

Underhill, V.; Beckett, L.; Dajani, M.; Oré, M.T. and Sabati, S. 2023. The coloniality of modern water: Global groundwater extraction in California, Palestine and Peru. *Water Alternatives* 16(1): 13-38



The Coloniality of Modern Water: Global Groundwater Extraction in California, Palestine and Peru

Vivian Underhill

Postdoctoral Researcher, Social Science Environmental Health Research Institute, Northeastern University, MA, USA; v.underhill@northeastern.edu

Linnea Beckett

Assistant Adjunct Professor, John R. Lewis College, UC Santa Cruz, Santa Cruz, CA 95061, USA; lbeckett@ucsc.edu

Muna Dajani

Senior Research Associate, Lancaster Environment Centre, Lancaster University, UK; m.dajani@lancaster.ac.uk

Maria Teresa Oré

Assistant Professor on the Water Resources Master's Program, in the Social Sciences Department at Pontifical Catholic University in Peru. Visiting Professor on the Water Resources Master's Program at National Agrarian University, Lima, Peru; teresa.ore@pucp.pe

Sheeva Sabati

Assistant Professor, Doctorate in Educational Leadership, California State University, Sacramento, USA; s.sabati@csus.edu

ABSTRACT: While water scholars have critiqued the social and political work of 'modern water' (Linton, 2010), lineages of critical water scholarship have yet to meaningfully engage with decolonial and Indigenous scholars' insights on the global architecture of coloniality/modernity as it relates to our understandings of water. We argue that this engagement is necessary because it further elaborates the political work done by modern water: not only propelling modern projects and their associated inequities but, more fundamentally, expanding and normalising global coloniality and racial capitalism as structuring forces that endure even as they transform (Robinson, 1983). Drawing on the interrelated histories, present situations, and possible futures of land and water development in California, Palestine and Peru, we explore how the development and persistence of modern water across these sites likewise illuminates the development and persistence of varying modes of coloniality. We present each country as a 'case' with a focus on what Oré and Rap (2009) call 'critical junctures': that is, political, social, technological, and economic shifts that, together, bring into sharp relief the global structure of colonial/modern water. Ultimately, this paper draws critical water scholarship and decolonial thought into closer conversation to re-place and particularise what has been produced as a universal (and universalising) concept and to highlight the consistent presence of alternatives and waters otherwise.

KEYWORDS: Coloniality, modern water, settler colonialism, California, Peru, Palestine

INTRODUCTION

In the early 20th century, engineers from France, Britain and other European nations travelled to California to study its hydraulic engineering. They brought back a vision of modernisation and

development that they implemented in colonial contexts such as Morocco, Algeria, Palestine and India. Their travel epitomised the circulation of hydraulic engineering knowledge and experts. Other countries such as Spain, South Africa, Argentina, Israel, Brazil, Russia, New Zealand and Canada also studied California's agricultural system and adopted components of its model, which was heavily reliant on its distinct water infrastructure (Swearingen, 1987; Troen, 2000; Teisch, 2011; Garrido, 2014). Referred to as 'a new California', this modern agribusiness approach became tightly woven into land use policy around the world.

While many of these locations share climatic similarities to California's arid landscapes, fertile soils, and (historically) rich groundwater, they share more than geographic parallels; they also developed in close conversation together. Hydraulic engineering advances developed through the multidirectional circulation of expertise and colonial experiments in extractive water practices. This circulation also fuelled an agro-export economy of water-intensive crops and what Molle et al. (2009) call hydraulic bureaucracies; that is, state- and nation-building efforts that rely on the control and use of water, and specifically on what Jamie Linton (2010) calls 'modern water'.¹

As Linton elaborates, modern water is produced as "the dominant, or natural, way of knowing and relating to water" (ibid: 14). It is made to seem universal even though it is particular to European and North American institutional science. Modern water reflects "the presumption that any and all waters can be and should be considered apart from their social and ecological relations and reduced to an abstract quantity" (ibid). It is marked by scientific and engineering ways of knowing water: canals, dams and hydraulic infrastructure that can be replicated the world over. Modern water thus undergirds the global spread and universalisation of modern irrigation projects.

We argue that, insofar as it is useful to think about modern water, it is simultaneously necessary to think about the *coloniality* of modern water. While Linton traces a genealogy of modern water and its associated inequalities, his work does not engage with decolonial scholarship. Lineages of critical water scholarship have also not yet fully taken up decolonial scholars' insights into the global architecture of coloniality/modernity.² We believe that such an engagement is necessary because it further elaborates the political work that modern water does: not only propelling modern projects and associated inequities but, more fundamentally, expanding and normalising global coloniality and racial capitalism as structuring forces that endure even as they transform (Robinson, 1983).

