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Global Water and Its (Anti)Political Consequences

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ABSTRACT: This paper draws from the history and geography of science and from political ecology to trace the history of the idea that water can be conceived of, and quantified as, a global resource. We argue that this approach has contributed to the depoliticising of water-related problems by favouring technocratic and managerial responses. A method for calculating water balances was developed in Russia in the late 19th century and came to maturity in the Soviet Union in the 20th century. We begin by describing how this method was first adapted to calculating global-scale water balances in the 1960s. We then investigate how, in the 1990s, the quantification of what we call 'global water' came to be translated into popular international discourse and how this contributed to the construction of a 'global water crisis' in that decade. We also look at how it gave rise more recently to what is known as the 'planetary boundaries' approach. A particular research agenda and set of policy prescriptions follow from this way of conceiving of, and quantifying, water. They are oriented towards governance mechanisms that depoliticise water-related issues by defining and structuring water problems as essentially hydrological in nature. The recommended solutions are thus predisposed towards the technical optimisation of water use; they typically seek out demand-side management tools, and instruments that will ascribe greater economic value to water. Drawing from 'post-political' and 'anti-politics' theories, we argue that the political consequences of global water follow mainly from the way the matter-of-factness of such an approach authorises technocratic-managerial solutions. Discourses that define water problems in terms of quantity put the main focus on *water* per se, rather than on the social relations and realities that underlie such problems.

KEYWORDS: Water, political ecology, quantification, water politics, water crisis, planetary boundaries

INTRODUCTION

The notion that water can be measured at the global scale and thought of as a global issue is a relatively recent development. In this paper, we describe this notion in terms of 'global water'. More precisely, 'global water' refers to the quantitative hydrological methods producing representations of water at the global scale, the representations themselves, and the way these methods and representations have been put to use to construct a 'global water crisis' and the 'planetary boundary' of human freshwater use.

We argue that the political consequences of global water follow mainly from the way its matter-of-factness helps authorise a technocratic-managerial approach to water problems and issues. The quantification of water, particularly at the global scale, and its translation into a 'global water crisis', has been instrumentalised to frame water-related issues as technical in nature. The solutions that this interpretation heralds include technical optimisation, demand-side management tools, economic instruments to promote water-use efficiency, and a variety of standardised 'best practices' in water governance. This focus on techno-managerial fixes draws attention away from – or completely avoids – recognition and discussion of the political circumstances that give rise to important water-related problems in the form of poverty, disparities of wealth, power imbalances, and the capture by elites of the apparatus of the state as it applies to the control and management of water. For this argument, we draw from the work of Swyngedouw and others on the 'post-political' turn; this is described as, "the rise of a neoliberal governmentality that has replaced debate, disagreement and dissensus with a series of technologies of governing that fuse around consensus, agreement, accountancy metrics and technocratic environmental management" (Swyngedouw, 2009: 604). This turn towards apolitical technocratic management is especially evident in environmental – including water – 'governance', where "the paradigm of 'adaptation' and 'resilience' to supposedly 'inevitable' environmental and social change has become dominant, and politics more generally seems to have been reduced to a best-practice competition in the execution of non-negotiable market imperatives" (Blühdorn, 2014: 146).

The depoliticising effects of global water stem from the way it helps frame water-related problems as *water-centric* problems. This framing draws attention away from the hydrosocial relations that produce each instance of water conflict and each water-related problem and issue (Linton and Budds, 2014). The discursive effect of global water is reflected in the title of our paper; it refers to a similar argument made by Ferguson (1990), who describes the depoliticising effects of development discourse in terms of an 'anti-politics machine'. In a similar way, global water, the global water crisis, and the discourses that have been constructed around solutions to the crisis constitute an anti-politics machine. This narrows the options for responding to water-related problems, and channels responses in the direction of economistic and technocratic mechanisms and tools that disavow the need for more radical political action. Examples of such radical action include insisting on the internationally recognised human right to water, vying against powerful state and international agencies for control of water resources, and reclaiming waters that have been commandeered by private interests.

Over the past couple of decades, a growing number of critical social scientists have considered that processes of 'depoliticisation' are occurring when, "the political – understood as a space of contestation and agonistic engagement – is increasingly colonised by politics – understood as technocratic mechanisms and consensual procedures that operate within an unquestioned framework of representative democracy, free market economics, and cosmopolitan liberalism" (Wilson and Swyngedouw, 2014: 6). To say that global water has the effect of depoliticising the water crisis means that it orients possible responses to water-related problems towards technocratic solutions, foreclosing what Swyngedouw refers to as "the political":

> The political is not about expressing demands to the elites to rectify inequalities or unfreedoms, the daily choreographies of interest and conflict intermediation in public policy arrangements and rituals of governance, or a call on 'the state' to undertake action. It is the demand to be counted, named and recognised, theatrically and publicly staged by those 'who do not count', the inexistent. It is the articulation of voice that demands its place… (Swyngedouw, 2014: 174).

Swyngedouw, quoting the political philosopher Slavoj Žižek, defines the political act proper as,

> not simply something that works well within the framework of existing relations, but something that *changes the very framework that determines how things work* (…) [A]uthentic politics (…) is the art of the *impossible* – it changes the very parameters of what is considered "possible" in the existing constellation' [emphasis in original] (Swyngedouw, 2009: 615).

The argument that global water depoliticises water problems does not mean that it has no political implications; on the contrary, global water strengthens the power of the state and of capital to control water and to decide who accesses it and who benefits from its use. It also favours research agendas and management approaches that strengthen the post-political definition of, and response to, water problems. These take the form of technocratic and economistic interventions that certainly "work well within the framework of existing relations", to cite the Žižek quote above, but do nothing to address the fundamental political-economic disparities, power imbalances and social inequities that underlie most water-related issues and problems (Linton and Budds, 2014).

Global water can be understood as a manifestation of what has been called 'modern water'; this is defined as,

> the mode of knowing and representing water that has dominated modern hydrological discourse, especially in the more industrialized parts of the world. This modern way of knowing and representing water essentially abstracts all waters from the social, historical, and local conditions in which they are produced and reduces them to a common abstract and timeless identity which can be represented as 'H_2O' and shown as circulating in the hydrologic cycle (Linton, 2014: 111).

