



THINK PIECE

A Critical Realist's Reflections on Coupling the Hydrological and Social Systems during a Global Crisis

Mary Murphy, University of Cambridge, United Kingdom

Abstract

Hydro-sociology is a recent field of study that aims to couple the human and water systems. It appears to be a response to dualistic thinking within hydrology and sociology that is also reflected in theoretical debates about structure and agency. Reflections about how specific rivers have ignited personal agency and define some of our political and economic structures are shared. Critical realists like Margaret Archer argue that reflexivity is a mediating tool between structure and agency. But what mediating tool is/can be used to mediate between the hydrological and sociological fields and related thinking? This think piece is a reflection on how a critical realist approach to structure and agency may deepen the connection and understanding of hydro-sociology.

Keywords: *critical realism, hydro-sociology, duality, water, structure and agency*

Introduction

As a critical realist, my ultimate concern is to “remove the rubbish that prevents us knowing the world” (Bhaskar, 2017, p. 7). Within the context of hydro-sociology, one of the challenges with increasing water body degeneration is finding a way to look under the surface beyond the literal rubbish which absorbs so much agency. In this paper I wish to consider the advice given by critical realists, Danermark, Ekström and Karlson, regarding the emergence and interplay between social structures and human agency and extend this to the emergent field of hydro-sociology. This methodological advice is to “keep structure and agency apart in order not to reduce one to the other and study the links between them over time” (Danermark & Ekström, 2019, p. 93).

This think piece arises from the author's start as an academic and activist in Northern Ireland in the early nineties and through direct experiences with rivers that helped shape her identity as a social activist and coincided with her emergence as a critical realist.

Structural awakening

My first reading of Giddens' theory of structuration (Giddens, 1984), in the nineties, indicated that the study of society is in fact the study of structure and agency. During a period of residency in Northern Ireland my activism at times merged with, and within, the academic and community structures that surrounded me and seemed to mirror the embedded conflation in Giddens' structuration theory. I could not find a way to separate my agency from the structure(s) I was in, let alone attempt to stratify and differentiate this into recognisable components defined geopolitically, through identity, politics and justice. That ability to approach structure and agency as a dualism rather than a duality, or a conflation, came later during my doctoral work at Rhodes University, South Africa, where I 'became' a critical realist. I started to see and agree with Archer that structure and agency are mutually dependent phenomena but are also quite different kinds of phenomena (Danermark & Ekström, 2019).

My philosophical connection to critical realism (CR) was deepened when Roy Bhaskar highlighted that CR is basically "about standing the world right way up" (2012). That claim resonated with my commitment to social and environmental justice.

Reflexive deliberation

I applied Margaret Archer's 'internal conversation' (Archer, 2003) in my doctoral work. I am now at the early stages of approaching the emerging field of hydro-sociology through the Connecting Water to Global Citizenship Via Education for Sustainable Development (CW2GC)¹ project at the Faculty of Education, University of Cambridge as a critical realist with a focus on structure and agency. This paper explores some of the potential impediments, questions and opportunities in using a CR lens within the field of hydro-sociology, in a time that is currently also defined by a global pandemic.

The impact of the COVID-19 pandemic on our structure and agency is enormous; it dominates our language, our media and our thinking. It is not simply our health, societies and economic systems that are at risk, but the stratified and differentiated thinking we need now more than ever is at risk of further deterioration by the power of "The Pandemic" on our discourse. All crises exacerbate injustice. Within this pandemic are other crises that are hidden from view. Even though water surrounds and defines our individual and environmental health, its degradation is often subsumed.

Hydro-climatic variability is now a key driver in human displacement with the following four extreme water effects documented by Nidhi Nagabhatla and Aidin Niamir² (2017):

1. An estimated 50-120 million will be affected in Bangladesh.
2. In 2007 one flood alone along the Zambezi river displaced more than 100 000 people in Mozambique.
3. More than 1 350 square miles of Nigeria's land is now desert. Over 70% of the Nigerian population depend on land for agriculture.
4. Flooding in 2012 displaced more than 2 million and affected more than 7 million people in Nigeria.