Drawing from decolonial scholarship, this paper expands on the important work of Linton and other critical water scholars by opening new analytical perspectives on the coloniality of the 'hydraulic mission' that has dominated water resource development since at least the early 1900s, and which continues today in the form of increasing extraction of groundwater. We foreground how ways of knowing, relating to, and managing modern water are intertwined with colonial practices of global racial capitalism, Indigenous dispossession, and labour exploitation, and how they have produced water crises worldwide.

As a group of interdisciplinary scholars working in California, Palestine and Peru, we present each country as a 'case', with a focus on what Oré and Rap (2009) call 'critical junctures' – that is, political, social, technological and economic shifts which, when positioned together, help in understanding the global structure of colonial/modern water. Our approach aims to push against modern water's universalisations by theorising from our own place-based research. We provide a series of non-exhaustive links across cases to better understand the co-constitutive nature of coloniality/modernity.

¹ We build on Molle et al.'s (2009) concept to not only address monolithic bureaucracies of water (what those authors call hydrocracies) but, more specifically, to conceptualise the role of water in state-building projects across colonial contexts.

² Here, we are thinking with a specific strand of Latin American decolonial thought as elaborated below. This claim is not meant to overlook significant and ongoing work on Indigenous water justice or water colonialisms (for example, Diver et al., 2019; Hartwig et al., 2022; Hayman et al., 2018; Wilson et al., 2021; Daigle, 2018; Barker, 2019).

In particular, these connections highlight how contemporary initiatives that are focused on accessing deeper groundwater reserves are only temporary solutions to the unsustainability, toxicities and violences of modern water (see, for example, Jackson and Head, 2020). Above-ground modern water projects such as dams and canals spread through the global architecture of coloniality (Hartwig et al., 2021; Sepulveda, 2018 Griffith, 2017). This enduring architecture is now propelling groundwater extraction that only furthers the racial and colonial violences of this broader system (see, for example, Hartwig et al., 2020).

Our case-based analysis aims to surface the coloniality of global groundwater overdraft. We believe that our case-based approach brings a more nuanced approach than the generalising that emerges from what some have framed as a 'global groundwater crisis' (see, for example, Giordano, 2009). We instead attend to each case in terms of its contextual richness, divergent colonial formations, and role in global economies. By rendering the particular colonial violences of these modern projects more visible, we hope ultimately to open avenues for anti- and decolonial alternatives.

THE COLONIALITY OF MODERN (GROUND)WATER

For Linton (2010), modern water is a conceptual abstraction. As the chemical compound H₂O, it is separate from other compounds and from the rest of the world with which it co-exists; it is only a resource, one that can be moved, managed or wasted. Importantly, part of the concept of modern water is its pretension to universality; like many colonial epistemologies, modern water assumes that there are no other legitimate ways of knowing, or being in relation with, water other than those of Western science. Modern water therefore works within a set of hierarchies that categorize epistemological *difference* as inferiority or incorrectness (Boelens et al., 2022).

While modern water is useful for describing hydraulic engineering and the scientific abstraction of water, we seek to emphasise the *coloniality* of modern water. Aníbal Quijano's (2007) framing of coloniality/modernity was later developed further by Walter D. Mignolo (see, for example, Mignolo, 2011) and others within Latin American decolonial scholarship and Global South scholarship. It proceeds from the premise that the promises, freedoms and wealth of global modernity are produced through – and are co-constitutive with – the violence, exploitation and unfreedoms of coloniality (Escobar, 2004; Mignolo, 2007, 2011; Quijano, 2001, 2007; Vázquez, 2011). Coloniality/modernity describes an imposed system of social organisation that produces gendered, racialised and geographic identities and relations which privilege European knowledge systems, patriarchy, heterosexuality and whiteness (Mignolo, 2007; Quijano, 2007; Maldonado-Torres, 2007; Lugones, 2008). Importantly, however, modernity's foundational progress narratives and its conviction of its own universality require these colonial unfreedoms to be erased, minimised, relegated to history, or seen as aberrations. The joining of 'coloniality' and 'modernity' with a forward slash (/) thus marks the centrality of colonial conditions to modernity, even as they are erased or minimised.

As Black feminist thought has further articulated, coloniality/modernity is premised on a racial onto-epistemology in which race as a category of differential humanity helps resolve and justify the clear disparities held within a moment of ostensible universal humanism (Wynter, 2003); that is to say, the rights and freedoms of the human are always constituted in relation to the unfreedoms of those outside the category of the human (Hartman, 1997; Lowe, 2015; Cacho, 2015; da Silva, 2007). As scholars of racial capitalism have similarly pointed out (Robinson, 1983; Gilmore, 2007; Day, 2016), capitalism requires this racial onto-epistemology; according to Jodi Melamed, "Capital can only be capital when it is accumulating, and it can only accumulate by producing and moving through relations of severe inequality among human groups" (Melamed, 2011: 77). The 'Eurocentric hegemony' of this racial and gendered

onto-epistemology thus organises the planet's populations into relations of domination for labour production (Quijano, 2000: 343).³