This operation of abstraction, reduction and representation is an important factor in the depoliticisation of water, as it removes the political content of water and defines water issues as technical in nature, thus authorising technical approaches to such issues.

One way in which global water serves to restrict water policy to a technical and managerial register is by helping create a discursive space in which only experts familiar with the methods and language of quantification are authorised to intervene. Quantification, as it is injected into the realm of public policy, presents an arcane argument that is often inaccessible to the 'unenlightened' who have not mastered its particular language. Quantifying the global water balance and projecting this as the basis on which public policy is to deal with the 'water crisis' thus produces a common space of understanding and a negotiated language with its own particular conventions and equivalences (Desrosières, 2008); access to this space is thereby limited to a community of experts. Such a restricted space and language facilitates the forging of apparent consensus around which water management coalesces. In this way, global water participates in what Jägerskog describes as "sanctioned discourses" which empower some and disempower others. They reflect the arguments of political coalitions that are driven by the immediate interests of elites and exclude those who are not able to construct their message in a way that allows them to access the discourse (Jägerskog, 2002).

To explore these concerns, our paper proceeds as follows: First, we trace the history of global water, by describing initially the concept of the global water balance and the calculation of global volumes of freshwater as developed by Soviet hydrologists and others during the 20th century. We then show how these practices became part of the international hydrological discourse during the period from 1964 to 1975, which is known as the International Hydrological Decade. While going to some length to describe the history of global water may seem like an arcane exercise, we feel it is important to do so in this special issue concerned with the political dimensions of water quantification. As we show below, global water has become naturalised, that is, it is presented as a simple matter of fact; it has also come to be instrumentalised as a self-evident argument and as a basis upon which to ground a particular kind of water (anti)politics. We feel that revealing the constructed nature of global water helps open this process to criticism, especially to the extent that the naturalisation of global water forecloses more radical political responses.

After having described the development of the idea of global water and the methodology that has produced it, we show how this helped frame a 'global water crisis' in the 1990s. Essentially, being able to cite scientifically calculable quantities of water at the global scale helped produce an urgent and immediate sense of scarcity as a basic universal condition with respect to the Earth's fixed supply of water. Far from being a neutral matter of fact, however, as Jonsson et al. (2020: 3) point out, "even the most cursory look at the past reveals how closely connected questions of scarcity are to the exercise of power". In this case, the political consequences of global water follow from the way it feeds water scarcity discourses. Such discourses favour neo-Malthusian policies for bringing 'the problem of population' under control; they also support the adoption of neoliberal policies as the most economically efficient means of addressing such scarcity. Global water served an agenda that was being articulated by the World Bank and other actors of the 'global water regime' in the 1990s and early 2000s. That agenda promoted market-based solutions to water scarcity and buttressed the wave of privatisation of water services (as well as the explosion of bottled water sales).

We then discuss the recent manifestation of global water as found in the 'planetary boundaries' (PB) literature. Here, the same basic methods have been redeployed to quantitatively delimit the safe space within which human societies can develop without purportedly risking systemic and irreversible changes in global hydrosystems. This revives the spectre of water scarcity and prompts calls for new techniques to keep humanity within these defined planetary boundaries. With the PB concept, the same basic methods and representations that produced the 'global water crisis' of the 1990s are recycled to produce discourses of water scarcity. These authorise further prescriptions for technocratic approaches to water management; included here are: economic instruments to allocate water more efficiently; and the development of new methods for assigning economic value to water so as to promote a more economically rational use of water. The planetary boundaries framework provides a seamless point of entry for economistic approaches to water management as advanced by international elite groups, notably the Global Commission on the Economics of Water (GCEW, 2023).

The conclusion revisits our arguments concerning the anti-politics of global water. It pays particular attention to the 'scarcity effect' produced by the global water narrative and the anti-political tendencies that follow from, and are supported by, that narrative.

THE GLOBAL WATER BALANCE

The quantification and representation of global-scale hydrological phenomena seldom occurred before the early 20th century, and what we call global water remained a somewhat obscure hydrological preoccupation until after the Second World War. By the early 2000s, however, global water was being commonly disseminated in tables, charts and diagrams and was contained on and between the covers of books. A number of publications helped it become a well-known fact; these included: *Water of the World* (Nace, 1964), *Water as a World Resource* (Chow, 1979), *World Water Resources at the Beginning of the Twenty-First Century* (Shiklomanov and Rodda, 2003), *Whither World Water?* (Rodda, 1995), and simply *The World's Water*, a series edited by Gleick that was first published in 1998 with a new volume appearing every few years (Gleick, 1998). Today, a cursory internet search for terms such as 'global water', 'global water resources', or 'global water facts' reveals a plethora of studies, representations, associations, advertisements and industries that feature global water as an unremarkable matter of fact.

In this section, we describe how this way of knowing and representing water came about. We specifically consider how a method for calculating water balances that was developed in late 19th century Russia and matured in the Soviet Union in the 20th century was adapted to calculating water balances at the global scale from the 1960s onward. We further describe how these methods were translated to the international community of hydrologists via the International Hydrological Decade (1964-1975), a programme that established the scientific credibility of the global water balance concept in the West.

The water balance concept refers to the amount of water in the form of precipitation that falls in a river basin or catchment area. It is equal to the surface water flowing out of the basin (as measured at the mouth of a river) plus the amount of water that has evaporated from the area of the basin. The origin of this concept in Western science is usually associated with the 17th century French proto-hydrologist, Pierre Perrault (Perrault, 2001 [1674]). Perrault is credited with being the first person to quantify the relationship between precipitation, evaporation and streamflow at the basin scale. This earned him the status of being considered the founder of modern hydrology (Carbonnel, 2001). In 1802, somewhat famously, John Dalton calculated a water balance for England (UNESCO, 1971), and the water balance is also the basic scientific concept behind what was later described as the 'hydrologic cycle' by the American hydrologist, Robert Horton (Horton, 1931; Linton, 2008).

