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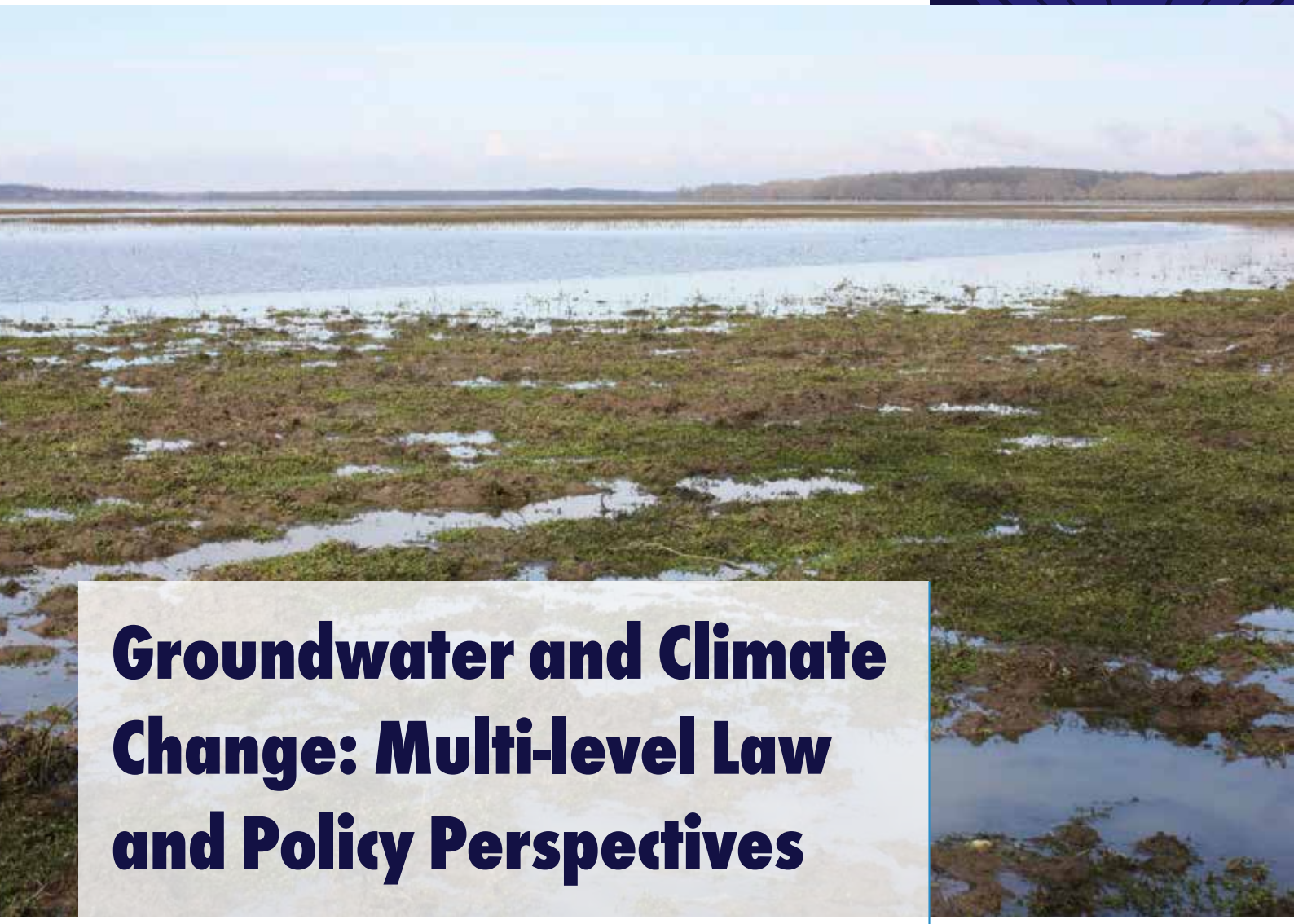

Groundwater and Climate Change: Multi-level Law and Policy Perspectives

■ *Croatia wetland © Celine Dubreuil*

KEY POLICY MESSAGES

- Groundwater and climate change must be considered in the same legal context.
- International law allows simultaneous consideration of climate change and transboundary aquifers under the adaptation regime.
- The EU's conservation law is a model for considering groundwater and climate change simultaneously.
- National groundwater law needs to consider conservation as well as use.

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GROUNDWATER AND CLIMATE CHANGE MUST BE CONSIDERED IN THE SAME LEGAL CONTEXT

Roughly 98% of the Earth's available freshwater lies under the surface, and is primarily used for irrigation (65%) and drinking water (25%). As many as 2.5 billion people rely exclusively on groundwater to meet basic water needs. Exponential increase in demand has led to widespread concern that groundwater reserves will be depleted irreparably in critical areas. Possible impacts of climate change on groundwater exacerbate the threat to future groundwater supply and management. Climate change impacts include: impeding groundwater recharge; increasing intrusion of saltwater from sea level rise; and decreasing groundwater quality due to flood and drought events, amongst others. Given these risks of climate change, groundwater must receive greater protection. Yet groundwater law and policy primarily focus on governing use, not protection, rendering groundwater uniquely vulnerable. Moreover, climate change and groundwater are often considered separately. Therefore, addressing both groundwater and climate change could lead towards safeguarding groundwater and integrating this resource into climate change adaptation strategies.

Insights on the interrelationship between groundwater and climate change can come at multiple scales. Here we look at international; regional (EU); and national (India).

