HAL
open science

A posteriori analysis of the design and the maintenance of retention ponds in the Ile-de- France region

Bruno Tassin, Jean-Marie Mouchel, Nadine Aires

To cite this version:

Bruno Tassin, Jean-Marie Mouchel, Nadine Aires. A posteriori analysis of the design and the maintenance of retention ponds in the Ile-de- France region. Novatech 2004, 5ème conférence internationale sur les techniques et stratégies durables pour la gestion des eaux urbaines par temps de pluie, Jun 2004, Lyon, France. pp.1115-1122. hal-00729079

HAL Id: hal-00729079

https://enpc.hal.science/hal-00729079v1

Submitted on 7 Sep 2012

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

A posteriori analysis of the design and the maintenance of retention ponds in the Ile-de-France region.

Analyse a posteriori de la conception et de l'entretien des bassins de retenue d'eau pluviale dans la région Ile-de-France

Tassin B.*, Mouchel J.M.*, Aires N.**

*Cereve, Ecole nationale des ponts et chaussées,
F77455 Marne la vallée cedex2
(tassin@cereve.enpc.fr, mouchel@cereve.enpc.fr)

**Agence de l'eau Seine-Normandie
51 rue Salvador Allende
92000 Nanterre
(aires.nadine@aesn.fr)

RESUME

Ce texte présente les résultats d'un séminaire de réflexion d'une journée sur les bassins de rétention d'eaux pluviales dans les villes nouvelles de la région Ile-de-France. Ce séminaire qui s'est tenu le 29 mars 2001 a rassemblé 25 experts de toutes les disciplines scientifiques et techniques impliquées dans la conception et la gestion des bassins de retenue d'eau pluviales

Il ressort que les grands bassins conçus dans les années 70 sont la marque d'un urbanisme qui n'a aujourd'hui plus cours. Ils ont contribué à structurer l'aménagement des nouvelles zones urbaines. Aujourd'hui les principaux enjeux sont relatifs au développement des différents usages de ces plans d'eau et à leur évolution.

ABSTRACT

This text present the results of a one-day workshop on retention ponds in the "Villes nouvelles" in the Ile-de-France" region. 25 experts participated to this seminar which took place in March 2001. All the relevant technical and scientific disciplines involved in the design and the maintenance of retention ponds were represented.

It appears that these ponds designed in the seventies are the signature of a typical urbanism. They contributed to organise the appropriation of the new urban areas by their inhabitants. Today the main related stakes deal with the development and the evolution of the multiple uses of these retention ponds.

KEYWORDS

Retention ponds, multiple uses, management, landscape design

1 INTRODUCTION

1.1 Retention basins in the Ile-de-France Region

The Ile-de-France region was created as an administrative entity in the middle of the sixties. It includes the city of Paris as well as eight other Departments located around Paris (12000 km^2). 11 millions inhabitants are living in the Ile-de-France – 20% of the French population -and the density of the population is decreasing from the centre of Paris to the peripheral zones but remains very high with an average of about 900 inhabitants/km^2. The population is quite stable with an increase rate of 0.25%/year over the last decade.

In order to equilibrate the development of the various parts of the region, and especially to avoid an increase of the population density in the old urbanised areas, it was decided in 1965 to create 5 new urban areas, called “villes nouvelles” (Figure 1). In 1993 700 000 inhabitants were living in these new urban areas located 20 to 40 km from the centre of Paris.