Here, however, we wish to focus on the idea of calculating the water balance at the global scale. For this, we take up the history of the water balance concept as it was developed in pre-Soviet Russia and later in the Soviet Union. By the last decade of the 19th century, when Russian and other hydrologists worked out the basic equation for the water balance, the term had already been in use for some time

(Lvovich, 1979 [1974]: 23-4; Lvovitch, 1972: 402), in Russian literally meaning "rotation of water in nature". As far as we know, this is the first time the water balance was stated as a standard equation: Runoff = Precipitation – Evaporation + or – the change in storage (R = P – E ± Δ G). It is the same as the basic model used by Perrault and Dalton except that the version that became standard in Russian use had a groundwater component, with groundwater defined as storage.

This formal equation is known as the Penck-Oppokov equation after the Austrian and Russian scientists who are usually credited with developing it (UNESCO, 1971). Soviet-era scientists argued, however, that it was the Russian hydrologist Brickner, rather than Penck, who deserves the credit; this would make the water balance equation an all-Russian affair (Lvovitch, 1972: 408). The basic idea of the water balance had been compelling to Russian scientists since at least the 18th century; it offered a way to help understand the rather unusual phenomenon of the Caspian Sea’s closed-basin drainage (UNESCO, 1971).

In an effort to produce a better understanding of these phenomena, Brickner used the basic three-term equation (Shiklomanov and Sokolov, 1983: 79) plus whatever hydrological data he could acquire. Using these, in 1905 he published what is acknowledged to have been the first study of the global water balance (Lvovitch, 1972: 402; UNESCO, 1971: 14). The global water balance is essentially an assessment of total evaporation from the oceans, total global precipitation, and total river runoff. It is based on data gathered from around the world. In the years between 1906 and 1970, some 34 global water balance studies by Russian, German and other hydrologists have been cited that followed Brickner’s work and applied the same basic method (Baumgartner and Reichel, 1972: 585). Of these, however, the assessments that were by far the most sophisticated were those by Russian – and later Soviet – researchers.

Stalin’s drive for world industrial superiority is one explanation for this Russian – Soviet predominance in the quantification of global water. A great deal of hydrological information was required to, among other things, expand Soviet hydroelectric production and install large-scale irrigation. The problem was that hydrologists had few resources and little actual data to work with, especially in proportion to the vast territory of the Soviet Union. This motivated them to develop methods for producing reliable information on precipitation, evaporation, and runoff for places where data was scarce. These methods involved mapping the parameters of the water balance; they were especially appropriate for calculating global water balances because hydrological data was practically unavailable for large portions of the Earth (including most of the African continent).[1] As explained by Lvovich (1979: v), "Because information available about sizable parts of the Earth is less complete than the information available about other parts (…) [the Russian] kind of approach (…) has to be taken to hydrological studies of the Earth’s water balance and water resources". In 1945, Lvovitch used these techniques to publish a monograph that included the first map of world river runoff and what was then the most sophisticated estimate of the global water balance.

During the Second World War, as a Major in the Red Army, Lvovitch visited the United States, representing Soviet hydrologists on an international scientific mission (Lvovitch, 1973: 42). It is not clear whether he met Raymond L. Nace on that visit. Nace was at that time a research hydrologist with the United States Geological Survey and was also in uniform for his country, serving as commander of a water supply company (Nace, 1967: 560). He was evidently good with languages, including Russian. According to Nace himself, it was the discovery of Lvovich’s 1945 monograph after the war that sparked his own career-long interest in global hydrology and in the idea of the global water balance (Nace, 1979: vi).

[1] Essentially, these techniques involved mapping the basic elements of the water balance by means of spatial interpolation. What data *were* available were used to construct isolines on maps. This allowed for the calculation of precipitation, evaporation and streamflow as a function of area.

Nace's encountering of the global water balance idea in the political circumstances of the post-war period had enormous consequences for Nace himself, for the water balance narrative, and for the fraternity of scientific hydrologists (Linton, 2004).

By the late 1950s and early 1960s, the American political class was worried about water. Extrapolating from past trends showing that economic growth was based on increasing water supply, they foresaw a time in the near future when they would run out (Moss, 1967). These worries were not uniquely American, but they were heightened by the geopolitical tensions of the time, which pitted them in economic and military competition with the Soviet Union. Government-employed hydrologists, principally Nace, responded by suggesting that the Americans lead an international hydrological research effort aimed at assessing global water resources. The importance of this effort followed from the concept of the global hydrologic cycle which connected the water resources of all countries, including the United States. With the approval of the US State Department (Batisse, 2005: 86), Nace prepared a document entitled, "A Proposal for International Cooperation in Hydrology" (Varady, 2004: 10), which he presented at a 1961 international hydrological forum. This initiative eventually gave rise to a 10-year international scientific effort coordinated by UNESCO, which was known as the International Hydrological Decade (IHD).

The IHD was described by Nace (1969: i) as, "man's first concerted attempt to take stock of his diminishing available resources of fresh water and to co-ordinate world-wide research on ways of making better use of them". It accomplished a number of things, including bringing focus to the rather fragmented practice of hydrological science (Nace, 1980), standardising many aspects of this practice, and consolidating hydrological identity around the concept of the hydrologic cycle. When it ended in 1974, the IHD was transformed into a permanent institution called the International Hydrological Programme, also housed within UNESCO.

What was described as the "flagship Decade project" (Batisse, 2005: 177) was to produce a state-of-the-art inventory of the world water balance. In 1974, *World Water Balance and Water Resources of the Earth* was published in Russian by the USSR Committee for the IHD. Raymond Nace oversaw its translation into English (Shiklomanov and Sokolov, 1983: 78), which was then published by UNESCO in 1978. This stood for many years as the authoritative work of its kind. It provided previously unavailable basic data at different scales and offered the possibility of assessing the state of the planet's available water resources in a scientifically reliable fashion (Varady, 2004).

THE GLOBAL WATER CRISIS

For a variety of reasons, including the 1987 publication of the *Report of the World Commission on the Environment and Development: Our Common Future*, the late 1980s marked a general shift in public concern towards environmental problems operating on a global scale. This globalisation of environmental concern was mobilised around issues such as climate change, depletion of the ozone layer, and biodiversity loss. In the 1990s especially, it was expressed in terms of the 'global water crisis' (Linton, 2004).

