

ANR Research Program - Sustainable Cities (call 2009)

OMEGA : Methodological tool for sustainable urban water management

OMEGA is a research funded by the French National Research Agency (2010-2014). It involves 4 partners :

- ▶ Laboratory of Civil and Environmental Engineering (LGCIE - INSA Lyon),
- ▶ Lyonnaise des Eaux, a SUEZ Environnement company
- ▶ Laboratory of Engineering, Technic, Urbanization, Societies (EVS - ITUS, UMR 5600 - INSA Lyon)
- ▶ Laboratory of Territorial Management of Water and the Environment (GESTE - Joint Research Unit Cemagref ENGEES)

The objective of our project is to develop and test a pluri-disciplinary assessment methodology allowing

- ▶ to measure service provided by the urban water management system,
- ▶ stakeholders to choose a strategy in order to improve service provision.

3 cities are involved in the project : The Urban Community of Bordeaux, Greater Lyon and The Mulhousian metropolitan area. Each city shares its own experience and vision for water management, each city is also a case study for the methodology.

The following pages present the background and objectives of the project, the partners and their missions and case studies. A section is dedicated to the news and production of the project.

a- Context and goals of the program

Nowadays urban drainage systems have become much more than a simple removal of storm-water and sewage out of the city. New management objectives and techniques must be considered, for instance related to the protection of aquatic environments or mitigation of nuisances due to the wastewater system. Moreover, urban water is becoming an increasingly important resource and a growing diversity of organizations and actors promote the emergence of new techniques. It is thus well known that the urban water system becomes more and more complicated and many experts argue that the concept of urban drainage should evolve into a more integrated concept of urban water management.

The waters produced within the city must be integrated into the design, organization and management of the city. It is then necessary to define means of interactions and cooperation between all pertinent organizations and actors, at the scale of the urban precinct and at the scale of the catchment area. These changes must concern both the technical facilities (object, device) and the stakeholders (local authorities, firms, non-profit organizations, etc.) which contribute to urban water management and provide services. This goal can only be achieved if service provision can be objectively assessed. This assessment allows stakeholders to choose the most efficient strategies. In this context, the objective of the OMEGA project, during 2010-2013, is to develop and test a pluri-disciplinary assessment methodology allowing (i) to measure service provided by the urban water management system; and (ii) stakeholders to choose a strategy in order to improve service provision.

This assessment takes into consideration technical, environmental, social, economic and organizational aspects. It will allow the efficiency of a strategy to be assessed before and after implementation, in order to provide a comprehensive decision support (supporting public discussion regarding the definition of assessment criteria, production of scientific data, rationalization of decisions within deliberation processes).

More precisely, this methodology provides an efficient means to:

- ▶ precisely define traditional and emerging functions that a sustainable urban water system should fulfill;
- ▶ define assessment means (indicators) that should be understood by all stakeholders;
- ▶ define the level of service that is expected by stakeholders and organizations regarding each function (target level for each indicator);
- ▶ define responsibilities for each service (by whom, when, how, to which level of service...);
- ▶ choose the most efficient strategy to meet the performance target;
- ▶ assess the service level that is actually provided by the system, throughout the implementation of the chosen strategy, and identify performance deficiencies;
- ▶ produce feedbacks on the strategy, by taking account of the demand evolution and/or gaps observed between predicted and observed results of the strategy.

The consortium of the OMEGA project include two laboratories from INSA Lyon (the LGCIE “Urban Water” team as coordinator and the laboratory EVS-ITUS working on “Environments & Urban Devices”), Lyonnaise des Eaux – a company of SUEZ Environment, Cemagref-Enges (laboratory GESTE working on investment choices and management of services asset) and the GRAIE association.

b- Organisation

The OMEGA program is divided into 9 work-packages :

Category	WP	Description
Methodological Approach	WP 1	Development of the methodological framework
Methodological Approach	WP 2	Systemic approach of the urban water management system
Specific study	WP 3	To Preserve natural environment and it usages
Specific study	WP 4	To Protect against flooding
Specific study	WP 5	To Promote urban water for urban life and to promote urban life for urban water
Specific study	WP 6	To Guarantee acceptable cost
Specific study	WP 7	To Preserve resources
Software development	WP 8	To Design a decision support software

