Tasks of local public services for environmental protection

G. Genon
Politecnico di Torino, DITAG, Italy

Abstract

For the best quality of life in modern metropolitan areas it is more and more important to correctly plan the activities of some fundamental public services (energy, transport, waste management, water); the aspects of the trust of services to public or private companies must be defined from the point of view of technical and organization requirements in order to obtain the best service realisation and at the same time a good approach to environmental protection.

These requirements have been examined with particular reference to the organisation of the water cycle and to the management of waste collection and disposal, in account of the particular influence of these sectors on the indicated aspect of environmental protection.

The most important aspects that must be defined are:

- object of the service
- instruments
- tariff
- monitoring
- planning

These aspects are examined as general requirements, and they are also discussed with particular reference to Italian situation.

Keywords: environment, local public services, water cycle, waste collection and treatment, planning.

1 Introduction

The ordered course of household, commercial and technological activities in a modern metropolitan area demands the regular supply of fundamental public services, such as drinking water distribution and removal and treatment of

WIT Transactions on Ecology and the Environment, Vol 129, © 2010 WIT Press
www.witpress.com, ISSN 1743-3541 (on-line)
doi:10.2495/SC100171

wastewater, collection and right final disposal of municipal and special wastes, centralised supplying of electric and eventually of thermal energy, and realisation of a network of public transportation.

All these services are strictly required for an ordered associated life, but at the same time they certainly involve many aspects concerning the environmental quality, in account of the offered service and at the same time for the potential impact results that from them that could arise.

In particular, in the present paper we have evaluated the services dealing with environmental health (management of the water cycle, system for waste disposal) in account of the direct influence deriving from them on the environmental quality of a metropolitan area.

For these services the local authority (the City in general, in some cases a city association) with a service agreement entrusts the operations to a public or private operator, which for a fixed period and for an established area is responsible for the enforcement of the operations that are required for the specific sector.

So it is interesting to evaluate, besides to the conventional aspects of any public agreement, the specific requirements that characterise the sector of environmental health, and to establish the criteria for the introduction of these aspects in the agreement.

These arguments will be developed at the same time and with joined considerations for the water sector and for the waste sector; many management and environmental aspects are in fact parallel and frequently similar for the sectors.

2 Object of the service, geographic ambit, consumers, duration of the agreement

The first point to be established is the definition of the specific services that are committed, the connotation of the interested consumers, the limits of the geographic ambit where the service will be developed, and finally the duration of the agreement: this is in fact the first requirements for a correct service entrustment.

Concerning the sector of management of the water cycle, it is absolutely impossible to ignore some activities, such as drinking water supply, transportation of polluted waters (sewage wastewater and surface rainwater), and final treatment before re-emission in receiving bodies.

Some other secondary activities can be foreseen in particular cases and in account of local situations: some examples are non drinking water supply for technological or irrigation aims, distribution of bottled drinking water in emergency situations, purification of technological wastewater in public treatment plants, treatment of sludge or residuals from primary or final treatments.

To the water service are clearly associated the management, maintenance and remaking activities for the piping system; the cost and complexity of these operations are strongly increased from the necessity to operate at the interior of a

metropolitan area where there are many potentially interferent networks, and also in account of the structural stress more and more induced from urban rehabilitation and traffic increase.

As concerns the waste sector, the fundamental services that are required are the sweeping and hygienisation of soil and constructions, the collection of segregated and mixed wastes, and the transfer of waste fluxes to intermediate or final destination.

Some secondary activities can be established case by case, and the examples are the urban roads maintenance with reference to exceptional meteoric events, the realisation and management of structures and plants destined to secondary materials recovery from waste fluxes, the energy production from waste.

As in the case of water sector, also in this sector, regular maintenance is required, improvement and monitoring of the collection network, with reference to fixed structures, transportation systems, and intermediate islands for transfer.

In both sectors it is necessary to exactly define the type of consumers for which the service must be assured, since from the characterisation of different consumers and for example from the consideration of the different origin of wastes it is possible to derive criteria for collection, tariff considerations, quality standards for collected wastewater or solid waste.