As we are mainly interested here in how the hydrological calculations of global water were used to help construct this crisis, several factors need to be considered when explaining the emergence of global concern for water at the end of the 20th century. The emergence of the modern environmental movement in the 1970s, together with concern about the degradation of aquatic ecosystems had, by the 1980s, brought the ecological significance of freshwater to the fore. It also became widely acknowledged at that time that in many parts of the world groundwater was being used at rates exceeding those of natural recharge. The growing sense that water had become a critical global issue was reflected in statements such as that made in 1995 by the then Vice-President of the World Bank Ismail Serageldin that the wars of the 21st century "will be over water". Despite international efforts during the International Drinking Water Supply and Sanitation Decade (1981-1990), it was estimated in the early

1990s that over a billion people still lacked access to safe drinking water and over two billion people had no access to sanitation services (Gleick, 1993b; World Water Assessment Programme, 2003).

The idea of a global-scale water crisis was popularised in the English-speaking world in the 1990s. This occurred largely through publications such as *Water in Crisis*, edited by Peter Gleick and published by the Pacific Institute, and *The Last Oasis: Facing Water Scarcity*, by Sandra Postel of the Worldwatch Institute (Gleick, 1993a; Postel, 1992). These brought the latest scientific findings on global water availability and water use to audiences in the English-speaking world. Significantly for our purposes, these findings were based on studies that could be traced to the global water balance data produced by Soviet hydrologists (Linton, 2010: 289). Using this data, Postel (1992: 27) points out that,

> [t]he total volume of water, some 1,360,000,000 cubic kilometers would cover the globe to a height of 2.7 kilometers if spread evenly over its surface. But more than 97 percent is seawater, 2 percent is locked in icecaps and glaciers, and a large proportion of the remaining 1 percent lies too far underground to exploit.

Of the 500,000 cubic kilometres (km^3) of precipitation that was reported as falling on the Earth every year, most precipitation falls into the oceans. Taking this into consideration, we are left with only 40,000 km^3 as "the world's renewable freshwater supply". Fully two-thirds of this amount, "runs off in floods, leaving about 14,000 cubic kilometres as a relatively stable source of supply" (ibid: 28).

This representation of available water as a tiny fraction of the total global volume of H_2O creates a natural crisis all by itself. This same data was represented in popular formats such as *National Geographic*. A special 1993 issue of the magazine was devoted to the water crisis; it depicted "the world's water supply" as a tiny tablespoon set against a gallon jug representing "all Earth's water" (Parfit, 1993; see also Linton, 2010: 196). Here, the (quantified) nature of water gets conscripted to produce an apparent problem: "When it comes to water", declares Postel, "nature has dealt a difficult hand" (Postel, 1999: 3). Such declarations were certainly made with the intention of raising awareness of the need for action to resolve water-related problems, including those faced by poor and disadvantaged people; however, the kind of action recommended is severely limited by the way the problem is presented. As a corollary of the apparently tiny supply of water available to humanity, resolving the world's water problems becomes a matter of using this supply more efficiently.

The last Oasis, to cite the title of Postel's 1992 book, is thus defined as an improvement in the efficiency with which available water supplies are used. Two of the book's three sections are devoted to technical strategies for improving water-use efficiency. Postel argues that,

> [m]oving toward more efficient, ecologically sound, sustainable patterns of water use (…) requires major changes in the way water is valued, allocated, and managed. Appropriate pricing, the creation of markets for buying and selling water, and other economic inducements for wise water use hardly exist in most places. They have a central role to play in the transition to an era of scarcity (Postel, 1992: 166).

To be sure, improving water-use efficiency is a laudable goal and an important aspect of addressing many water problems; however, to the extent that it deflects political discussion or avoids prioritising the underlying political circumstances that cause such water problems, it can serve as a distraction.

Using global water to proclaim a crisis, and in that way inciting a technocratic approach to water problems offers an example of what Latour means when he argues that 'nature' can have the effect of paralysing politics (Latour, 2004: 18-19). Latour identifies globalised environmental discourse as the site where this operation is most manifest. He states that, "Where 'global thinking' is concerned, [environmentalists] have come up with nothing better than nature already composed, already totalized, already instituted to neutralize politics" (ibid: 3). Citing Latour, Swyngedouw (2009: 611) similarly describes, "a certain short-circuiting between science and politics, whereby the 'matters of fact' of science are directly translated, without proper political mediation, into 'matters of concern' and subjected to a de-politicized techno-managerial, policy and socio-cultural deliberation".

Turning briefly to the collection of articles edited by Gleick, *Water in Crisis* (1993a), we find another example of how nature is deployed to neutralise politics. It should be noted that in the 1990s this publication was considered by many to be an essential, if not the definitive, statement of the condition of freshwater resources on the planet. As mentioned above, the success of the book has since given rise to a series of popular reports entitled *The World's Water*. The first substantive article of *Water in Crisis* is *World Fresh Water Resources* by Shiklomanov, who was then based at the State Hydrological Institute in St. Petersburg where he appears to have inherited Lvovich's informal title of "dean of Soviet hydrology" (Nace, 1979: iv).

The global water data presented in Shiklomanov's chapter[2] provides the essential numbers that allow Gleick to declare that water is "in crisis". As in *The Last Oasis*, these numbers present an apparently obvious problem: the available water resources do not add up to meet projected demands, especially in the developing world. Gleick notes that the rate of population growth in developing countries is such that almost all new births will be in regions where access to clean water and sanitation services are already severely lacking (Gleick, 1993b: 105). Stressing that the number of countries with inadequate per capita water resources will grow to unacceptable levels unless extraordinary measures are taken, Gleick concludes that, "[t]he world's population cannot continue to grow indefinitely. It must be stabilized as quickly as possible (…). The problem of population must be tackled directly" (ibid: 106). Gleick's concluding chapter puts forward the 'solutions' to the crisis, which are a medley of improving water-use efficiency mainly through the application of economic instruments and general calls for population control. These solutions certainly recognise the disproportionate water plight of poor people and promote various technologies and economic tools to alleviate 'water poverty'; however, they refrain from naming *poverty itself* as the main *cause* of many of the water-related problems they identify.