Water quality has been identified as a key driver for people to relocate thereby exacerbating the human displacement challenge. Migration is fast becoming a survival strategy to the water and wider environmental crisis (Nagabhatla & Niamir, 2017).

There is an ongoing struggle to find a balance between human and environmental needs that often leads to a dividing line with emphasis on one or the other depending on perception, power, and societal position. As Nagabhatla and Niamir (2017) have illustrated, water is often at the heart of social justice and can clearly indicate the inequities in our social system. The field of hydro-sociology reflects dualistic debates that continue to define how water flows through our political economic and social systems. But it may also provide an opportunity to close the gap allowing new ways to discuss the human-environment interaction and interconnection. Archer's analytical dualism may offer a model with which to study those interconnections.³ Early reflections show some cross-disciplinary themes between the hydro-sociology field and the methodological frameworks in CR's structure and agency.

Hydro-sociology is an emerging field of study. Sivapalan, Savenije and Blöschl (2012) defined socio-hydrology as a new "science of people and water...that aims at understanding the dynamics and co-evolution of coupled human water systems" (p. 1271). Hydro-sociologists acknowledge that it is no longer possible, and indeed never was, for natural scientists to study the hydrological system as if humans were mere observers of that system. "In socio-hydrology, humans and their actions are considered part and parcel of water cycle dynamics, and the aim is to predict the dynamics of both" (Sivapalan et al., 2012, p. 1271). The focus on dynamic and integrated prediction of human actions on the hydrological system appear to echo the principles of emergence, time, differing powers and characteristics, and the interplay between structure and agency which are conceptually embedded in Bhaskar's (1998) and Archer's (1995) theory of structure and agency. As Archer highlighted, "the consideration of emergence introduces a time dimension in the analysis. The interplay between social structure and agency takes place over time; emergence is a process" (Danermark & Ekström, 2019, p. 79).

There is consensus within and beyond the field of hydro-sociology that human activities are rivalling geologic-scale forces. Manifestations of the hydrology-human link include declining snowpacks, shrinking aquifer storages, distorted river flow, altered groundwater recharge, freshwater degradation, and "increasing structural and physical scarcity of water across the globe" (Zeitoun & Warner, 2006, p. 435). The United Nations University Institute for Water highlighted in the Global Risk Report in 2016 how "the water crisis and water-based shocks, including migration is presenting new risk and vulnerability scenarios for the sustainability and human development agenda" (cited in Nagabhatla & Niamir, 2017). The sustainability crisis is further compounded by the power and significance of our oceans as over 70% of the Earth's surface is ocean with many developing countries already dependent on ocean resources for food, work and livelihoods. Because of these impacts, Thorsten et al. have argued that we "need profound changes to the science because hydrologic and human systems are now intrinsically coupled" (cited in Wagener et al., 2010, p. 5).

Wagener et al. (2010) have historically mirrored the call by Sivapalan et al. (2012) for a paradigmatic shift where hydrological research produces cross-disciplinary integration that catalyses new research and new teaching methods. If we are to avoid repeating the duality and conflation of past theories of structure and agency evidenced in the fact paradigm (where structure conflates downward on agency), the action paradigm (where agency conflates upward on structure) and the central conflation in Giddens's structuration theory (Danermark & Ekström, 2019, pp. 74-79), then we need to adopt a morphogenetic approach, which describes the process of transformation "derived from those processes that tend to elaborate or change a system given form, structure or state" (Archer, 2012, p. 5).

Hydro-sociology is a field of study that by its coupled name acknowledges, or at least encourages, the interconnectedness of the hydrological system with the human system. This presents an ontological and hermeneutic challenge integrating the theory of structure and agency within the emerging field of hydro-sociology. One of the first challenges was identified by Ertsen et al. (2014): "when simulating social action in modelling efforts, as in socio-hydrology, an issue of obvious importance is how to ensure that social action by human agents is well-represented in the analysis and the model" (p. 1369).

