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A Return to Terzolle: A Vision for the Recovery of "River Memory"

Alexander Palummo

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Abstract: The aim of this article is to promote new dynamics of organization and territorial planning in areas strongly affected by problems of hydrogeological instability and hydraulic risk. This is because public opinion often becomes aware of the problem of the risk factor only as a result of direct exposure to the problem, asking the political decision makers for definitive and above all immediate answers that are structurally impossible to find in a secondary prevention perspective (namely, solving a problem and, at the same time, preventing any relapses). The River Restoration approach, proposed here as a method with a lower impact and maximum yield in the cost/benefit ratio, may not be easily explained to a citizenship driven by the emotional response of urgency. In order to create the right conditions for sharing and discussing this approach, it is therefore proposed to design a broad-based information campaign, which includes precise references to the territory and therefore enables people "to imagine it" in its possible future transformations, thereby promoting a new "territorial" aspect of the notion of "active citizenship".

Key words: ecological network, resilience, scenarios, river restoration

1. Changes in the Man-River Relationship

As borne out both by studies of comparative mythology and archaeological finds dating back to prehistoric times, human beings have developed civilization in close synergy with water resources. Access to fresh water and the availability of watercourses with which to irrigate fields or on which to transport basic necessities (even on which to travel) are considered, by experts of historical and anthropological disciplines, factors facilitating the social and economic prosperity of small and large communities. Therefore, man soon recognized his dependence on rivers. The vital importance of this link has inevitably determined man's adaptation to water resources, as borne out not only by the divinization of water sources so common in ancient religions, but also and above all by a system of beliefs, knowledge and

practice that subordinated communities' choices and rhythms of life to the "needs" of rivers. This subordination was instrumental inasmuch as it was part of a precise calculation of the cost-benefits relationship which clearly showed how, by learning about the river, the available resources could be optimized according to the season and the distinctive characteristics of the territory in which people lived. The way the ancient Egyptians learned to exploit the silt carried downstream by the floods of the Nile and thus obtained one of the most productive agricultural systems of antiquity is emblematic.

However, technological and cognitive progress have progressively loosened the link between Humanity and Nature: the increased confidence in the former's abilities led to less attention being paid to natural rhythms, towards which there was an increasingly loosened dependence bond. And if the first "environmental disasters" of anthropic origin, dating back to the Neolithic period (10,000 B.C.), could have limited impacts on the planet in the light of the limited

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size of the human population, with the progress of science and technology and the related improvement of the quality of life, the anthropic pressure began to have increasingly harmful effects. Just as the Greeks and the Romans deforested whole headlands to build their ships, so the medieval tanneries began to poison the watercourses in which they poured their waste and sludge. The environmental damage has grown exponentially and, as regards the rivers themselves, has in many cases reached the point of no return in the twentieth century. To understand how the man-river relationship has been overturned over the last 5,000 years, an emblematic instance is the Yamuna River: one of the major water resources in India, it has gone from being a sacred river (of such importance as to confer sacredness on the more famous Ganges, by flowing into it) to becoming a dead river, with the acquiescence of environmental activists.

The Italian situation offers a limited series of cases, given that the peninsula is mostly arid. However, as there is also little building space, Italian political decision-makers (and their consultants) have often been confronted by drastic choices, in order to “recover” politically the deficit imposed not so much by territorial characteristics as by the desire to reproduce at any cost models born in, and for, other places.

The paradox of the situation was — and continues to be — that the desire to manipulate and subjugate nature continued to be accompanied by the desire to enjoy its benefits.

A case in point, from this perspective, would, for example, be the project that Leonardo da Vinci had drawn up for the Arno River: an irreplaceable resource from the point of view of water supply and mobility; a resource, above all, of which the Florentines wanted to deprive the Pisans: for this purpose Leonardo planned a deviation of the river's course.

Leonardo's deviation was not implemented, but many small and frequent interventions nevertheless devastated the Tuscany region over the centuries. In this regard, some important historical events include:

the great reclamation at the mouths of the Arno (San Rossore) and the Serchio, the reclamation of Padule di Fucecchio and Bientina, the continuous changes of the course of the Arno and relative embankments, as well as the great containment works (dams, the Lake of Bilancino, etc.).

2. The Terzolle Torrent

On this occasion, I have therefore chosen to consider in detail a case-study in order to hypothesize a different course of development in the man-river relationship, namely the Tuscan area falling within the Metropolitan City of Florence and corresponding to the Torrent Terzolle Basin.

The Terzolle Torrent, which starts near Cercina (a suburb of Sesto Fiorentino), originally flowed directly into the Arno River. The nearby Mugnone Torrent, which instead originates in the municipality of Vaglia and flows into the Arno, came to collect the waters of the Terzolle, with the consequent significant increase in its flow rate and the union of the two basins, due to the anthropic intervention during the XVI century.