The 'global water crisis' was thus portrayed as needing to be addressed by applying economic instruments to promote water-use efficiency, investing heavily in the 'water sector', and controlling the demographic abstraction known as 'population'. It was readily taken up by the more popular press and by groups, institutions and corporations with vested interests in water services and water infrastructure. Among these institutions, the World Water Council (WWC) is perhaps the most important. The WWC was convened in 1996 by the World Bank, the United Nations Development Programme, representatives of the water services industry, professional water associations and water policy experts. It has since organised a series of high-level meetings known as the World Water Forum, held every three years. In 1997, the WWC gave itself the mandate to develop a *World Water Vision* (World Water Council, 2000), the purpose of which was to "offer relevant policy and (…) recommendations for action to be taken by the world's leaders to meet the needs of future generations" (ibid: 68). The panoptical gaze of this Vision has been extended and widened through subsequent meetings of the World Water Forum.

The document entitled *World Water Vision*, and a second document called *Toward Water Security: A Framework for Action* were presented at the Second World Water Forum, held in 2000 (Global Water Partnership, 2000). The *Vision* framed 'the water challenge' as being global in scale and as primarily a case of inadequate supply in the face of increasing demand. Without dramatic technological innovations, institutional change, and substantial new investment, the world of 2025 was projected to face an even more sizable 'water gap'. The Framework document called for dramatically expanded investment in water supply infrastructure, primarily by mobilising the private sector through incentives such as privatisation and full-cost pricing of water (Conca, 2006: 1-2). In these reports, water is framed as a scarce resource and as an economic good that must be managed in an economical and integrated fashion.

[2] Shiklomanov's tables depicting global water resources and global water balances are based, respectively, on data collected by Soviet scientists and data based on research conducted by Soviet scientists (Shiklomanov, 1993: 13,15). The data he used in 1993 was not new; rather, it was from sources that were originally published in the 1960s and 1970s during the International Hydrologic Decade, as described in Chapter 7 (ibid: 24).

Together with the machinery by which they are diffused, these documents and the agencies producing them constitute what Conca (2006: 2) has called a, "global water regime (…), a set of norms – prescriptive rules and standards of appropriate behaviour meant to govern water-related actions on a global scale". We argue that these norms, rules and standards correspond to what Wilson and Swyngedouw (2014), and others, have identified in terms of the post-political "depoliticising practices that have marked the past few decades", particularly in the realm of "the depoliticization of contemporary environmental governance" (Wilson and Swyngedouw, 2014: 4; Blühdorn, 2014). The water crisis has been instrumental to such depoliticising practices by governments. As Jacques Rancière, a key theorist of the post-political has put it,

> Our governments have been operating for quite some time under the alibi of the impending [ecological] crisis which forbids entrusting the affairs of the world to its ordinary inhabitants and dictates that they be entrusted to the care of specialists in crisis management – that is to say, in fact, to the financial and state powers partly or wholly responsible for it (Rancière, 2024: 24-25).

Publication of the 2000 *World Water Vision* provided the occasion to apply these practices to the realm of groundwater management. The work of Shah et al. (2000), funded mostly by the World Bank and prepared as a contribution to the *World Water Vision*, described a state of groundwater that was characterised by depletion due to overexploitation, water logging and salinisation, and various kinds of pollution. Based on figures presented by Shiklomanov (1993), Gleick (1993b) and Postel (1999), they provided estimates of the renewable annual supply of groundwater; this raised a red flag about the false sense of abundance such figures might imply and suggested that global numbers (at the national and world scales) tended to mask the heterogeneity of situations. The recommendations of their report echoed those of the *World Water Vision*; these included producing quantified data for planning groundwater use, instituting demand-side management through the registration of groundwater users via permits and/or licenses, pricing groundwater, and technically optimising groundwater use.

Proclamation of the 'global water crisis' in the terms described above has helped pave the way for an industry of think tanks and intergovernmental agencies, and for a 'global' water research agenda that focuses on engineering demand management, economising water efficiency, and rationalising water use. The research agenda, as set out in the *World Water Vision* document, called for an "increase [in] public funding for research and innovation in the public interest". The language used in the document is instructive:

> The consultations that were part of the World Water Vision exercise revealed that because water and the environment have not been valued, there are enormous gaps in our quantitative knowledge about freshwater ecosystems. Similarly, there is little stimulus for innovation in water conservation technologies. Pricing water resources will encourage the private sector to do some of this. Still more publicly funded research is needed to promote the development and dissemination of innovative technological, social, and institutional approaches to international water resource management, especially in areas serving the public interest and not addressed by market-driven research and development (World Water Council, 2000: 2-3).

The Pacific Institute defines itself as, "a global water think tank that combines science-based thought leadership with active outreach to influence local, national, and international efforts to develop sustainable water policies". It provides an example of how the global water research agenda is being fulfilled. The Institute stresses its "science-based approach (…) [which is] firmly grounded in meticulous research and sound science (…) in disciplines ranging from climatology to environmental engineering and hydrology, examining critical water challenges and identifying the most effective science-based solutions" (Pacific Institute, n.d.a). It is telling that the "disciplines" itemised include no social science, nor do they give any hint of the possibility of an approach that puts social relations and conditions at the heart of water research. This is not to say that such research agendas ignore questions of conflict. On the contrary, "In regions where water scarcity is becoming an ever-increasing concern, water may become a driver of conflict and violence. And in parts of the world where violent conflict is occurring, vital water infrastructure can be damaged or destroyed" (Pacific Institute, n.d.b), Together with partner think tanks, institutions and mechanisms, including the World Resources Institute, the Water, Peace and Security (WPS) partnership, and Oregon State University's Transboundary Freshwater Diplomacy Database, the Pacific Institute has been in the business of tracking water conflict since the late 1980s. In its own words:

> The Pacific Institute's work on water and conflict is focused on identifying and understanding the risks of water-related violence, but also identifying strategies for reducing these risks, including technical and engineering solutions to improve access and efficient use of water, the application of political and legal tools to protect civilian water systems, and new economic approaches to address inequities in freshwater availability and affordability (Pacific Institute, 2023).