Apart from civil consumers, where the service is naturally required and it is not subjected to particular conditions, it is necessary to individuate the service modalities directed to commercial activities similar to households (shops, restaurants and hotels, commercial centres, schools, theatres and meeting places), and also to technological activities (industries, handcraft shops, energy production plants, etc.).

As it was indicated, it is necessary to fix for this type of consumers specific criteria for sewage service and for waste collection, and also to define the limits of quality for the materials that can be accepted, the systems used to control this quality, and the criteria used to take into consideration this quality in the fixation of the tariff.

The fixation of parameters for the tariff must be coherent with national laws, but from the other side it must take into account aspects of local specificity, or particular objectives for service development.

The geographic ambit for the service of drinking water supply and also for non drinking water can be easily identified in the borders of the city (or the cities association) that entrusts the service; in a similar manner the activities of soil and structures hygienic preservation, and collection and transport of waste, seem to have a well defined destination, corresponding as in the previous case to the reference territory.

Other aspects of the service execution on the contrary very probably involve other territories: outside from the city territory is frequently situated the intake point for the raw water, and consequently the management, control and analysis of the drawing activities, the arrangement of the best protection systems for the original water resource, and the transportation of raw water to primary treatment plant necessarily involve exterior territories.

In a similar way the final destination of the polluted water fluxes that with different sewers have been collected is normally found in an area outside of the city borders.

Also as concerns the final destination of different collected solid wastes, and the construction and management of required treatment plants, the need to resort to areas outside from the area where the service is executed is very frequent, in account of environmental and operative considerations.

The service implementation on territories outside of the reference territory, both for water and waste, is linked with considerations concerning the planning of the indicated services; in fact some superior planning authorities have the task to define routes and outlets for the wastewater and solid waste fluxes, and also to establish criteria for primary resources utilisation.

In the definition of the service agreement this aspect of the requirement of exterior territories for the derivation and final destination will involve important considerations concerning transport tariff, responsibility for the operations outside of the city, monitoring guaranties.

Finally it is important to carefully consider the aspect of the duration of the agreement; besides to the obvious aspect of the possibility to discuss and verify each year the tariffs, there are, in fact, some considerations that recommend a rather high length, and they consist of:

- possibility to amortize in many years the investments in large infrastructures, apparatus and structures that must be at disposition for the operator;
- possibility to plan progressive policies for collection, treatment, purification systems improvement, and more generally possibility to modify the relationship with consumers;
- better knowledge of the territory where the service must be realised;
- progressive time utilisation of acquired information;
- possibility to avoid burdening the performance in short times as a consequence of strong seasonal effects.

In opposition to these arguments, there are other aspects that push to a more frequent agreement re-negotiation, as:

- modification of the technological scenario for the systems for potabilisation, treatment and final destination of residuals and by-products, or for the systems for waste collection and final treatment; as a consequence of this modification, in many cases it is necessary to arrive to a completely different formulation of the agreement;
- emersion on the market of different technological systems or different collection solutions, previously not in general use, that suggest the entrustment to different subjects.

3 Resources, planning, reference authorities

In both the water cycle sector and the environmental health sector it is possible to observe a continuous development as concerns technology, operations and

environmental protection; this development is a right answer to the modification of rules, but it is also a consequence of modification of the technological structures offered by market, in direction of an increase in economy and performances; it is therefore very suitable in the service agreement to insert a specific prescription concerning the adoption of the best techniques, in the moment where they appear on the national or European technological panorama.

Also with reference to the structures that are used for the wastewater collection, or for systems for drawing and transport of waste, it will be necessary for the operator to conform the structures that are utilised not only from the point of view of economy and efficiency, but also in consideration of the necessity to obtain an increasing environmental safety, with consideration of the evolution of standards that will be fixed from laws and also from best practices.

As concerns the resources availability for the water sector, in order to guarantee a reliable service continuance it seems very convenient for the operator of the service to be in possession of all the required structures as concerns the operations of derivation, raw resource transportation to primary treatment plant, drinking water distribution, collection and transport of wastewater, and final treatment before emission in receiving body.

In fact it should be possible, in theory, to use for some phases of the above-mentioned cycle foreign structures, but this opportunity should lead to a too heavy load on the quality of the supplied service and on its control in management phase; these aspects are very important in consideration of the particular delicacy of the whole process from the sanitary and health point of view.