Ertsen et al. (2014) have alerted us to some apparent challenges⁴ in connecting the hydrology and human systems:

1. How do we connect two dynamic systems that despite influencing each other also work independently?
2. How can socio-hydrology models represent human agency particularly when human agency and systems are constantly changing?

One way to overcome some of the challenges of studying agency within the field Ertsen et al. (2014) suggested is to "face human agency squarely" (p. 1370) and direct modelling approaches to the individual which is at the lowest possible scale that can still be considered 'social'. Borrowing from Latour's 'actor-network' concept, they explored how a "focus on the short term, small-scale interactions among people with(in) their environment can be developed" (p. 1370). In recognition of the scale of the hydrological and social sciences, it is argued that contributions to the field would benefit through research that occurs on a scale that situates research subjects as individuals that are directly connected to specific water bodies in their immediate environment. This would need to involve applying ethnographic tools in data collection, reflexivity in data analysis and awareness of structure and agency as separate but within an individual's specific hydro-sociological context.

Hydrological structures that educate and define

My agency as a researcher within the hydro-sociological field was shaped by four rivers: the **Barrow**, the **Foyle**, the **Liesbeek** and the **Jukskei**. These rivers shaped my identity, my politics, my awareness and inspired and activated my agency.

1. The River **Barrow** is part of a river system in Ireland known as the Three Sisters, the others being the River Nuir and the River Suir. The River Barrow is the second

largest river in Ireland and traverses three counties spanning the mid-East to the South East coast of Ireland. It flows through the town of Athy where I was born. Athy or Baile Átha Í ('the town of Ae's ford') is named after a 2nd century Celtic chieftain, Ae, who is said to have been killed crossing the River Barrow thus giving the town its name. I grew up beside the river; it was a place where I swam, walked, fished and built reed huts for contemplation. Proximity to the river also suggested a socio-economic status in the town where I grew up as houses close to the river were usually an indication of a middle-class position. From a very early age I became aware of the social significance of the privilege of access to a river and how it shaped my identity and was instrumental in my initial learning about nature.

2. Whereas the river from my childhood was instrumental in my environmental education, the politics of rivers was awakened when I moved to Northern Ireland. The divisions and polarisation of Northern Ireland were reflected and represented on many levels. For example, the way the city where I lived was referred to, often erroneously, signified the political divide. Referring to the city as *Derry* supposedly signified a Nationalist or Republican association or identification, whereas reference to it as *Londonderry* marked a person politically affiliated to Unionism or Loyalism. The River **Foyle** was seen as a line that emphasised the segregation of communities during the Troubles⁵ where Protestants predominantly moved to the east side of the river, whereas the majority of Catholics remained on the city side or west bank of the river. In 2011 the Peace Bridge was built on the River Foyle as a symbol of unity between the two communities. Living near the River Foyle was the first time I became aware of what it meant to describe a community as living on the 'other' side of the river.
3. Given my historical association with rivers as places of play and fun, education and political awakening, my first interaction with the **Liesbeek** River in Cape Town, South Africa, awakened my environmental agency. During an internship studying gang violence in 1991, I lived across the street from the lower catchment of this 9 km urban river. My focus on social justice and rivers as political metaphors had flowed with me to Cape Town so it was with this lens that I first engaged with the River Liesbeek. I saw it symbolically as the structural division of the middle-class urban edge of Cape Town and the townships that held the real lived experience of Apartheid's destruction.⁶ What I had not expected, or had ever witnessed, was a river clogged by both visible and invisible pollution. It was my first experience of the destructive impact of humans on the hydrological system and through retrospective reflection, I recognise how it ignited another layer of my activism that became channelled in focused work to regenerate the river. My agency slowly started to encompass the more than human world. I joined as a volunteer with a community-based organisation, the Friends of Liesbeek (FoL) that focused on keeping the river free of rubbish. The work of this non-profit organisation is

ongoing as the human impact on the river continues to take its toll. How the river is structured into the upper catchment, middle and lower catchments reflects the inequalities in Cape Town. The river starts its course in the upper catchments and flows through affluent suburbs. It meanders through a commercial area of the city in its middle catchment and then in its lower catchments merges with the Black River before joining the sea. Close to the confluence and pathways of these two rivers is an urban area known as the Cape Flats that is defined by poverty and gang war. For some young people living on the Cape Flats, gang violence is a social phenomenon that must be negotiated daily. Navigating opportunities in education and careers often means crossing rivers that cut them off from wider social inclusion.⁷

