



**HAL**  
open science

## A causal model to understand the impact of blue infrastructures on health and well-being

Marie-Florence Thomas, Tania Serrano, Selena Lopreno, Oksana Rybchak,  
Nina Lemaire, Anne Roué Le Gall

### ► To cite this version:

Marie-Florence Thomas, Tania Serrano, Selena Lopreno, Oksana Rybchak, Nina Lemaire, et al.. A causal model to understand the impact of blue infrastructures on health and well-being. Embrace the Water, A Cities of the Future Conference 2017, International Water Association (IWA), Jun 2017, Göteborg, Sweden. hal-01734910

**HAL Id: hal-01734910**

**<https://ehesp.hal.science/hal-01734910>**

Submitted on 15 Mar 2018

**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 causal model to understand the impact of blue infrastructures on health and well-being**

Marie-Florence Thomas<sup>1,4,\*</sup>, Tania Serrano<sup>2,4</sup>, Selena Lopreno<sup>1</sup>, Oksana Rybchak<sup>1</sup>, Nina Lemaire<sup>2</sup> and Anne Roué-Le Gall<sup>2,3</sup>

<sup>1</sup>École des Hautes Etudes en Santé Publique, Laboratoire d'Etude et de Recherche en Environnement et Santé (LERES), du Professeur Léon Bernard • CS 74312 • 35043 Rennes Cedex, France

<sup>2</sup> Ecole des Hautes Etudes en Santé Publique, Département santé-environnement-travail et génie sanitaire (DSET-GS), Avenue du Professeur Léon Bernard • CS 74312 • 35043 Rennes Cedex, France

<sup>3</sup>UMR 6051 CRAPE-Arenes

<sup>4</sup>UMR 1085 IRSET

\*Corresponding author : [marie-florence.thomas@ehesp.fr](mailto:marie-florence.thomas@ehesp.fr)

## **Keywords**

Causal model, health, well-being, blue infrastructures, urban water

## **Summary of key findings**

- The model proposed leads to a new representation of the “Water component” in the city. It takes into account the diversity of waters (rain water, storm water, wastewater, urban river ...), the dynamics of water in the city (related to the water cycles) and the heterogeneity of territories in terms of water management.
- This model helps to understand the impacts (benefits/risks) of blue infrastructures and blue space on health and well-being.

## **Backgrounds and relevance**

In the current scenario of global change (climate change and urbanization), the key issues for the water “in and for the city” are the secure supply of high water quality and the flood protection. But the development of concepts related to a sustainable city, water sensitive cities (Wong et Brown, 2009) or urban health planning (Roué Le Gall et al, 2014) leads progressively the authorities to consider the other dimensions (environmental, social and economic) of the urban water. In fact, urban municipalities are increasingly seeking for integrating alternative water management in order to recover rain water, to lower the urban heat island and flooding effects, to create or maintain wetlands, while protecting water resources...

Except the potential health impacts of storms and floods (Lane et al, 2013), the sanitary risks related to new practices and new uses of urban water (urban bathing for example) are not well identified. However, urban water begins to be recognized as an important component of healthy urban living (Van Dinther et al, 2016), both for physical and mental health (Foley et Kistemann, 2015; Völker and Kistemann, 2011, 2013, 2015; Coleman and Kearns, 2015), even if little attention is paid to measure happiness and quality of life in the cities (Science for Environment Policy, 2015). The objective of the paper is to present the construction of a causal model to understand the impact of blue infrastructures and blue spaces on health and well-being.

## **Material and Methods**

The model is designed from the Swiss categorization tool inspired from the works of Nutbeam (2000) and Milvoy and Roué Le Gall (2015), coupled to the concept of the Millennium Ecosystem Assessment (ecosystem services and human well-being) (Pretty et al, 2011). The model is built from

data acquired on different districts of Rennes (France), with flooding area, storm water infrastructures, easy water accessibility for recreational purpose, etc..., completed by socio-economic and public health data of the population.

## Results and Conclusions

The causal model proposed helps to understand the impact of blue infrastructures and blue spaces on health and well-being by:

- explaining the impacts (benefits and risks) of the blue spaces on the health determinants,
- identifying variables of vulnerability or resilience. These variables will help communities to plan strategies allowing to enhance benefits and minimize risks related to urban water (public policies, technical solutions, individual and collective behaviors...).

## References

- Dufour B., Moutou F., Hattenberger A.M., Rodhain F. (2008) Global change: impact, management, risk approach and health measures--the case of Europe Rev Sci Tech. 2008 Aug;27(2):529-50.  
<http://www.millenniumassessment.org/>
- Lane K., Charles-Guzman K., Wheeler K., Zaynah Abid Z., Nathan Graber N., and Matte T. (2013) Health Effects of Coastal Storms and Flooding in Urban Areas: A Review and Vulnerability Assessment. Journal of Environmental and Public Health. Volume 2013, Article ID 913064, 13 pages. <http://dx.doi.org/10.1155/2013/913064>.
- Nutbeam, Don (2000): Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International 15, 259-267.
- Science for Environment Policy (2015) Indicators for sustainable cities. In-depth Report 12. Produced for the European Commission DG Environment by the Science Communication Unit, UWE, Bristol. Available at: <http://ec.europa.eu/science-environment-policy>.
- Völker S. and Kistemann T. (2011) The impact of blue space on human health and well-being – Salutogenetic health effects of inland surface waters: A review. International Journal of Hygiene and Environmental Health. Volume 214, Issue 6, November 2011, Pages 449–460.
- Völker S. and Kistemann T. (2013) “I’m always entirely happy when I’m here!” Urban blue enhancing human health and well-being in Cologne and Düsseldorf, Germany - Social science & medicine, 78, 113-124.
- Foley R. and Kistemann T. (2015) Blue space geographies : Enabling health in place. Health & Place 35, 157–165.
- Milvoy et Roué Le Gall (2015) Aménager des espaces de jeux favorables à la santé. La santé en action, n°434.
- Völker S. and Kistemann T. (2015) Developing the urban blue : comparative health responses to blue and green urban open spaces in Germany. Health & Place 35, 196–205.
- Coleman T. and Kearns R. (2015) The role of bluespaces in experiencing place, aging and wellbeing: Insights from Waiheke Island, New Zealand. Health & Place 35, 206–217.
- Roué-Le Gall A. et al (2015) Agir pour un urbanisme favorable à la santé, concepts & outils. Guide EHESP/GDS. ISBN : 978-2-9549609-0-6
- Pretty J.N., Barton J., Colbeck I., Hine R., Mourato S., MacKerron G. and Woods C. (2011) ‘Health values from ecosystems’. In: the UK National Ecosystem Assessment, Technical Report, UNEP-WCMC, Cambridge, the United Kingdom
- Wong T. H. F. and Brown R. R. (2009) The water sensitive city: principles for practice. Water Science & Technology, 60, 3 , 673-681.
- Van Dinther D. et al (2016) Designing green and blue infrastructure to support healthy urban living.ECN-0\_16\_029