Only for the operation of the final disposal of treatment by-products (chiefly sludge from water treatment) it seems to be possible to use structures of other operators, in some cases also outside of the reference territory, and so the possession of specific structures can be avoided: in any case a well fixed guarantee is required in order to obtain the continuous availability of verified final points for disposal.

In a similar manner, as concerns the systems for the soil sweeping and for waste collection, the operator must be in possession of suitable means and apparatus, that in any situation will be at disposition for the operations.

On the contrary, for the final disposal in many cases the separately collected materials and the mixed waste will be sent to exterior plants or platforms, that structurally are not under the control of the operator of the service; it seems therefore necessary also for this case to establish steady agreements for the collocation of the wastes, and to fix quantities, characteristics and systems for transfer, able to cover all the duration of the service entrustment.

As concerns planning of activities, from one side the activity of soil sweeping and structures hygienisation, and from the other side the activity of collection and transport of water seem to be well consolidated operations, and so it is only necessary to fix and forecast the required technological renovation and the overhaul and substitution of obsolete or no longer suitable apparatus.

The systems for final disposal of waste and the ones for primary and final treatment of water present a strong evolution; in account of this the operators

will be required to adapt the industrial plans to the objectives fixed for the service from national or local planning, by individuating costs, benefits and conditions for this structural improvement.

In the periodic tariff revision the necessity to conform to modified situations will be one of the reference parameters that will be evaluated together with the natural fluxes evolution.

As we have see, the agreement concerning the service entrustment is subscribed from the City (or cities association) and the operator; but it is nevertheless convenient to consider also the relations with other authorities in charge of planning and control.

In this connection the activities of the operators must be coordinated with the addresses of the regional authorities that have the responsibility for the planning of services concerning water or waste for a fixed territory; to the operator it will be required to take into account the regional planning directives and the fluxes distribution criteria that are fixed from Authorities, and to adapt to this its social and industrial planning. It is a very sensible point the form that is adopted for the verification of this aspect, so it will be carefully considered in the definition of the service agreement.

At last it must be taken into consideration the territorial control authority, that is in charge for the supervision and for the regularity of operations; it will be necessary to individuate a monitoring joined agency that will verify the reliability in the system conduction, and the correspondence to general criteria for environmental safety.

4 Tariff

The tariff that each year will be recognized, from the City where the service is done to the operator that is delegated to it, will be calculated as concerns the items of hygienisation, collection and disposal from the multiplication of a specific tariff for the quantity of swept soil, of waste that in some form is collected, of residual that is transferred to exterior disposal centres.

It will be convenient to establish an assessment and control methodology for the quantities, in order to be able to reconstruct and validate the quantity that at the conclusion of the service is communicated from the operator. The specific costs must instead be previously defined, for suitable time lengths (generally the duration will be an year), and they will derive from a specific analysis: this analysis will concern the evaluation of the operative costs and the other internal costs, as concerns the operations, in case of operator autonomous activity, while in the cases when the operator will rely on support of others (as for example for disposal of some quantities of collected waste) it seems convenient to perform a market analysis with the aim of the individuation of potential solutions, in order to arrive to agreement hypothesis.

Similar considerations must be done also for the definition of the water service tariff: it is required to fix a methodology for control and verification of the fluxes that are moved in the different service sectors, and also to arrive to a careful reconstruction of specific internal and external costs.

5 Aspects of accomplishment of service, quality levels, monitoring

It is necessary, when the service is entrusted, to carefully define the quality of the activities that must be accomplished, both with reference to the subjects that are the users of this activity, and also with reference to the whole environment; it will also be convenient to establish a system for verification of these aspects, and for exterior communication.

As concerns the water sector, guaranteed quality levels must be defined for the water that is distributed to private users, but also to commercial and technological activities; these levels must be in any case not less than the fixed values deriving from national laws. It is also required to define the guaranteed pressure and flow-rate, with eventual differences during the day. The frequency and maximal length of accidental events able to lead to an interruption of the supplying service (except for situations that cannot be forecast), must be indicated.

To the operator it is required to establish the limit characteristics of the collected wastewater, as a function of the original activity, and to indicate the control systems that will be used to verify and guarantee these characteristics.

