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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modelling microbiological water quality in the Seine river drainage network: past, present and future situations" *by* P. Servais et al.

Anonymous Referee #1

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General comments.

This manuscript provides with data on the faecal coliforms as water quality indicator of the Seine river. The original and interesting aspect of this contribution is the use of a validated model that predict data from non-experimentally studied points and future and past situations. The predictive capacity of the used model in combination with diverse environmental, geographic and social data allows a number of evaluations and prospective analysis of basic interest in water management and related interested parties.

The quality of the paper is also supported by the long and high quality history of the

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author's contributions in the field of aquatic microbiology, modelling, and microbial environmental public health studies. An additional and valuable aspect of this paper is that according the parsimonious principle (or Ocham's razor) the use of one single parameter (the faecal coliforms) allows a coherent and satisfactory scientific interpretation of the Seine river water quality evolution.

Based on the reported results, the authors trigger a debate on the public social demands and water management that is in my perspective some what simplistic and deserve a deeper and more consistent analysis. In order to achieve a more complete, useful and comprehensive final version of this manuscript I provide a number of comments and suggestions for improvement, hoping that interactive comments from other experts and stakeholders may improve the dissemination, applicability and expansion of this approach.

Conclusion:

I consider this manuscript in its present form acceptable for publication, but at the same time I have some interactive comments and I suggest a number of eventual modifications to improve the scientific aspects as well as final debate on the social and managerial aspects.

Scientific comments.

1. One of the "official" statements accepted and assumed in this paper is that: i) faecal coliforms are present in the faeces of humans and warm-blood animals and ii) faecal coliforms do not grow in natural waters although they persist if not eliminated biologically or via water treatment. Considering that i) the high organic matter concentration of the Seine river, in most cases of faecal origin and therefore contain the nutrients that faecal coliforms uptake; ii) the large temperature interval for growing of faecal bacteria (12–48°C); iii) the high concentration of faecal bacteria at the source points and iv) the existence of some reports indicating

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the growth of fecal bacteria in free waters, my questions are the following:

(a) In what circumstances faecal bacteria may growth in Seine waters?

(b) In case of growth, how this situation may change the output of the model?

(c) If so which ones would be the consequences of the predictions?

2. In section Introduction, paragraph 15, the DNA based tools to detect bacteria are mentioned as an alternative method to assess microbial risks in free waters. I want to express my strong concern on these tools since they only provide information on the presence of a nucleic acid sequence and do not provide any information at all about the capacity to infect or provoke a disease or just to know if the detected sequence is or not inside an alive cell.

3. Considering that a precise public health risk may be estimated from the epidemiological data that regularly are published in the area, what possibilities exists to incorporated and cross-validated the model and the output of the model with the current epidemiological of the region?

4. It is any way to comment, compare or discusse the data provided for the Seine river with other similar rivers in Europe or even USA?

5. Author should provide with more comments on alternative technoscience options to be applied in present and future Seine river scenarios. Some comments on the different options for waste water disinfection should welcome since UV is the only alternative mentioned in the paper and today other options exist and are applied. Examples may be the Zenon membrane bioreactors (http://www.zenonenv.com/about) or the electrochemical disinfection or urban waters.

Management comments.

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1. A current dilemma in risk analysis today is to what extend the risk communication to the public in general may protect the consumer. An already known phenomenon in risk analysis is the amplification or attenuation reactions of the consumer once the risks have been communicated (see The Social Amplification of Risks, Edited by: N. Pidgeon et al., Cambridge University Press, UK, 2003 and others). To what extend the model and its output in combination with the epidemiological data may be used to assess the amplification or attenuation processes in risk analysis?

2. The authors in its final section 6 Conclusions, open a hot but unavoidable debate today: how the society will resolve the dilemma of requesting for a clean environment but on the other hand increasing the pollution? The current techno-sciences are sufficient to provide a solution of the problem? Is the society aware about the economic cost of these strategies?

3. Considering that water treatment technologies requires substantial amounts of energy and an energy crisis is soon likely, to what extend the energy will became a limit in water treatment options? The energy limits to water treatment options, would the consequence of the price or the scarcity of the energy in the future?

4. Since the two basic elements that are the main driving forces for the contamination of free waters are: i) the density of the population in the studied area. It is obvious that the population growth and in particular the density growth of the urban areas is a major factor and ii) the increase in water consumption per capita in home activities as personal care, house cleaning, gardening and others, the question is: should o should not be adequate to discuss about the limits and potential control of the population density in future towns? Or perhaps the debate needs to address the limits and control of water consumption? Or may be the debate is about the limits of the water and energy consumption? Or may a combination of all of them?

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5. Could the authors provide more comments on alternative technoscience options to be applied in present and future Seine scenarios. Some comments on the different options for waste water disinfection will be welcome since UV is the only alternative mentioned in the paper and today other options exist and are applied. Examples may be the Zenon membrane bioreactors (http://www.zenonenv.com/about) or the electrochemical disinfection or urban waters and others.

6. To what extend the roots of the dilemma is the citizen's behaviour that their consume habits will not be sustainable soon?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 1153, 2007.