To sum up this section, we have tried to show how global water was, and continues to be, deployed by powerful actors with vested interests in the water sector and by researchers in the water think-tank community, to produce a 'crisis' for which they have all the solutions. These solutions frequently boil down to the need for economic instruments and engineering techniques for managing water more efficiently; in that way, discussion can be avoided of the underlying political causes of water problems and the need for radical political change in the form of such things as redistribution of wealth, breaking the oligopoly of the water services industry, standing up to the engineering conglomerates who dictate the world's water infrastructure, and shifting control over water resources from state agencies to local political authorities and water users themselves.

FROM CRISIS TO DRAMA: THE PLANETARY BOUNDARY OF WATER USE

More recently, the global water narrative has been put to use by proponents of planetary boundaries (PB) discourses. In their 2009 article, *Planetary Boundaries: Exploring the Safe Operating Space for Humanity*, Johan Rockström and other Earth systems scholars gave renewed life to the spectre of a water crisis at the global scale by introducing the PB framework (Rockström et al., 2009a). This framework delimits a biophysical space inside which human societies can develop without causing irreversible or catastrophic environmental effects that threaten the survival and prosperity of humankind.

Building on ecological economics, global sustainability and resilience approaches, the framework presents the Earth as a system composed of interacting biophysical and socioeconomic processes and cycles. Referring to the conditions of the Holocene geological era, it establishes thresholds for nine Earth system processes[3] whose exceedance, they warn, could, "push the planet out of the desired Holocene state" (Rockström et al., 2009a) and hinder its capacity to adapt to both natural and human disturbances (Rockström et al., 2014; Steffen et al., 2015).

Among these processes, they cite anthropogenic disturbance of the 'global hydrological cycle'. In the initial freshwater planetary boundary paper, the 'global' qualification refers to a generalised threat to water due to intensive worldwide water consumption. It also refers to their own method of aggregating local and regional hydrological processes to define continental or planetary threshold(s). In this they include runoff and surface water flows at the basin scale, as well as circulation of vapor at the regional scale. The determination of a freshwater planetary boundary draws on the assumption that exceeding a certain level of 'consumptive blue water use'[4] at the global scale would undermine the stability of the

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[3] The processes being considered include: climate change, ocean acidification, stratospheric ozone depletion, atmospheric ozone depletion, atmospheric aerosol loading (increase in concentration of particulates in the air), disturbance of biogeochemical cycles of nitrogen and phosphorus, global freshwater use, land-system change, loss of biodiversity, and chemical pollution due to different substances (including heavy metals and plastics). The authors initially proposed a quantification for seven of these.

[4] This level represents the "maximum additional consumptive blue water use in the world beyond the preindustrial situation" (Rockström et al., 2014). Using the coloured water categories defined within the virtual water framework (Allan 1998), it

global or continental freshwater cycle, with disastrous consequences for ecosystems, the regulation of biogeochemical cycles (including carbon, phosphorus and nitrogen) and the climate.[5]

Since the original PB publication, the limit to freshwater consumption has been subject to evolving estimations. Rockström et al. (2009a) initially evaluated the global freshwater boundary at 4000 km^3 per year. They estimated that the maximum volume of freshwater that is geographically and temporally accessible at the planetary scale and on an annual basis is between 12,500 and 15,000 km^3 (Rockström et al., 2009b). To calculate this, they referred to the global water data published by Postel (1998) and by researchers from the International Water Management Institute (de Fraiture et al., 2001); for this they relied on, respectively, studies by Lvovich et al. (1990) and by Shiklomanov (2003). They then defined the boundary as occurring at the point where human populations "divert" 60% of this volume, which is an estimation that was provided by de Fraiture and colleagues. They corrected the obtained range (5000 to 6000 km^3 per year) by considering uncertainties, and finally proposed the initial estimates of the planetary boundary for human freshwater use.

Refined estimates of this figure were presented in subsequent publications and works under the lead of Gerten, a global climatologist and hydrologist. Using an approach that was based on the modelling of water requirements for ecosystems at a lower scale, they proposed an updated range for the 'planetary boundary for consumptive freshwater use' as 1100 to 4500 km^3 per year (Gerten et al., 2013). Compared to Shiklomanov's estimates of 2600 km^3 per year consumed globally by human societies, the lower limit to water consumption draws a far more pessimistic picture of the current water situation at the planetary scale than do the initial estimates.

The freshwater boundary was further revised to integrate scientific findings in global hydrology that were derived particularly from the development and use of world hydrological models. Revisions progressively distanced themselves from the idea of a unique global boundary, or at least stressed the necessity of adopting a multiscalar approach that considered the spatiotemporal variability in water availability as well as the different forms of water and related storage compartments (Zipper et al., 2020; Gleeson et al., 2020).

With the PB approach, attention shifted from the idea of a global water 'crisis' to a water 'drama'. This was stressed in the titles of several papers authored by Rockström and colleagues, such as *The planetary water drama: Dual task of feeding humanity and curbing climate change* (Rockström et al., 2012), and *The unfolding water drama in the Anthropocene: Towards a resilience-based perspective on water for global sustainability* (ibid, 2014). The planetary boundary framework has received widespread attention within the scientific community, particularly in sustainability studies and Earth systems sciences, with sometimes heated debates between its supporters and its critics (Lewis, 2012; Montoya et al., 2018). The criticism included scientific disagreements as well as concerns about the potential environmental and political consequences of applying the PB approach (Leach, 2015).

The top-down approach used to attribute limits to water consumption is of particular concern to some scholars (Molden, 2009; O'Neill et al., 2018; Puy and Lankford, this issue). Pointing out the acceptance of the framework and the relative silence of the hydrological community on its flaws and possible misuses, Heistermann (2017: 3456), for example, raised concerns about a concept that was, "not only scientifically weak, but also misleading and potentially dangerous if operationalized in a policy context". Heistermann particularly pointed out the lack of evidence regarding the effects of anthropogenic local water use on regional or global water cycles, as well as inconsistencies when linking the basin, regional and global scales. He also joined his voice to those of people who were concerned about the implementation of

particularly focuses on blue water, that is, the continental fresh surface and ground water that is either flowing though rivers or temporarily stored in water bodies such as lakes and glaciers.