Regarding the final treatment activity, the operator must define how it is possible to respect the environmental quality criteria that are operating for the receiving environment, to verify the environmental quality of discharge, to perform on it routine controls.

The regular control of the used piping system is of paramount importance, as concerns the drinking water distribution, and also for the wastewater transport to the final disposal point; the operator has in charge the ordinary maintenance and the restoration interventions on this system, and for this activity it is necessary to define conditions, frequencies, operating ways, expected results.

In the sector of environmental health, in order to obtain the required results concerning soil sweeping and hygienisation of structures, it is necessary to define the time frequency of interventions, the limits of areas where the service is directed, the quality requirements that must be obtained after the intervention in the object of it.

For the collection items, after the indication of different types of waste that can be collected in a separated or mixed manner, it is necessary to establish the time frequency of containers emptying, the characteristics of the containers that are used for collection, their volume and resistance characteristics, the periodic washing operations.

It is moreover required to determine how the service will be organised (door to door collection, road collection, call service, with road containers, in islands, etc.) with reference to the different qualities of waste that are collected.

The structure of ecological islands must be defined, and it is necessary to establish the type of operations to be conducted in these structures, and the environmental safety criteria that must be respected in order to avoid impact phenomena on the surroundings from there.

For the transfer of the materials that with various solutions have been collected in direction of intermediate or final destinations, the autonomy level about the choice of final destination that can be granted to the service operator must be defined, and also to establish which verifications must be carried out from it as concerns the potential destination points, and to define the control activity that the operator must carry out on transfer operations.

If the subject that receives the entrustment of the service has at disposition owner structures for the final destination (a landfill for example), it is necessary to define the criteria for an environmentally acceptable use of these structures, and the monitoring systems that from the operator will be adopted.

In both sectors the service agreement must contain solutions, object and cost distribution for the creation of an independent monitoring service, in charge of the verification of the activity of the society that receives the service entrustment; the monitoring system is required to periodically prepare a specific report.

In the case of water service, it is necessary to take into account both aspects, from one side the satisfaction of requirements of the single consumer (solutions and economy for drinking water supplying and wastewater removal systems, quality of drinking water that is fed, presence of specific information), from the other also aspects concerning the environmental protection in a general way (protection of derivation points, correct destination of residual material fluxes, environmental acceptability of the operations of treated wastewater re-emission, limitation of aspects of atmospheric pollution arising from different operations, verification of the environmental quality for the points of transfer, etc.).

With the same approach for the environmental hygiene service the considered aspects will be both specific aspects concerning the service that is directed to the consumer, and also more general aspects of verification of a correct environmental performance and a best limitation of secondary phenomena of pollutant transfer.

6 Declaration of services and communication for consumers

It is a fundamental prescription of the service agreement the duty for the operator to regularly provide for preparation and publication of a service charter directed to the consumers, where all the information that can be considered useful for the service are contained.

This information must be directed to three aspects, which are:
- type of actions that can be required to the consumer;
- activities that the operator is obliged to furnish to consumer;
- results that have been obtained or it will be possible to obtain.

Some examples of the first category of information are the indication of the types of waste that can be collected, which are the collection systems (type of containers, frequency of exchange, topographic and logistic disposition), or, in the case of water service, indication of materials that can be poured in the discharges, systems for organisation of collection of rain and surface water, type of structures for distribution and treatment that must be accepted in the reference territory.

The second information points out the collection (or water quality) standards that are guaranteed from the operator, the hygienic and environmental quality levels that will be obtained and saved, the final fate that is assured for the fluxes in different way separated, the obligation to realise some ecological infrastructures, etc.

Finally the third type of information must represent and report the historical results of collection and disposal activities (or in the other case the results of potabilisation and final treatment), with disaggregation of data concerning different types and different territorial ambits, and with clear representation of evolution trends.

It is important to note, as concerns the information that must be supplied to the consumers, that it is necessary for the operator to specify which are the service general indications that will be transmitted to the consumers, chiefly in the sector of drinking water supplying and in the specification of different waste fluxes, or in the fixation of collection criteria; it is moreover required to specify the forms by which this information could be transmitted.