4. The **Jukskei** River in South Africa's capital, Johannesburg, starts its journey buried under concrete. The river's path illustrates the stark contrast between rich and poor. During my work for the World Summit for Sustainable Development 2002, I led a group of commercial philanthropists, governmental representatives, social activists and environmental organisations down part of the river's course that runs through the impoverished area of Alexandra township and the affluent suburb of Sandton. At the time of the visit, the river was graded Class F, considered a dead river, because rubbish, hazardous waste and pathogens made it unsafe. I had not until then experienced a river in such a degraded state. It increased my commitment and dedication to environmental and social justice. It also clearly illustrated that rivers connect us and carry symbols of destruction and inequality. Those who were living informally on its banks experienced the most exposure to any river hazards.

What is evident from the rivers that have flowed through my awareness and reflections is a reminder of our globalised world and how interactions and work on/with/upon rivers connect us to and influence the wider world. Rivers are one aspect of the hydrological system. The hydrological or water system refers to the continuous movement of water above, on and below the Earth. Through its dynamic and constant cyclical regenerative movement, I propose that this system shares some of the characteristics of Archer's morphogenetic cycle.

Reflexivity, critical realism and the morphogenetic society

To 'stand the world right way up' (Bhaskar, 2012) requires an engagement, study and understanding of the social world within which we live. We engage with structure as agents, Margaret Archer argued, through reflexivity. At its heart, reflexivity refers to the ability to think about our thinking. Margaret Archer (2003) formulated a theory of reflexivity which she called the internal conversation.⁸ She argued that the internal conversation is a mediating process between structure and agency.

Through the mediating process of the internal conversation, agents⁹ engage in internal deliberation in relation to structure whereby they become the authors of their own projects. Archer linked the causal relationship between structure and agency in what she called the 'morphogenetic cycle'. By reflecting on what we know, our world is transformed; new shapes emerge. To identify one's self, one must compare to an exterior reality. Through a process of moving deeper within, or engaging in Archer's internal conversation, we transform the exterior reality. This process of reflexivity leads to change: "there is only one story because we make our lives, at least in part, by deliberating upon all contexts in which we find ourselves, often involuntarily" (Archer, 2003, p. 52). Archer described how the 'morphogenetic society' is built in her theory of the morphogenetic cycle: "structural conditioning (which is temporally prior, relatively autonomous yet possessing causal powers) conditions social interaction, which in turn generates structural elaboration. [This] scheme of **Structural Conditioning** → **Social Interaction** → **Structural Elaboration** ... crucially is stretched out over time" (Archer, 1995, p. 157).

But our deliberations about the world are not linear as suggested by this depiction of structural elaboration. We present our thoughts in linear planes and use numeric, alphabetical and graphic devices to indicate a linear order in texts. Our agency as writers is defined within a structure. But the process that gets the words to line up is cyclical and often fragmented. Similarly, morphogenesis is a cyclical process whereby the agent, through a process of reflexivity, deliberates on the structure that surrounds her and then acts upon the world in a cyclical and ever-expanding process that either results in morphogenesis or contracts to morphostasis. Circularity is conceptually enshrined in the morphogenetic cycle. Circularity is also a defining feature of the hydrological system. If we are to heed the methodological advice highlighted by Danermark (and cited earlier in this think piece) to keep structure and agency separate and study the links between them over time, we would also need to manage the circularity within both the hydrological and social systems. I suggest that critical reflexivity has potential methodological application for the emerging field of hydro-sociology.