India © Trevor Birkenholtz

INTERNATIONAL LAW ALLOWS SIMULTANEOUS CONSIDERATION OF CLIMATE CHANGE AND TRANSBOUNDARY AQUIFERS UNDER THE ADAPTATION REGIME

In the past, international law largely ignored transboundary aquifers. Raya Marina Stephan shows that this is no longer the case and identifies links between climate change and transboundary aquifer legal regimes. The two coalesce under adaptation. For climate change, these linkages are most cohesive under legal mechanisms with provisions on adaptation. Prominent among these are the United Nations Framework Convention on Climate Change (UNFCCC), the Cancun Adaptation Framework (CAF), and the Paris Agreement. UNFCCC Article 4.1§e requires all U.N. Member States to "[c]ooperate in preparing for adaptation to the impact of climate change [on all] … water resources". The CAF, established at COP 16 (2010), calls for addressing adaptation and mitigation priorities equally. A footnote in the decision clarifies the need to enhance adaptation projects relating to water resources and terrestrial freshwater. Article 7 of the 2015 Paris Agreement reaffirmed the CAF, stating "[p]arties should strengthen their cooperation on enhancing action on adaptation, taking into account the [CAF]." These climate change legal mechanisms identify adaptation as a

basis for considering transboundary aquifers. The international legal regime for transboundary aquifers extends from the Draft articles on the law of transboundary aquifers (annexed to UNGA Resolutions 63/124 and 68/118), the UN Watercourses Convention (UNWC), and the Convention on the Protection and Use of Transboundary Watercourse and International Lakes (UNECE). The Draft Articles establish flexible guidelines for protecting transboundary aquifers. The UNWC extends limited protection, and the UNECE establishes a greater scope of protection covering all transboundary aquifers. By examining the obligation to cooperate and the core principles of international water law, the author finds that these three legal mechanisms contemplate adaptation measures including: development of knowledge and exchange of information, monitoring, research, management, and planning, and the requirement to establish joint bodies/mechanisms. Collectively, the interconnections between groundwater and climate change legal regimes demonstrate how international law offers a framework for considering both regimes simultaneously.

THE EU'S CONSERVATION LAW IS A MODEL FOR CONSIDERING GROUNDWATER AND CLIMATE CHANGE SIMULTANEOUSLY

Owen McIntyre builds the case that EU nature conservation law is an informal step towards integrating climate change adaptation measures into existing regulatory frameworks. One example is safeguarding groundwater to help buffer the impacts of climate change. EU nature conservation law includes the 1979 Wild Birds Directive and the 1992 Habitats Directive. Together, the directives implement an enclave strategy, which protects sites of high ecological value (Natura 2000 sites) from harm by plans or projects under national authority. To judge a project's level of harm to a Natura 2000 site, the court evaluates an "appropriate assessment" of "the integrity of the site concerned" as per Article 6(3) of the Habitats Directive. This process is a particularly robust standard, because unlike environmental impact assessments or strategic environmental assessments, a project's impact on the integrity of a Natura 2000 site is determinative. So much so, that EU nature conservation law presents one of the most effective mechanisms for protecting groundwater resources that are ecologically significant to Natura 2000 sites.

Tidal Marshland © Matthew Kirwan, USGS

EU nature conservation case law also confirms a link between groundwater and climate change. The Court of Justice of the European Union in *Sweetman v An Bord Pleanála* adopted an approach to protecting ecologically significant groundwater resources that allows consideration of the risks climate change poses to groundwater. EU nature conservation law demonstrates how considering ecological needs can lead to strong regional protections that consider groundwater in the context of climate change impacts.

NATIONAL GROUNDWATER LAW NEEDS TO CONSIDER CONSERVATION AS WELL AS USE

Globally, India contains the greatest number of groundwater users. In India, groundwater is the source of about 80% of drinking water and 60% of irrigation water. Already, total demand outpaces the recharge rates of aquifers. Moreover, India's groundwater is particularly vulnerable to impacts of climate change. Philippe Cullet, Lovleen Bhullar & Sujith Koonan explain how considering the environmental dimension of groundwater can enhance protections and better account for the impacts of climate change.

Since India's groundwater regulation is limited, it is no surprise that there is little analysis of the impacts of climate change on it. Protection

■ *Croatia wetland © Celine Dubreuil*

measures are piecemeal, with regulation focusing on extraction and land ownership to the neglect of environmental dimensions such as aquifer recharge. Legal reforms, like the Model Groundwater Act, 2016, may fill some of the gap by introducing an aquifer-wide protection plan into regulation. For groundwater to provide a buffer to the impacts of climate change, protection measures should consider the aquifer as a system that includes surrounding aquifers, surface waters, and the global water cycle.

The closest link to framing groundwater in a global ecosystem is the National Plan on Climate Change (NAPCC), the first collective effort by the government of India to address the impacts of climate change on various sectors, including water. The NAPCC also recognizes water as a 'climate-sensitive sector' and water is the focus of one of its eight missions.

Calling to reform groundwater law and enact policy is easier said than done. While waiting for law and policy change, India is enhancing efficiency of groundwater use by deploying water saving technologies. Irrigation is particularly relevant, as it accounts for 88-91% of the country's groundwater withdrawals, while drip irrigation is a prime example of a widespread water saving technology. Yet Trevor Birkenholtz explains how such water conservation technologies may not actually save water unless paired with enforceable rules governing total water groundwater use.

Left alone, such technologies will not help decrease groundwater withdraw. For example, three climate change and groundwater policy mechanisms show the powerful momentum behind water saving technology. The NAPCC (2008), the National Mission for Sustainable Agriculture (2010), and the National Water Mission (2011) all support technological approaches to enhancing irrigation and/or general water efficiency to adapt to the impacts of climate change. All these mechanisms also share a focus on increasing the use of technologies rather than reducing irrigation water demand. Experiences around the world have shown how short-sighted this is: If farmers retain rights to the "saved" water, they will apply it to more crops.

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