can be seen everywhere that this institutional position does not foster the development of large-scale programmes, as these departments lack both financial resources and innovative know-how.

When linked to local drinking water policy, urban sanitation builds a visible identity, both technically and financially, because liquid waste is directly linked to water consumption. This is most clearly illustrated by the fact that a sanitation fee can be added to the water bill using the polluter-pays principle. Yet this association can be a double-edged sword, because talking about sanitation at the same time as water leads naturally to a "network" logic, the famous sewer system that is unsuited to the majority of African urban areas.

## 5.2. Strategies for large-scale development of sanitation: municipal management or management at municipal level?

All the difficulties involved in urban sanitation in sub-Saharan Africa are brought together here:

- a sharply growing but poorly identified demand for sanitation facilities that could mobilise financial capacities associated with habitat improvement and is just asking to be properly captured by a judicious and imaginative supply,
- a completely changing economic market for sanitation goods and services thanks to a dynamic private sector, but which experts in the field and public authorities find difficult to grasp and therefore promote,
- an integration with the local water policy, which usually leaves sanitation neglected and which limits the technological solutions but which can also, still too rarely, constitute the operational spearhead,
- and, finally, as a basic urban service, a detrimental absorbtion into municipal concerns of urban environmental management, which are too vast and confused (combat of pollution and various urban risks).

Only a strategy designed at municipal level can be an overall strategy that adopts the links in a chain approach: upstream (access to sanitation), intermediary (transport) and downstream (treatment). Only this dimension can mobilise all stakeholders (public sector, private sector, populations and economic players).

However, nowhere have municipal authorities shown themselves to be sufficienty motivated and skilled to lead participatory, comprehensive and sustainable action in the field of urban sanitation.

Furthermore, from the strategic point of view, we insist on the fact that only an integration with the water policy and the institution that drives it locally can provide sanitation the necessary complementary and indispensable financial tools (with the inclusion of a sanitation fee in the water bill according to the polluter pays principle now being known and accepted) and, above all, a tangible and solid operational dynamic.

Could a pragmatic key for resolving the central issue of the institutional framework for urban sanitation, and thus for lifting the various obstacles standing in the way of large-scale development of basic urban sanitation services, be the setting up of a management system run at municipal level but by an independent entity closely associated with the local water policy and under municipal oversight?

One experiment would be to move in this direction, learning from the lessons of Burkina Faso and Tanzania as suggested above.

**The studies discussed in this summary**
(most of these studies are in French, but some exist in English. A summary in English of each study is available)

Hydroconseil-A01*. Les entreprises de vidange mécanique des systèmes d'assainissement autonome dans les grandes villes africaines – *Mechanical pit-emptying companies for on-site sanitation in African Cities* (Mauritania, Burkina Faso, Senegal, Benin, Tanzania** and Uganda**)

CrepaCI-A02. Stratégie de gestion des boues de vidange issues des fosses septiques des latrines dans une ville de plus de 500 000 habitants – *Strategy for managing sludge from latrine septic tanks in a town of more than 500 000 inhabitants* (Bouaké, Ivory Coast)

Lasdel-A03. La question des déchets et de l'assainissement dans deux villes moyennes – *The question of waste and sanitation in two medium-sized towns* (Niger)

Shadyc-A04. Une anthropologie politique de la fange : conceptions culturelles, pratiques sociales et enjeux institutionnels de la propreté urbaine – *Political anthropology of effluent: cultural conceptions, social practices and institutional stakes of urban hygiene* (Burkina Faso)

Cereve-A05a. Gestion domestique des eaux usées et des excreta : étude des pratiques et comportements, des fonctions de demande, de leur mesure en situation contingente et de leur opérationnalisation – *Household management of waste water and excreta: a study of practices and behaviours, factors of demand and their extent in contingencies and their operationalisation* (Guinea, Ivory Coast, Burkina Faso, Niger, Tanzania)

Moshi-A05b* (Dar es Salam University / Pau et des pays de l'Adour University). L'amélioration des services d'assainissement de la ville de Moshi. Analyse de la demande et régulation du secteur – *Improvement of sanitation services in Moshi. Analysis of demand and sector regulation* (Tanzania)

Trend-A06**. Le potentiel d'utilisation de réacteurs anaérobies de type UASB pour le traitement des boues fécales – *The potential for the use of upflow anaerobic sludge blanket (uasb) reactor for the treatment of faecal sludge in Ghana*

Gret-A07. Planification concertée pour la gestion des excreta – *Participatory planning for managing excreta* (Mauritania, Ethiopia)

ENSP-A08. Gestion et valorisation des eaux usées dans les zones d'habitat planifié et leurs périphéries – *Waste water management and re-use in planned urban development zones and their outskirts* (Cameroon, Chad)

Iwmi-A09**. Co-compostage des boues de vidange et des déchets organiques pour l'agriculture urbaine et périurbaine : un projet pilote à Kumasi – *Co-composting of faecal sludge and Solid waste for urban and peri-urban agriculture: a pilot project in Kumasi* (Ghana)

Cereve-A10. Valorisation des eaux usées par lagunage dans les pays en développement – *Re-use of waste water through lagooning (Stabilisation ponds) in developing countries* (Niger, Cuba, Burkina Faso, Senegal, Ghana, Ivory Coast and Cameroon)

Ceda-D03. Recherche d'espaces pour le dialogue, la prise de conscience et l'organisation en vue de l'action dans la commune urbaine – *Seeking spaces for dialogue, awareness raising and organisation to taking action in the urban Municipality* (Benin)

IRD-D08. Gestion des déchets et aide à la décision municipale : Municipalité de Mopti et Circonscription Urbaine de Porto Novo – *Waste management and municipal decision-making support in Mopti and Porto Novo* (Mali, Benin)

* Study partly in English

** Study in English