[5] They refer to papers from Meybeck (2003) and Vörösmarty et al. (2004), respectively: *Global Analysis of River Systems: From Earth System Controls to Anthropocene Syndromes*, and *Humans Transforming the Global Water System*. Both of these provide a representation of water at the planetary scale.

water policies and regulation mechanisms that relied on such global figures which could possibly lead to inappropriate actions and the exacerbation of tensions at the local and basin scales (Häyhä et al., 2016; O'Neill et al., 2018; Leach et al., 2018).

Despite these controversies, the PB framework has been eagerly taken up in international policy arenas. The planetary boundary concept was a central feature in the report by the UN Secretary-General's High-Level Panel on Global Sustainability (2012) entitled *Resilient People Resilient Planet*, for which Rockström was a contributing expert. Jeffrey Sachs, the influential professor at Columbia University, economist and UN advisor, also pushed for the integration of the planetary boundary concept into the Sustainable Development Goals (SDGs),[6] in line with the idea of global or international environmental governance.

The PB framework has also been widely deployed in financial and business circles (Whiteman et al., 2013; Butz et al., 2018). As stated by Sachs during an intervention at the United Nations Economic and Social Commission for Asia and the Pacific in October 2019, "[p]rofit should not come from dirty polluting industries (…) but from business within planetary boundaries" (ESCAP, 2019). Setting global targets and limits for sustainable development (Sachs et al., 2019), the framework has been, and remains, progressively integrated into the tools that are used for corporate environmental reporting and assessment (Clift et al., 2017). It is used, for example, in guidelines for environmental and carbon reporting of companies (CDSB, 2019) and in combination with life cycle assessments and other footprint approaches (Fang et al., 2015; Bjørn et al., 2020), with cautious considerations of a planetary threshold when it comes to freshwater (Bunsen et al., 2021).

It is telling that the planetary boundaries framework sets no boundaries for such phenomena as disparity of wealth, concentration of power, unfettered economic growth, or even for readily quantifiable factors such as poverty. All of these are factors that need to be recognised as underlying the world's most important water-related problems. Keeping within boundaries of this kind would require radical political dialogue and transformation, whereas the physical boundaries set within the PB framework are, in theory, attainable by means of applying economic and managerial instruments. The most important political consequences of the PB approach relate to the prescriptions it offers for ensuring that 'humanity' remains within the correct planetary boundaries; invariably, these prescriptions are a matter of technical, economistic water management. It is revealing in this regard that Rockström and other PB protagonists now spearhead the Global Commission on the Economics of Water, whose mission is nothing less than to foment, "a sea change in how we value, manage and use water" (GCEW, 2023a: 4). According to this document, "[a] sustainable and just water future can be achieved. It requires transforming the economics and restructuring the governance of water. We must take actions that are bolder, more integrated, across sectors and more networked at national, regional and global levels" (ibid: 7).

Although it is presented as a kind of revelation, the essential focus of the GCEW hardly represents a sea change in thinking. It seeks to find new ways to value water economically in order to promote greater water-use efficiency; these include but, notably, go beyond, simply putting a monetary value on water. To give an indication of the technocratic vision of the Commission, Rockström, who is one of its co-chairs, speaks of putting, "an economic value on water as a capital asset (…) by quantifying water as a currency behind different services that society needs to or wants to provide for its citizens" (Global Water Intelligence, 2023: minute 19: 40 to minute 20: 02).

The Commission's work acts as an ideal anti-politics machine by reducing water equity problems to questions of water quantity and by proposing new economic instruments – accompanied by some supporting social policy 'mechanisms' – to fix these problems. Ngozi Okonjo-Iweala, Director-General of the World Trade Organization and co-chair of the GCEW, describes the Commission's vision thus: "We

[6] In the end, the planetary boundaries framework was not integrated into the UN 2030 Agenda for Sustainable Development that formalised the SDGs.

believe in the Commission that pricing water advances not just efficiency but also equity goals (…). You actually need that efficiency in order to ensure equity, to ensure water goes to poor people (…). So, we want to release enough water so they can actually have access" (Global Water Intelligence, 2023: minute 27: 30 to minute 29: 21). Okonjo-Iweala adds that, "At the same time, we want to make sure we put in place mechanisms – social policies – that enable them to have access and if this means support for poorer people, you know, these are the kinds of policies we need to look at" (ibid: minute 23: 22 to minute 29: 38).

As shown in the work of the GCEW, the prescriptions flowing from the PB framework call for the creation of a global governance apparatus. Early prescriptions that were made specifically for keeping humanity within the freshwater-use boundaries provide some insights on this. For Rockström and colleagues, taking seriously the fundamental role of water in the planetary system requires a "planetary stewardship for water resilience" (Rockström et al., 2014: 1259). From their plea for "multilevel adaptive" water governance emerges the idea of a system where "maximum allowable" water volumes are delineated at the basin or sub-basin scales (Yang and Cheng, 2021). These are meant to take into consideration ecosystem needs and the possibilities of regulating water consumption and allocations through the global trade in virtual water (Allan, 1998); this implies the possibility of globally offsetting water-related environmental impacts. The omission of 'the political', as we have defined it, from this landscape of technocratic virtuosity is taken further in the work of the GCEW. Its report, *Turning the Tide: A Call for Collective Action* (GCEW, 2023b), asserts that the "global water cycle [is] out of balance for the first time in human history". It calls for a global governance structure for water and for the regulation of water allocations through the global market and international trade agreements. Insisting that the manifestations of water scarcity are, "the consequences not of freak events, nor of population growth and economic development, but of our mismanagement of water globally for decades", the GCEW unites the most recent studies of water quantified at the global scale with the assertion that water is fundamentally a hydrological and technical-managerial problem (GCEW, 2023a: 10).

CONCLUSION

We have argued that the most important political consequence of global water is its depoliticisation of water problems and issues by helping define and structure them as essentially hydrological in nature. By defining water-related problems as water-centric, the solutions favoured are predetermined in terms of managing the resource more efficiently, primarily by means of instruments that ascribe greater economic value to water and by technical approaches to the reduction of water demand. These managerial approaches constitute the research agendas of global water think tanks and of the national and international agencies that are responsible for water. Focusing on such approaches has the effect of displacing the social problems that underly most water issues, the resolution of which requires political action as well as managerial reform. This displacement of the social and political in global water discourse leads to what we have described as its anti-political consequences.

