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## ***Interactive comment on “Present challenges for future water sustainable cities: a case study from Italy” by L. Bonzanigo and G. Sinnona***

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Review of the paper: 'Present challenges for future water sustainable cities: a case study from Italy' by L Bonzanigo and G Simmona

This paper addresses important issues about the sustainability of cities into the future. The authors explore the factors affecting change and therefore the consequences for sustainability of cities, while using a particular methodology from Australia. This methodology has been developed for cities facing extreme crises in water supply, whereas the authors of the paper want to apply the method to cities in Italy which have nowhere near the vulnerability of their Australian counterparts.

The paper begins by describing the contribution of cities to climate change, and factors

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influenced by climate change that affect the sustainability of cities. There is probably little disagreement between urban water managers that their cities of tomorrow must be made sustainable as they develop in time, whether the density of population is changing, industry is growing, there is a greater load of traffic per square kilometer, the urban area is being extended, the climate is warming, or legislation and economic factors are decreasing or increasing social, political and cultural stability. The authors draw attention to the declaration of UN-Habitat (2011) that cities themselves are major contributors to climate change, and that although we might secure the sustainability of the cities with respect to water, we may well fail to ensure that adverse man-induced changes to the climate generated by the cities may not be so easy to achieve. I am not entirely happy with the quotation from UN Habitat, in that, although cities may generate 60% of the anthropogenic carbon dioxide emissions' I would question whether they produce a significant proportion of particular other important greenhouse gases such as water vapour. Again, most of us would probably agree that some human settlements are vulnerable to global warming, in particular low-lying coastal cities may be prone to rising sea-levels or larger storm surges, especially those cities that are experiencing land subsidence. Further, the acknowledged increase in the frequency of present-day extreme storms in many areas of the world is likely to make cities more vulnerable to pluvial and fluvial flooding. The risk of fires in urban vegetation during longer periods of more intense heat and drought will disturb any equilibrium in urban areas, as will changes in the spread of diseases affecting vegetation and animal species. There are some important statements in the introduction which are not elaborated on, such as 'climate change poses serious threats to the urban infrastructure, quality of life and entire urban systems'. Despite what the authors have said before this statement it is not clear to me what these threats are, what aspects of quality of life the authors have in mind, and which urban systems are considered. Also, the mention of the year 2003 being the hottest in Europe since 1540 makes me think of how the climate has changed during the last millennium. It is well established that the period 1280-1850 was a 'little ice age', with the climate warming from about 1850. If the authors are

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going to introduce a historical perspective on climate change, they would do well to make it relevant on the time scale appropriate to climate change. I would urge the authors to review their opening paragraphs and make their examples and illustrations more robust and logical.

The sustainability of a city's water resources and management depends on a wide range of factors. The authors have assumed that the availability of a sufficient and reliable source of water is a critical factor for many cities. In turn, whether the source is a river or groundwater aquifer, climate change may have a strong bearing on the viability of the resources. This may be a correct assumption for some cities, especially where a resource is already being over-exploited and the alternatives are highly expensive. Given that there are alternatives (eg desalinization, water reuse, long distance pipe-lines from remote sources) then one could argue that a key issue of sustainability is the ability of the city and its citizens to pay for their water. In other words, it all reduces to a matter of economics (with the associated politics, social conditions, and quality of life). So it would appear that the authors are addressing only one aspect of the sustainability of a city's water resources.

**Methods** The authors are specific about the aims of their study: â€¢ Assess the vulnerability (as defined by IPCC) of Ferrara and Parma to drought â€¢ Assess measures towards a more sustainable and resilient water consumption They explore vulnerability using the Water Provision Resilience (WPR) indicator of Milman and Short. This indicator is a function of six subsidiary indicators. The authors concluded that for their work the contributing indicators should be clustered in four categories: â€¢ Type of water resource â€¢ Structural measures â€¢ Institutional and political framework â€¢ Communication strategies To analyze policies and actions taken by the cities towards sustainable water management the authors adopted the Australian Water Sensitive Urban Design approach, which promotes the integration of stormwater, groundwater supply and wastewater management at the urban scale to protect the aquatic ecosystem. The authors conclude that the key factors they need to consider are â€¢ Inter-organizational

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collaboration and coordination of community participation – Regulatory framework and processes – Organizational capacity – Organizational commitment The authors could explain what they mean by structural measures and institutional and political framework where they introduce them. However, they do describe in some detail the findings of the workshops held in the two cities as they affect the derivation of the WPR indicator.

**Results** The dependence currently of Ferrara on the Po River and Parma on its groundwater aquifers is seen as a major risk in that these sources need to be complemented by others. Structurally the diversification of water sources, the control of pollution in groundwater and the withdrawal from the Po River from alternative abstraction points during low flow are seen as being significant. Politically the Mayor should acquire emergency powers during a severe drought in order to impose restrictions on water use, to involve different city services, and do mobilise industry and citizens. A sound communication plan is viewed as being very important, including an on-going awareness programme concerning drought, and promoting the reduction in consumption of water generally. **Conclusions** – The role of citizens in urban water management, as well as in drought emergencies, is recognized as being crucial. – Integrated urban water management as envisaged by WSUD lies well in the future for Ferrara and Parma. – The lessons learned by Ferrara and Parma can be replicated in other cities

**Discussion** An important aspect of the paper is the stress on the involvement of citizens. Unfortunately, although it is acknowledged that citizens need to be more involved in decision making the greater the severity of a drought affecting water supply, there is little urgency in involving citizens generally in the management of water in the city. The authors suggest that where there is good reason to be concerned about climate change in that there is already a considerable threat to the continued supply of water to a city, its citizens are more likely to be stimulated into activity in relation to their city's water management. It appears that the awareness raising campaigns in the projects at Ferrara and Parma did much to sensitize citizens to the risks and threats that they

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personally were subject to, but does this mean that similar projects are needed in other cities if citizens are to be alerted to the threats and opportunities? It would be interesting to know where the roots of effective involvement of citizens as stakeholders in water supply and drainage could be, thus helping to lay a more solid and effective basis for their contribution to the sustainability of the cities they live in.

Given that Ferrara and Parma are not positioned at the extreme end of the vulnerability spectrum for which the WSUD principles were developed, could the authors posit a methodology that would be appropriate for different parts of the vulnerability spectrum? This would necessitate a better definition of the spectrum and the positions of cities such as Ferrara and Parma on it.

I enjoyed reading this paper, and was challenged by its conclusions. In general I appreciate the methodological approach. Integrated water management is evidently the way forward. I regret that the paper was limited in practice to the water supply issue, and did not include other aspects of urban water management directly, such as stormwater and discharges through combined sewer overflows. These are needed for WSUD to be applied formally. Perhaps the authors could consider a project where the extension of the analysis to drainage, including ecosystem analysis, as well as supply is considered.

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