7 Implementation of services in Italian market

The realisation of an ordered and effective entrustment system for the public services operating in water sector and in the sector of environmental protection met in the Italian situation some aspects of high worth, but on the other side some critical circumstances that only in part it was possible to overcome.

The prevalence of the first or the second ones is different in different country territories, with the consequence of a very differentiated situation: in fact for some areas the performances are completely corresponding to European quality standards, while situations of remarkable backwardness are still present, chiefly in areas where it seems that is lacking a strong political will in order to overcome services development models that are no more suitable.

As concerns the positive side, it is possible to mention the following aspects:

- for the water sector, the situation until to about ten years ago was characterised by a condition of high fragmentation, with the presence of small or very small entrustments directed to very limited territories, with the consequence that in account of this small dimension it was not possible to arrive to economy and effectiveness results; this situation in the last years has been replaced by the appearance of larger operating activities with a more extended reference areas, and therefore the result more strictly corresponds to an effectiveness model;
- the sector of waste treatment and disposal has been characterised by a clear progress in the awareness both from the public authorities and also from the service operators of the fact that it is no more possible to postpone virtuous policies directed to recovery and valorisation of residuals, with the result of a noted decrease in the critical need to find ever new spatial and technological solutions for disposal;

- the national regulation has correctly singled out the functions of entrusting authority (City or cities association), from the programming authority (some new authorities, the ATO, Autorità Territoriale di Ambito, Territorial Ambit Authorities, have been established in order to plan the water or waste activities in a specific area), and also from controlling authority (the authority in charge is generally the Province); so the different competences are well distributed;
- operators with very high professional standards are present at the interior of entrusted societies in the sector of water cycle management and in the sector of waste disposal organisation; so it is possible to face with correct choices to the unavoidable periodical emergencies.

Some critical aspects are still present, and they are chiefly represented by:

- presence for the water sector of a piping system that in many case is rather obsolete, and in any case chiefly in metropolitan areas is subjected to high pressure, with the consequent urgent need to realise important restoration works, with a cost heavily impacting on the tariff;
- infiltration in the waste sector of criminality elements, that are directed to take advantage of monopoly or income situations, chiefly in situations that at the same time do not correspond to realisation of specific services;
- limited use of instruments of differentiated tariff or incentives for practices directed to resources re-use or saving, with the consequence of consumption standard for water use or production standards for waste generation that do not correspond to the best parameters that from the international situation can be in comparison observed;
- presence, in decreasing but still important forms, of psychological oppositions, often connected to a wrong evaluation of potential environmental impacts, to the acceptance of innovative solutions that require a territorial modification; it is therefore very difficult to give an intervention answer with compulsory plant choices to situations of limited efficiency or to new needs.

It is, in any case, convenient to take into account, from the point of view of the best perspectives for the sector in Italy, two elements: the first one derives from the interest for the application of local public services regulation that has been more and more strongly showed in the last years from the academic world and from the public and private research foundations; this interest led to the development of an articulate effort of elaboration and definition of useful models for the sector best activity.

The second positive element can be recognised in the creation, from different territory authorities (Cities, Regional Administrations), of Agencies that are specifically directed to the study, the control and the addressing of local public services; these agencies have therefore been an useful instrument of stimulus and reference in order to realise more effective public services

8 Conclusions

As a conclusion, an exhaustive description has been introduced about the principal parameters for the definition of the tasks of local public services in metropolitan areas, with reference to the environmental quality connected to the water service and to the realisation of modern systems for waste disposal.

Technological, territorial, management, administrative and financial needs have been individuated; their best use can lead to an effective and economical service, that will be at the same time able to act with an environmentally friendly approach and to satisfy the needs of the consumers.

It is nevertheless required from the political authority to correctly found and coordinate the system, and particularly to clearly fix and control addresses, priorities, exigencies.

This definition of a general framework that strictly needs integration of different capacities and approaches can certainly be obtained from the applied research sector and from the territorial development studies; in fact from this observatory it is possible to obtain observations of phenomena that require modifications, suggestions of alternative models, proposals for more convenient structures in order to give an answer to the needs of a public system that is more and more complex and multi-disciplinary.

Acknowledgement

The Author wishes to thank the Authority for the Local Public Services of the City of Turin for initial impulse for this paper, and for the useful information that has been transmitted.