Category	WP	Description
Case study	WP 9	To Apply OMEGA methodology on 3 case studies

c- Consortium

The consortium regroups 4 partners :



1- COORDINATOR : LGCIE (LABORATORY OF CIVIL AND ENVIRONMENTAL ENGINEERING) – INSA LYON / UNIVERSITY OF LYON

The team "Urban water" of the laboratory is divided in 3 main topics :

- ▶ Topic 1 : Metrology / modelling of water and pollutants fluxes in complex structures in sewers,
- ▶ Topic 2 : Transfer, Characterization and treatment of stormwater in urban/periurban catchments,
- ▶ Topic 3 : Performance/Efficiency of Urban drainage operating – Decision making.

The OMEGA project concerns the third topic. [more information](#)

LGCIE is in charge of the following tasks :

- ▶ task 1 : Development of the methodological framework,
- ▶ task 2 : Systemic approach of the urban water management system,
- ▶ task 3 : Function « To Preserve natural environment and it usages »,
- ▶ task 4 : Function « To protect against flooding »,



2 : LYONNAISE DES EAUX Lyonnaise des Eaux is a SUEZ Environnement company dedicated to drinking water treatment and distribution ; and to wastewater collect and treatment. Lyonnaise des eaux serve 19% of the French population for drinking water and 18% for wastewater. [more information](#)

Lyonnaise des eaux is in charge of the following tasks :

- ▶ task 7 : Function « To preserve resources »,
- ▶ task 8 : To Design a decision support software,
- ▶ task 9 : To Apply OMEGA methodology on 3 case studies ,



3 : EVS-ITUS – INSA DE LYON (ENVIRONMENT CITY SOCIETY) The team « Environments & Urban Devices » works on technical and spatial devices as the origin of the human city and human environment. Roads, public amenities, transports, potable water networks,

wastewater networks, road signs and markings, informatics system used for urban asset management, public lighting, (...) represents many examples of urban devices. These devices are observed as means of urban and social activity. [more information](#)

EVS-ITUS is in charge of the task 5 : Function « To Promote urban water for urban life and to promote urban life for urban water ».



• **4 : GESTE - CEMAGREF-ENGEES (Territorial Management of Water and Environment)** GESTE is studying the management of potable water services, wastewater services and solid waste services. 3 main topics are defined :

- ▶ Investment choices and management of services asset ;
- ▶ Service analysis (assessment, tools for management and monitoring) ;
- ▶ Governance and participation.

This program is included in the first topic. The team has already been involved in numerous works on these subjects (economical assessment, asset management, etc.).

GESTE is in charge of the task 6 : Function « To Guarantee acceptable cost ». [more information](#)

d- Case study - cities

Task 9 of the project is dedicated to the full-scale implementation of the methodology on each case study. The implementation requires operational and scientific approach in order to fulfill cities objectives and to learn from case studies.

Cities involved in the project are :



The Urban Community of Bordeaux - CUB : <http://www.lacub.fr/>

The Mulhousian Agglomeration : <http://www.sivom-mulhouse.fr/>

The Greater Lyon : <http://www.grandlyon.com/>

Final conference of the OMEGA project : 22 may 2014 (French Article – [LINK](#))



f- Resources

POSTER :

- poster of the OMEGA project (In French) : [Fichier image](#)

Reports :

- Report 1a "Methodological Framework" (In French) [PDF](#)
- Report 2a "Systemic approach of the urban water system" (In French) [PDF](#)
- Report 9 "Cas studies" (In French) [Fichier PDF](#)
- Report 2b et 1b "Methodological guide " (In French) [Fichier PDF](#)
- **Scientific report** (In French) : [Fichier PDF](#)

Papers :

- Belmeziti A., Cherqui F., Tourne A., Granger D., Wery C., Le Gauffre P., Chocat B. (2015) **Transitioning to sustainable urban water management systems : how to define expected service functions ?**, *Civil Engineering and Environmental Systems*, online : 01 Jun, [link](#).