Hydro-sociology – Water as structural metaphor

Water is difficult to define geopolitically. Ownership can be claimed over certain water bodies like dams, but claims on rivers are more difficult, because they move; it is their fluidity that cuts across and through local, regional, national and social boundaries. Hydro-sociology therefore connects to the related field of hydro-hegemony which combines concepts of power, hegemony and intensity of conflict to facilitate analysis of water conflict. Zeitoun and Warner (2006) argued that all water conflict occurs within a broader international political context, weakness of law and ever-changing attitudes and alliances, and therefore cannot be viewed without this context. Zeitoun and Warner's work looks at intensities of dozens of destructive, but largely silent water conflicts that lie somewhere between 'water wars' (feared but non-existing according to the authors) and the much lauded examples of trans-boundary water 'cooperation'. It is difficult to ignore what Ersten described as wider

dynamics especially as it is the “context within which human agency is acted out” (Ertsen et al., 2014, p. 1369).

Zeitoun and Warner (2006) highlighted a shared view of how increasing structural and physical scarcity of water needs deeper analysis of transboundary conflicts. For example, the authors noted that despite the Oslo II accords where Israel recognised Palestine’s water rights, 90% of the Jordan River resources are controlled by Israel in comparison to 10% under Palestinian control (p. 453). They argued that the ability to shift to cooperation over domination is beset by the problem of an absence of international water law (p. 455).

Cape Town is the site of two sites of ongoing research with CW2GC. Known globally as Day Zero, the city experienced a drought considered officially the worst on record without historical precedent. Day Zero refers to a date where the City of Cape Town feared they would literally be in a situation where available potable water would run dry. The response by its near 4 million citizens is a remarkable example and story of how communities worked together to avert a catastrophe. Is this an example of Margaret Archer’s reflexive society, in this case where agency was activated to address a structural crisis in the hydrological and social systems?

Hydro-sociology shows that the hydrological system cannot be viewed as a separate system but is rather coupled to (Sivapalan et al., 2012) or interlinked with (Koutsoyiannis, 2011) the human system. But rising environmental protestors and climate activists are threatening ‘disruption to stop the system’ (like Extinction Rebellion, 2021). What then is the human ‘system’ that will be disrupted and potentially destroyed? Does the term ‘human system’ suggest homogeneity? Can we suggest there is a human system when we as humans continue to define ourselves in dualistic terms evidenced in how we communicate and define each other? What system will take ‘its’ place, what research and action can be taken while the revolution we see on our streets make these declared changes? Ultimately, will hydro-sociological agents help turn the world right side up in such a way that the flow of water remains accessible to all?

What seems to be absent in the implied interdisciplinary nature of hydro-sociology research is an active framing of the interconnections of these systems within theories of structure and agency. As Archer claimed, “modernity is slowly ceding place to a ‘morphogenetic society’ as meta-reflexivity now begins to predominate, at least amongst educated young people” (2012, foreword). What is absent from the claim is a fundamental discussion about justice, rights and access to education within the globalised system. As Bourdieu reminded us, “education is complicit in the reproduction of the social division of the labour of domination” (cited in Nash, 1999, p. 3). Delivering education that enables, encourages and develops critical and reflexive thinkers may activate agency, but the reproduction of the socio-economic divisions will persist without righting the structures of the world. I believe learning about how humans are changing the hydrological structure may make visible a crisis that threatens to further divide us.

Notes on Contributor

Mary Murphy

Dr Mary Murphy is a Director of Studies, Bye-Fellow and supervisor in Economics for Lucy Cavendish College, and a postdoc researcher at the University of Cambridge, Faculty of Education. She has a particular interest in how economics, politics and society sustain the environmental crisis. Her environmental education work is underpinned by critical realism and semiotics. Her research work includes hydro-sociology, environmental education and the use of technology to enable education.