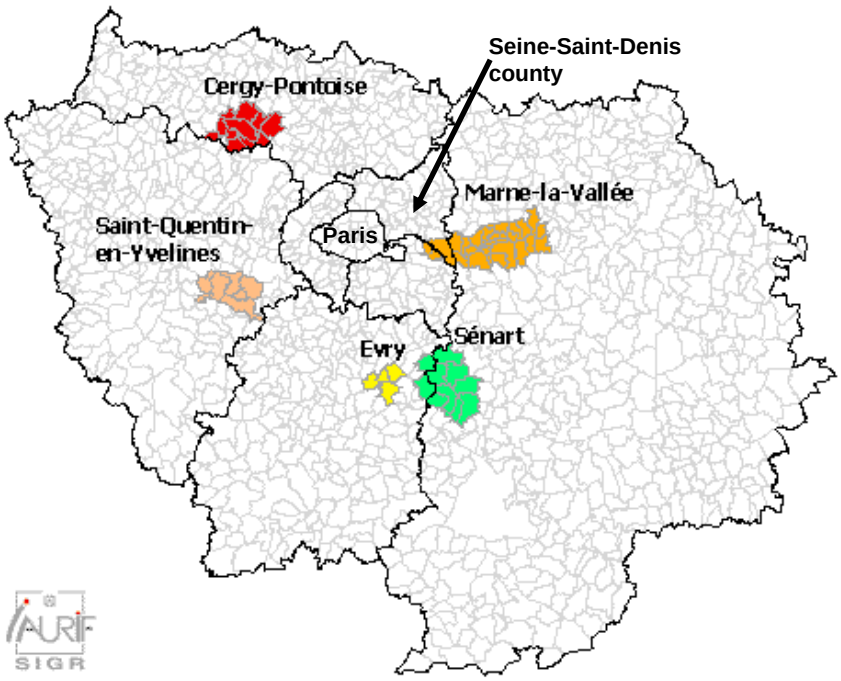

Figure 1 The Ile-de-France region and the 5 “villes nouvelles” (IAURIF SIGR map)

Management of rain water was a major issue in the design of these “villes nouvelles”. As the basic principle of the “villes nouvelles” was to develop not densely populated areas, they have been located for most of them in the upper parts of the catchments of the tributaries of the main rivers (Seine, Marne, Oise rivers), which constitute the natural receiving systems of runoff water. The use of a classical drainage system, based on the old paradigm of the transfer of rain water as quickly as possible from the catchment to the receiving system would have led to a financial dead end because of

the required size of the pipes, and to a major impact on the receiving system because peak flow values of runoff water would have had the same order of magnitude as the river flow.

Thus it was decided to design numerous retention ponds placed on the previous hydrographic network in order to enable a drastic reduction of peak flows as well as a suppression of most of the pipes or at least a reduction of their diameter. A few hundreds of these retention ponds are now existing in the Ile-de-France region.

Moreover these retention ponds were used, especially during the first phases of the construction of these “villes nouvelles”, as structuring elements of the new urban areas. They are now not only hydraulic equipment but also water mirrors in the city, highly appreciated by the population.

1.2 *A posteriori* analysis : Methodology

20 to 30 years after their construction, it appeared necessary to gather the point of view concerning this kind of equipment of their various stakeholders, from their designers to their final users. For this purpose, a 1-day seminar was organised (29 mars 2001) in collaboration with the “Agence de l’eau Seine-Normandie”, with the participation of more than 25 scientists and experts from various fields from urban planning to urban hydrology and sociology, and managers in charge of urban water management (Table 1) (Cereve-AESN, 2003)

Categories of experts	Number of experts
urban hydrologist	4
Wetlands experts	3
Landscape designer	2
water manager (large basin scale)	3
Geographs	3
BMP experts	1
Water manager (local scale)	5
Consultant basin design	2
Economist	1
Sociologist	1

Table 1 composition of the panel of experts

During the seminar 4 topics were successively addressed: i) the role of this equipment in the city, ii) the various categories of users and their opinions, iii) the management of the retention ponds, iv) the future of this concept and of the existing ponds. For each topic a short introductory talk was given in order to present the main points related to that topic. Then a 2-hour free discussion managed by a moderator allowed the sharing of experiences and point of views.

This paper aims at reporting the main points of view and ideas discussed during this seminar. Despite the fact that each of the following items could be illustrated with the exact words of the participants, it was decided to present only a synthesis of the

discussions, without any reference. Thus this paper stands for an executive summary of the seminar.

2 RETENTION PONDS IN THE CITY

Retention ponds are quite common in urbanised areas. However, in our case they are particularly numerous and large (4% of the urbanised surface for an individual area between 0.5 and 20 ha). Thus all the experts agree that these ponds are important structuring elements inside the city. In some cases, the image of the city is completely related to the frequent presence of water, because of these ponds. In such a configuration, the city looks like a large urban park and the ponds belong to the global landscape of the city and not only to a local landscape, at the neighbourhood scale.

This readability of a retention pond in the urban landscape is necessary condition for the development of numerous and various uses.

As these ponds are connected one to another, they are at the basis of green corridors, with pedestrian or bicycle ways. This connectivity is also of outmost importance from an ecological point of view. The more a pond is connected to other ones; the more interesting is the ecological quality.

However certain ponds remain outside of the urban landscape. They are located in interstitial places along highways or on industrial territories, which are quite common in new urbanised areas. Because these places are most of the time without any interest and difficult to reach, they remain actually quiet and undisturbed. Wetlands specialists indicate that they observed and very strong biodiversity within such places. As a consequence and despite their unfavourable environment, these ponds need to be regularly monitored and maintained.