- Cherqui F., Belmeziti A., Granger D., Sourdril A. & Le Gauffre P. (2015) **Assessing urban potential flooding risk and identifying effective risk-reduction measures**, *Science of The Total Environment*, 514(1), 418-425. [link](#)
- Nafi A., Bentarzi Y., Granger D. & Cherqui F. (2014) **Eco-EAR : A method for the economic analysis of urban water systems providing services**, *Urban Water*, online : 14 Jan : [link](#)
- Caradot, N., Granger, D., Chaggier, J., Cherqui, F. & Chocat, B. (2011) **Urban flood risk assessment using sewer flooding databases**. *Water Science & Technology* 64, 832-840 : [link](#)
- Granger D., Sourdril A., Rousseau J.P., Darribère C., Cherqui F. & Le Gauffre P. (2013) Evaluation de l'aléa débordement sur un territoire : valorisez vos données !, 8ème Conférence Internationale Novatech, 23-27 juin, Lyon, France. (In French) : [lien vers l'article](#) | [lien vers le poster](#)
- Cherqui F., Granger D., Métadier M., Fletcher T., Barraud S., Lalanne P. & Litrico X. (2013) Indicators related to BMP performance : operational monitoring propositions, 8ème Conférence Internationale Novatech, 23-27 juin, Lyon, France. [lien vers l'article](#) | [lien vers le poster](#)
- Nafi A., Bentarzi Y., Granger D. & Cherqui F. (2013) Eco-EAR : méthode d'analyse économique des services rendus par le système de gestion des eaux urbaines, 8ème Conférence Internationale Novatech, 23-27 juin, Lyon, France. (In French) : [lien vers l'article](#) | [lien vers le poster](#)
- Cherqui F., Baati S., Bentarzi Y., Chocat B., Le Gauffre P., Granger D., Loubiere B., Nafi A., Patouillard C., Tourne A., Toussaint J.Y., Vareilles S. & Wery C. (2013) Quels enjeux pour la gestion des eaux urbaines ? Contribution à la formulation des services à rendre par le système de gestion des eaux urbaines, 8ème Conférence Internationale Novatech, 23-27 juin, Lyon, France. (In French) : [lien vers l'article](#)
- Nafi A., Bentarzi Y., Granger D., Wery C., Cherqui F., Loubiere B., Trognon-Meyer C., Gsell S. & Perret P. (2012). Comment évaluer le coût du service d'assainissement : Méthodologie et application d'un cas réel. Colloque international de Service Public d'Eau Potable, 14-15 novembre 2012 à Grenoble (France), actes sous presse. (In French) : [lien vers l'article](#)
- Ah-leung S., Baati S., Patouillard C., Toussaint J.-Y. & Vareilles S. (2012). Que fabrique-t-on avec les eaux pluviales urbaines ? Les dispositifs techniques et les usages du parc Kaplan dans l'agglomération lyonnaise. 8ème Conférence Internationale Novatech, 23-27 juin, Lyon, France. (In French) : [lien vers l'article](#)

Contribution to reference books :

- **Improving performance of water and sanitation public services** under the coordination of Pierre-Alain Roche, President of the ASTEE, Solène Le Fur, policy officer at the ASTEE, & Guillem Canneva, lecturer and researcher at AgroParisTech : [PDF](#)
- Cherqui F., Wery C., (2013) "Integrating urban water management services" in **Urban planning and urban services : the essential alliance**, ASTEE, juin 2013, pp. 64-67. [PDF](#)

Case studies and demonstrations :

- Asset urbanity : the case of urban drainage systems (In French), Constance THUAL : [PDF](#)
- Study on Aquatic Environment on the Mulhousian Agglomeration (In French), Zeineb BEN HADJ KHALED : [PDF](#)
- Quality of water bodies and stakeholders' perception on the territory of the Urban Community of Bordeaux (In French), Emeline DE CRUZ : [PDF](#)
- Synthesis of the French regulation regarding storm water management (In French), Cynthia SCHAUS : [PDF](#)

Program coordinator - Frédéric CHERQUI - INSA Lyon - LGCIE - frederic.cherqu[at]insa-lyon.fr
Coordinating program Assistance and its outreach : Laëtitia BACOT - GRAIE - laetitia.bacot[at]graie.org