Although a simple simulation is being proposed here, it was necessary to identify an area that potentially granted at least a minimum margin of reversibility compared to the invasive interventions inflicted by human hands, so as to be able to formulate hypothetically a tenable proposal, also from the political point of view. From this point of view, the area of the Terzolle Basin seems interesting because it has changed, over the last 50 years, from a predominantly agricultural use to being a strongly urbanized area: the final stretch of the Terzolle is in fact immersed in the urban context. Its territorial transformation, visually disharmonious and naturalistically improvised (there are many instances of buildings constructed in the riverbed and of exposures to hydraulic risk) seems, even to inexperienced eyes, inept planning from above instead of the result of a — more horizontal — process of mediation between

different needs and sensitivities emerging from the area in question.

3. Restoring Space to the River to Restore Life to Society

In all likelihood, the territory under examination asks the political interlocutor for the same things that his counterparts want in the rest of the peninsula: a mitigation of hydraulic and hydrogeological risks and less geological instability. And in other areas of Italy the political response was quick and literally tranchant: for example, in the environs of Aulla (Tuscany, Italy) the tragic experience of the 2011 flood has triggered protective rather than preventative measures, with the building of a real wall of almost 1 Km that separates the city from the Magra River. See in this regard "*Incubo alluvione, ad Aulla il nuovo argine non piace*" (Flood Nightmare, Aulla does not like the New Riverbank), La Nazione, 27 October 2016: "That wall? It is frightening. Five years after the flood that destroyed most of the city of Aulla, there is growing distrust among the citizens who feel more imprisoned than protected by the embankment on the Magra River. It is sufficient to listen to their concerns and observe the embankment along Via Lunigiana, to realize that what was to be the initial part of the work is still missing, at the height of the Taverone Torrent. A part of the embankment that makes the Magra bend, following the riverbed and its natural course, which the current wall could not contain in the event of flooding. So, the city, in case of another flood, would become a huge swimming pool".

The environmental impact of this work will be (if not already today) probably disastrous, both in ecological (an anthropic barrier that increases the fragmentation of habitats) and hydraulic terms (the waters of the river, in their natural flow, will, in any case, erode the bases of the wall). Even the economic impact is not negligible: a town of 59 km², populated by just over 11,000 inhabitants, has pledged to spend about 4,000,000 Euros for this work.

This model of intervention is so decontextualized,

with respect to the area in question, that it can be theoretically replicated anywhere: in fact, as emerges from a more careful analysis, it can only replicate the same type of complications anywhere, and without even definitively solving the problem for which it would have been implemented. With a road metaphor, we could say that in most cases resorting to this extreme interventionism is like taking a blind alley. And, remaining with the metaphor, the only thing to do to find the way is to reverse.

In the case of the Terzolle-Mugnone Basin, I therefore propose a, so to speak, reverse mechanism. From the point of view of the environmental impact I draw inspiration from the principles of River Restoration, which certainly favours a gain in terms of effectiveness, efficiency and economy inasmuch as it advocates the least possible intervention, with a reduced use of resources (mainly local) and certainly for a shorter time in relation to other types of interventions (see the case of Aulla above). According to CIRF's definition (Italian Centre of River Restoration, cirf.org), it is "the integrated and synergistic set of actions and techniques, of a very different type (from the legal-administrative-financial, to the structural), aimed at bringing a watercourse, with the area most closely connected with it (fluvial system), to the most natural state possible, capable of carrying out its characteristic eco-systemic (geomorphological, physico-chemical and biological) functions and endowed with greater environmental value, while also trying to satisfy the socio-economic objectives" (CIRF, 2006).

However, the aspect that we want to emphasize here is that the maintenance of a water course "looked after" with this approach cannot be left to isolated, even if continuous, interventions delegated to the workers in charge on the model of what already happens for the maintenance of urban green areas.

A river acknowledged in its dynamism is constantly placed in an interlocutory position with its territory and with those who live there. A change in the political

management of the problem must necessarily be followed by a different way of "acknowledging" the river. In fact, an ability not to be learned from scratch because the ancient knowledge, of those who cohabited on the banks of the Terzolle cultivating its banks, is still a recoverable and above all usable heritage. The numerous projects (Tuscan and not only) of re-ruralization express a need not only environmental, but also for the restoration of healthy and eco-compatible lifestyles. Taking up these requests can also pragmatically translate itself, in terms of landscape and ecological planning, in the enhancement of ecosystem services: namely "the multiple benefits provided by ecosystems to mankind" (Millennium Ecosystem Assessment – MA, 2005).

Clearly, like any radical change, there must be a willingness to bear the initial costs of the re-adaptation phase: not only, for example, to stop building and cementing in the riverbed, but also think about a change of intended use (when not a demolition) for those buildings constructed without hydraulic safety criteria: for example, in risk areas according to the Flood Risk Management Plan (PGRA in Italy). This is certainly one of the most sensitive and potentially conflictual steps in a return to rurality, because even the urbanization process, despite the distortions, has implied "semantic" investments by the population.

Precisely for this reason it is important that the new course of action is not imposed vertically but is built from the bottom, proposing moments of sharing and resorting as long as possible to participatory processes in which the dissemination of information and its acceptance occur in less stringent times but in a perspective of economic and social sustainability and above all of circularity.

4. Conclusion

The watercourses, apart from always being fundamental for the development of civilization, have become, over the centuries, important indicators of the environmental health of an area.