2.1 The uses of the retention ponds, the users and their opinion

It is very difficult to define a methodological approach for assessing the uses (hydraulic efficiency and pollution removal excepted) of a pond and the compatibility between different uses, as well as the attachment of a user or a category of users to a pond. Environmental economics tools look very difficult to apply, especially to evaluate the ecological function of a retention pond. Moreover experts agree that utilitarian uses may be assessed quantitatively but that tools do not exist presently for assessing the non-utilitarian uses like the social

From a qualitative point of view, the main uses of the retention ponds are easy to assess. Most of the time they remain very usual: walking, fishing, and remote controlled modelling and generally do not cause any conflicts between the users. Fishermen are always present, all over the year, even in uncomfortable places in the vicinity of highways. The attraction potential of water for walkers was recently measured in the Seine-Saint-Denis county (figure 1) in their large parks. It appears that the number of walkers around ponds is three times higher than in other parts of the parks. During the spring and the summer season, many people are staying on the banks of the ponds, not only during the sunny weekends, but also during the noon break.

Bathing activities are forbidden on most of these ponds. However on larger ones sailing and windsurf are authorised and many people practise there their favourite sport.

Fishermen are very well organised through representative associations. Other users associations may exist for specific uses (remote control model, nature protection) centred on the pond itself. The problem of the peaceful coexistence between the various uses is of outmost importance. All the experts agree that it is generally related to an active dialogue between local authorities and users associations. Thus despite

the fact that local authorities do not fully decide how a retention pond is going to be used, they are naturally involved in the negotiation loops when possible conflicts may arise.

The use of the retention ponds as a support for pedagogic activities is in strong development. More and more teachers of young children (6 to 11 years old) consider that these ponds constitute favourable places for the discovery of nature in an urban context. This use depends obviously on the quality and accessibility of the aquatic and terrestrial ecosystems. Specific conditions are necessary for facilitating the development of this activity. The pond must be seriously monitored to get a sufficient knowledge of its ecology. The presence of nature conservancy associations, which are present on the pond, is also a highly positive point, because the members of these associations would assist the teachers and the pupils in the discovery of nature.

Surprisingly the seminar participants never mentioned the pollution removal as a use. On the one hand depollution as well as water storage are the basic obvious objectives of retention ponds and were omitted by the experts. On the other hand, the discussion was oriented towards the uses and the users and, as these objectives do not include specific categories of users, they were not considered as relevant uses in the discussion. However, looking carefully on the uses on specific ponds, it appears that conflicts may exist between the hydraulic management on a pond and for instance nature conservation associations. As it concerns the protection against floods, hydraulic management is a priority action on the pond. However long and careful negotiation may converge to often more complex but also more satisfactory management procedures (Donadieu, 2003).

Experts pointed out an other interesting point related to uses. They agreed in the fact that the uses vary during the lifetime of the ponds. Because the social context of a pond evolves with time, its uses evolve too. Firstly, the *a priori* uses considered during the design phase of a pond are often different from the uses that really occur after its achievement. This is not a consequence of a misconception during the design phase of the project but of the appropriation, through an easy and secure reading of the landscape of the pond by all categories of users which may induce unexpected uses. Secondly the organised development of a specific use is in most cases based on the efforts of a very small group of people and often of a single individual. As the energy of this small group decreases with time, after several years their activity declines and other uses are able to develop. If it seems necessary to maintain a specific activity over time, it is also necessary to support it financially and to recognise it institutionally, at least at a local scale.

2.2 The management of the ponds

The maintenance and the management of the ponds are directly depending on the preceding discussion on the various uses of the ponds. There is a close link between the uses which take place on a pond and its maintenance. Moreover when local associations are involved in the organisation of a particular use, it is also often asked whether it can help and contribute to the maintenance of the pond. Thus associations may play a central role both in the reflexion about uses but also in the realisation of the maintenance.

The management of retention ponds needs an integrated approach and must include the management of the catchments connected with. Thus the maintenance of a pond is firstly the maintenance of the drainage system which enters it. The entering of wastewater into the retention ponds causes the most frequent dysfunction. Solving it implies a permanent survey of the urban catchment connected to the pond, in order to detect new wrong connections, especially in individual housing areas. Concerning industrial risks and their consequences on retention ponds, the rapid turnover of

factories on industrial zones is a real concern for the managers who often have to update the list of related risks.

Concerning the water within the pond, there is no explicit target for water quality. The main concern is to be able to detect major trophic dysfunction, either linked with anoxia and heterotrophic activity or with algal blooms, or with an excessive sedimentation rate. A guide for retention ponds monitoring is presently lacking in France, and monitoring programmes are as numerous and different as the services in charge of the maintenance of the ponds. This strongly limits the development of knowledge.

Moreover Annex II of the EU Water Framework Directive does not consider the “lakes” with an area less than 50 ha. As this is the case of most of the retention ponds, they remain in a shadow area despite their large number.