As we have shown, global water has a performative effect, especially as it is represented in discourses of 'global water crisis' and the 'planetary boundary for consumptive freshwater use'. Water scarcity becomes the fundamental water reality with which humanity must contend. To conclude our paper, we consider the political consequences of this 'scarcity-effect' of global water in light of the foregoing arguments. As stated by Harvey (1974: 272),

> It is often erroneously accepted that scarcity is something inherent in nature, when its definition is inextricably social and cultural in origin. Scarcity presupposes certain social ends, and it is these that define scarcity just as much as the lack of natural means to accomplish these ends.

Critical approaches to the concept of scarcity highlight its constructedness and how it is embedded in contemporary historical circumstances. As Xenos (1989) argued, scarcity, understood as a generalised condition of human experience, is an invention of the 18th and 19th centuries; it is associated with the normalisation of neoclassical economic thought and the presumption of unlimited human wants. Prior to the prevalence of this notion of scarcity as a basic condition of life, scarcities were perceived in terms of the dearth of specific items pertaining to specific periods of time (Xenos, 1989: 3).

The proclamations of absolute physical limits to resources at the global scale, which are made possible by the quantification of global water and similar methods, present another version of scarcity discourse. This is described by Ross in terms of, "a new paradigm of scarcity (…), a concept of scarcity that had hitherto not existed. This could be characterized as 'this-time-we-really-mean-it' scarcity" (Ross, 1996: 6). Unlike the neoclassical-economic version of scarcity, 'this-time-we-really-mean-it' scarcity rests on a foundation of scientifically reasoned and calculated physical limits at the planetary scale, with 'global water' being a central component. Once again, this has the effect of making scarcity a basic condition of existence, except that now, instead of being driven primarily by human nature in the form of the perceived insatiability of human wants, it is driven by the "scientifically reasoned and calculated physical limits" that are imposed by nature itself. As noted above, this corresponds to what Latour describes as the translation of scientific 'matters of fact' into 'matters of concern' and their subjection to depoliticised techno-managerial approaches (Latour, 2004; Swyngedouw, 2009). Such approaches typically work well "within the framework of existing relations", but they do nothing to change the framework or the parameters of what is considered politically "possible" (Swyngedouw, 2009: 615). In this way, the scarcity effect serves to sustain the existing power relations. As Jonsson et al. (2020: 3) point out, "even the most cursory look at the past reveals how closely connected questions of scarcity are to the exercise of power".

The construction of a global water crisis in the 1990s served the interests of many state and private actors. In the spectre of global water scarcity, they saw an opportunity to apply neoliberal economic instruments to the governance of water. This included the privatisation of water services, which enjoyed a wave of success in the 1990s and early 2000s (Barlow and Clarke, 2002; Bakker, 2010). More recently, the advent of the planetary boundaries approach has, if anything, strengthened these trends and tendencies. As Huff and Mehta (2020: 31) emphasise, because it is presented at such an abstract global scale, the PB approach is irrelevant for understanding how water scarcity actually impacts people and ecosystems in an empirical sense in real places and circumstances. "Still", they point out, "it has a powerful narrative to frame and justify a range of policy approaches concerning global environmental change". The planetary boundaries approach implies the need for allocating water resources and conducting water-related economic activity with greater efficiency; in this way, it buttresses neoliberal policies that are based on the market as the dominant means of allocating such resources and organising economic activity.

At the same time, global water has contributed to discourses on water scarcity that have strengthened state actors. In India, for example, deliberately induced anxiety over water scarcity has been observed to facilitate collusion between the state and proponents of large dams; in such cases, water supplies are often engineered at the expense of more sustainable, small-scale and traditional techniques (Mehta, 2006; Sasidevan and Santha, 2018). This phenomenon has also been observed in Syria (Saadé-Sbeih et al., 2018).

In all these ways, global water has helped lend political legitimacy to various schemes and regimes. Identifying water limits implies allocating the volumes deemed available and, by extension, defining the rules and legitimating the authority for making such allocations. Authority for water allocation can then be vested in the state or the market according to neoliberal principles; alternatively, as suggested by proponents of the planetary boundary approach, a hypothetical supranational institution can supervise the allocation of a global water budget between states. The calculation of identifiable limits to water resources at the global scale has thus served to legitimise and reinforce the power of such actors; all of these share the characteristic of transferring power and authority from more local, small-scale decision-making structures to larger and more powerful ones.

As suggested in the above quote by Harvey, among the most significant political effects of this version of scarcity is the extent to which it covers up, or distracts attention from, the social circumstances that gave rise to the problem in the first place; it also obscures its uneven social effects. Huff and Mehta (2020: 43) have argued that, "Often, the problem lies in how we see scarcity as a natural phenomenon, which distracts from due consideration of the ways in which it is socially generated and experienced". Indeed, an observation made by many critical scholars is that, "excessive concern with natural limits and physical scarcity tends to distract from deeper social and political dimensions of the problem" (Jonsson et al., 2020: 3). To put the matter more directly, the planetary boundaries approach obfuscates the excessive resource use by the wealthy and powerful which contributes disproportionately to the crossing of these boundaries; this constitutes one of the most important political implications of the global water and the PB approach. Responsibility is shifted from the specific structures and social relations that have created the problem, to an abstract planetary public; often, those who are least responsible for the problem are thus saddled with the obligation to change their behaviour, limit their numbers, and reduce their demands.

To conclude, perhaps the most pervasive political consequence of conceiving of water as a global phenomenon, measuring it at a global scale, and constructing crises and boundaries on that basis, is that it distracts attention from the concrete, local and deeply political circumstances that give rise to water-related problems and issues. To quote Huff and Mehta (2020: 39), "[A]ggregate views of water scarcity can be problematic because they can hide real inequalities in water access determined by property rights, social and political institutions, and cultural and gender norms". Such eliding of the political factors that determine water-related problems is a signature feature of the global water discourse.

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