References

- Archer, M. S. (1995). *Realist Social Theory: The morphogenetic approach*. Cambridge: Cambridge University Press.
- Archer, M. S. (2003). *Structure, Agency and the Internal Conversation* (1st ed.). Cambridge: Cambridge University Press.
- Archer, M. S. (2012). *The Reflexive Imperative in Late Modernity*. Cambridge: University Press.
- Bhaskar, R. (2008). *A Realist Theory of Science*. London: Verso.
- Bhaskar, R. (2012). Closing Address, International Association of Critical Realism (IACR) Conference, Rhodes University, Grahamstown, 20 July 2012.
- Bhaskar, R. (2017). *The Order of Natural Necessity: A kind of introduction to critical realism*. (Hawke, G. ed.) South Carolina: CreateSpace Independent.
- Danermark, B. & Ekström, M. (2019). *Explaining Society: Critical realism in the social sciences* (2nd ed.). Milton Park, Abingdon: Routledge, Taylor & Francis Group.
- Ertsen, M. W., Murphy, J. T., Purdue, L. E. & Zhu, T. (2014). A journey of a thousand miles begins with one small step: Human agency, hydrological processes and time in socio-hydrology. *Hydrology and Earth System Sciences*, 18(4), 1369-1382. doi:10.5194/hess-18-1369-2014.
- Extinction Rebellion. (2021). Newsletter: Rebellion of One Special! 2 May 2021. Retrieved from <https://extinctionrebellion.uk/2021/05/04/uk-newsletter-special-rebellion-of-one/>
- Giddens, A. (1984). *The Constitution of Society: Outline of the theory of structuration*. Cambridge: Polity Press.
- Nagabhatla, N. & Niamir, A. (2017). *Water Crisis and Human Migration: Elucidating the 'cause-impact' connexion*. doi: 10.13140/rg.2.2.14247.24480.
- Nash, R. (1999). Bourdieu, 'habitus', and educational research: Is it all worth the candle? *British Journal of Sociology of Education*, 20(2), 189-206.
- Sivapalan, M., Savenije, H.H.G. & Blöschl, G. (2012). Socio-hydrology: A new science of people and water. *Hydrological Processes*, 26(8), 1270-1276. doi:10.1002/hyp.8426.

- Wagener, T., Sivapalan, M., Troch, P. A., McGlynn, B. L., Harman, C. J., Gupta, H. V., ... Wilson, J. S. (2010). The future of hydrology: An evolving science for a changing world. *Water Resources Research*, 46(5). doi: 10.1029/2009WR008906.
- Zeitoun, M., & Warner, J. (2006). Hydro-hegemony: A framework for analysis of trans-boundary water conflicts. *Water Policy*, 8(5), 435–460. doi.org/10.2166/wp.2006.054.

Endnotes

- 1 When completed, data gathered through CW2GC research will be used in additional papers to add further discussion to the hydro-sociology field. The research focuses on community based water regeneration projects.
- 2 Nagabhatla and Niamir divided water related migration into three broad categories: Water Quality; Water Quantity and Water Extreme. A few 'water extreme' examples are presented to highlight and frame water-caused-migration within the context of the larger climatic debates.
- 3 A more detailed discussion of how Archer's analytical dualism may assist in coupling the human-water systems is under development.
- 4 Some additional theoretical and methodological challenges include studying a system that pre-exists and extends beyond our knowledge of it; only appears in our social ontology through our need for it; is studied through agential and structural lenses that are diverse and conflicting in terms of our manipulation and protection of the hydrological system.
- 5 The Troubles, also known as the Northern Irish Conflict, referred to a period of low-level war from the late 1960s to its symbolic end with the signing of the Good Friday Agreement in 1998.
- 6 This occurred within the early days of my first visit to South Africa where my understanding of the socio-economic and political history of the country was blunt and reflected very clear dualistic thinking. I later realised that my thinking was also polarised. This concern with dualities continues in my personal, academic and political reflections.
- 7 Many of those structural impediments that I observed on the Cape Flats during my ethnographic work as an Honours student in 1991 still exist. See Murphy, M. (1993). *Gang Interpretations of Violence in South Africa and in the International Community, and the Relationship between the Two*. Unpublished Honours dissertation (Peace Studies), University of Ulster, Derry.
- 8 See Archer (2003) and Archer (2012)
- 9 The term 'agent' is used as Bhaskar does to mean "anything which is capable of bringing about a change in something (including itself)" (Bhaskar, 2008, p. 109).