Concerning the maintenance of the pond surroundings, an ecological treatment is required, and is a prerequisite for the presence and the development of an interesting terrestrial ecosystem. Unfortunately, this maintenance is mainly under the responsibility of the park maintenance service, which in most cases does not have the required culture for an ecological treatment.

This difficulty could be partly solved by a transfer of the maintenance to private associations. However, in most of the cases the activity of these associations is only efficient during a short period, typically few years as noticed previously. Thus their decreasing involvement must be considered since the creation of the pond or the beginning of the maintenance programme, and a teaching programme has to be proposed to the park maintenance service in order to help in the transfer of knowledge to permanent organisations.

In a few cases, maintenance services developed themselves efficient techniques and very satisfactory results concerning biodiversity for instance have been obtained. However these services do not want to communicate both internally and externally on this subject and prefer a secret strategy. They fear that their ecological way of working will be replaced by a more classical and expected safer one if their hierarchy would know it.

From a financial point of view the classical maintenance of the surroundings of the retention ponds, often based on lawn mowing is much more expensive than the ecological treatment, which requires more know-how but less money.

3 CONCLUSIONS :THE FUTURE

3.1 Future of retention ponds

It is commonly considered that retention ponds are a sustainable solution to the runoff problem in urban areas. In the Paris region, their average area indicates a potential efficient pollution removal. Moreover they enable a drastic decrease of the peak discharge in the final receiving system during storm event and they avoid the costly construction of very large pipes over sometimes quite large distances On a more sociological aspect they provide an access to water and surrounding spaces sought by the urban population for several reasons and uses that were just presented.

Despite these facts, environmentalists refutes this sustainability and *a contrario* consider that they cause non-reversible modifications of the pre-existing ecosystems in the upper parts of the drainage systems, due to the modification of the water flow as well as the habitats of the various autochthonous populations. They also think that these ponds help in the development of an unsustainable urbanism with its economical and social implications, which could not be considered outside of such source control solutions for urban runoff.

In any case, all the experts agree to say that the characteristics of the retention ponds, which were designed in the seventies, are now belonging to the past: too large and too expensive. The increase of the price of the soil in urban and urbanising areas makes it economically impossible to freeze 2 to 4% of the available areas as well as to protect against events with a return period far over 10 years. In the very recently urbanised parts of the “villes nouvelles” much more technical and compacts detention and retention ponds are presently used. They also store water much more frequently than elder ponds do. Other source control technique are also more and more considered, thanks to the development of regulations that force the control of the runoff flow at the parcel scale.

Moreover, new vulnerability approaches, including a controlled partial flooding of urban areas and the education of urban citizens to the consequences of rain, seems to be the natural evolution of the previous “retention / infiltration” paradigm.

3.2 Future of existing retention ponds

Concerning existing retention ponds, outside of the purely technical aspects (hydraulic behaviour, control of the origin of the incoming water, monitoring of the water quality), the main stakes deal with the harmonious evolution of the uses. It seems obvious that this evolution is based on a bottom-up principle, meaning that the users are at the basis at the evolution of the uses and that the manager(s) has (have) to organise it, with the help of landscape designers and sociologists. The improvement of the dialogue between all the involved stakeholders is the key for success in this evolution.

Of course, a 1-day seminar is too short for proposing a throughout analysis of the existence of these ponds as urban devices in the city and many questions could not be fully discussed. This includes mostly economic and sociologic aspects. It must be said that retention ponds and their environment have not been considered as research or study objects, and that even experts lack of a generalised feedback and experience on this subject. Moreover this seminar is only a starting point and a more detailed study based on individual interviews of a larger panel of actors remains to be done

In any case, this seminar enabled the meeting of stakeholders who often remain isolated and the expression of very general characteristics related to the urban insertion of retention ponds.

4 ACKNOWLEDGMENTS

The Agence de l’Eau Seine-Normandie is gratefully acknowledged for its support in the organisation of this seminar and its participation as well as the 25 experts who accepted to spend one full day for discussing on retention ponds.

BIBLIOGRAPHIE

Donadieu P. (2003) La nature palustre dans la ville. Actes des 14èmes journées du DEA Sciences et techniques de l’environnement (sous presse, à paraître aux presses de l’école nationale des ponts et chaussées)

European Union (2000) Water Framework Directive 2000/60/CE http://europa.eu.int/comm/environment/water/water-framework/index_en.html

IAURIF (2003) Système d’information géographique régional http://www.iaurif.org/fr/sig/presentation/

Cereve-Aesn (2003) Evaluation socio-économique des plans d’eau urbains et de leur mode de gestion. Compte rendu du séminaire du 29 mars 2001. Rapport technique.