However, analyzing that same area in an ecosystemic perspective and therefore including man among the variables whose interdependence is to be reconstructed, we would discover that the salubrity of a river could become the litmus test of a broader concept of wellbeing, that is, extended to all the communities (human and animal) that are involved with it.

Certainly the wild urbanization of the last century has broken the ancient bond between man and river, making this connection less evident. But even just trying to define the "negative" situation, that is, in the light of the "disconnections" frequently detectable nowadays, the need to intervene before the relationship between human society and the water element is compromised even more seriously and irreversibly.

The choice of the water catchment area of the Torrent Terzolle as a case study was due to many factors, including the potential — if not immediate — reversibility of the problematic situation that characterizes it. The hypothesis of the application of the River Restoration cannot envisage lasting results if it is not immediately integrated with an operation to recover the rural tradition, a long time bearer of knowledge and practices related to the "conscious" cohabitation with the river.

With all the due prudence with regard to the case under consideration, it seems important to try to invest in re-ruralization (redevelopment) because it not only represents a new productive and environmental possibility, but also a cultural one. In other words, a process of the recovery of local identities and therefore of the old relationship between citizens and the river, which could, in fact, encourage not only the recognition of mutual needs (more safety for man, cyclical changes for the river and its riparian areas), but also the recovery — relatively painless — of that "healthy interdependence" that would permit the return of a more self-sustainable, healthier lifestyle, with less impact on the landscape and the environment.

References

- [1] A. M. Caivano, *Rischio idraulico ed idrogeologico*, EPC libri, Milano, 2003.
- [2] L. Casagrande, P. Cavallini, A. Frigeri, A. Furieri, I. Marchesini and M. Neteler, *GIS Open Source: GRASS GIS, Quantum GIS e SpatiaLite, Elementi di software libero applicato al territorio*, Dario Flacovio Editori, Palermo, 2013.
- [3] M. Dinetti, *Biodiversità urbana*, Bandecchi & Vivaldi, Pisa, 2009.
- [4] M. A. Gomasca, *Introduzione a telerilevamento e GIS per la Gestione delle Risorse Agricole e Ambientali*, Edizioni Associazione Italiana di Telerilevamento, Milano oppure Cfr, 2000.
- [5] N. Dainelli, F. Bonechi, M. Spagnolo and A. Canessa, *Cartografia Numerica*, Dario Flaccovio editore, Palermo, 2008.
- [6] ISPRA, *Linee guida per la valutazione del dissesto idrogeologico e la sua mitigazione attraverso misure e interventi in campo agricolo e forestale*, ISPRA-Ambiente, 2013.
- [7] A. Magnaghi and D. Fanfani, *Patto città-campagna. Un progetto di Bioregione Urbana per la Toscana centrale*, Alinea, Firenze, 2010.
- [8] S. Malcevschi, *Reti ecologiche polivalenti, infrastrutture e servizi ecosistemici per il governo del territorio*, Il Verde editoriale, Milano, 2010.
- [9] G. Menegazzi and P. Palmeri, *Il dimensionamento delle opere di ingegneria naturalistica*, Regione Lazio, 2007.
- [10] P. Mogorovich and P. Mussio, *Automazione del Sistema Informativo territoriale, Elaborazione Automatica dei Dati Geografici*, Masson Bologna, 1988.
- [11] A. Nardini and G. Sansoni (a cura di), , CIRF. *La riqualificazione fluviale in Italia. Linee guida, strumenti ed esperienze per gestire i corsi d'acqua e il territorio*. Mazzanti editori, Venezia, 2006.
- [12] A. Palumbo, *Un'ipotesi di riqualificazione fluviale attraverso la mitigazione del rischio idrogeologico nel caso delle confluenze del Caprio e del Teggia*, Tesi di Laurea Magistrale in Pianificazione e Progettazione della Città e del Territorio, Relatore Prof. Carlo Alberto Garzonio, Università di Firenze, 2014.
- [13] A. Palumbo, *La Riqualificazione Fluviale come strumento per la mitigazione dei rischi idraulici e idrogeologici*, Atti SIU, 2015.
- [14] A. Palumbo, *Gestione e ripristino del territorio in aree soggette a rischio idraulico/idrogeologico attraverso la Riqualificazione Fluviale*, Atti ASITA, 2015.
- [15] A. Palumbo, *La Riqualificazione Fluviale come strumento di rinaturalizzazione dei corsi d'acqua e di valorizzazione dei servizi ecosistemici*, Urbanistica Informazioni, INU, 2016.
- [16] A. Palumbo, *Mitigazione del rischio attraverso la gestione della vegetazione in un'ipotesi di riqualificazione fluviale*, Atti IDRA16, 2016.
- [17] M. Panizza, *Geomorfologia applicata*, La Nuova Italia Scientifica, Roma, 1990.
- [18] D. Patassini, *Valutazione e pianificazione*, Franco Angeli, 2006.
- [19] F. Pearce, *Un pianeta senz'acqua, viaggio nella desertificazione contemporanea*, Il Saggiatore, Milano, 2011.
- [20] F. Supino, *Idrobiologia applicata*, Hoepli, Milano, 1989.