The framework of coloniality/modernity helps us articulate the constitutive relationships between the agricultural wealth that has been made possible by large-scale hydraulic projects and the dispossession and exploitation of peoples and lands/waters that these hydraulic projects have simultaneously required. The relation between wealth creation and dispossession/exploitation can thus clearly be seen not as coincident, but as in fact fundamentally co-created. In each case, the technical expertise of hydraulic engineers was sponsored through government projects and was utilised to build complex hydraulic infrastructure that moved water to arid regions. These projects were carried out with an urgency fuelled by an enthusiastic flow of financial capital from large-scale producers, banks, external financiers and others to underwrite large-scale agricultural production and the development of urban areas. Large agricultural landholdings required the exploitation of labour for production, urban areas consumed the food and products produced from these fields, and the people and places from where the water was moved suffered varying degrees of land/water dispossession and cultural and environmental injustice.

As we will show, this analysis is particularly important with regard to global groundwater extraction because it locates it as an extension of longstanding colonial relations, rather than as a new phenomenon or a recent 'crisis'. Groundwater extraction, viewed this way, involves more than the movement of water; it is extracted and exported as the fuel for an industry that transforms land and water and organises people into racialised labour systems. Adopting this lens of the coloniality of modern water allows valuable insights into water over-extraction, the dominance of scientific ways of knowing and managing water, and its ongoing role in dispossession and exploitation.

A RATIONALE FOR A CROSS-CASE ANALYSIS

Our thinking about the coloniality of modern water emerges from an international collaborative project entitled Transformations to Groundwater Sustainability (T2GS). This project brought together researchers from eight sites (Peru, Morocco, Tanzania, Zimbabwe, California, India, Algeria and Chile); the goal was to engage in interdisciplinary cross-learning around locally based practices of groundwater management (see, for example, Sabati et al., 2021; Zwarteveen et al., 2021). One aspect of these discussions came to be colloquially referred to as the 'California Dream' – that is, the promises of large-scale water projects as a mode of racial capitalist development.

What is compelling about these California-specific hydraulic discourses and practices, however, is how they both are, and are not, California-specific. While a particular imaginary of lucrative agricultural enterprise is often attributed to California, these systems actually travelled multidirectionally through the emergent field of hydraulic engineering's global circuits, expanding state-led large-scale water management and agriculture across the globe (Chastain and Lorek, 2020). The travel of what Kuper, Mayaux and Benmihoub (2023, this issue) describe as 'California imaginaries' thus actually reflects the spread of a modern water imaginary. We are interested in the interplay between California-specific

³ As Maria Lugones describes in her (2007) discussion of colonial/modern gender, part of the function of coloniality is to reduce the capaciousness of gendered forms into a binary system that is limited to only sex, sexuality and reproduction. This system is then pulled into racial and gendered hierarchies to better facilitate relations of domination, dispossession and labour exploitation. Foundationally, however, to even conceptualise gender as isolated from the many modes in which people live their lives with others is to participate in the coloniality of modern gender. We believe that this example also illustrates the coloniality of modern water; it separates water from its constitutive relations and reduces it to a resource that can be moved/diverted/managed to uphold an agro-export industry that pulls regional economies into a global system and requires Indigenous dispossession and racialised and exploited labour.

imaginaries and discourses and the global dynamics of colonial/modern water, in large part because the California Dream speaks to the imaginary of 'modernity' at the global level.⁴

In this paper, we hope to begin that conversation by drawing together extensive empirical and historical research from our respective regions, using a cross-case information-oriented methodological approach to case selection and representation (Flyvbjerg, 2006).⁵ This approach privileges the informational content of each case and is designed to support the development of larger frames of thought from cross-case analysis. Even as we trace comparative similarities across cases, however, we are aware that this can collapse important distinctions between them. Our intention is not to homogenise these cases into a global space; rather, it is to use their particularities to understand the linkages by which coloniality/modernity has created the conditions for groundwater over-extraction across the globe (Gasteyer et al., 2012).

Decolonial theorisations of coloniality/modernity trace a global architecture that traverses ontological, epistemological, political, social and material domains. As we present each case, we do so with broad historical strokes and specific examples in order to identify how the global structure of coloniality informs current realities in each region. We present analytical summaries of each region as a 'case', focusing on the critical junctures of political, social, technological and economic shifts that together allow us to surface the global structure of colonial/modern water. Ultimately, we draw upon the comparative historical trends from each case to understand aspects of the current groundwater crisis through a lens of coloniality/modernity and to potentially open new ways to address that crisis.

CALIFORNIA

California was a central site of US experiments in hydraulic infrastructures. During the 19th century, discourses that intertwined race with notions of worth and productivity were central to the settlement and development of US lands and waters (Underhill et al., 2022). Throughout California's first 100 years of settler colonial water development, engineers and politicians framed Northern California's rivers as 'wasted' because they ran to the San Francisco Delta and, ultimately, to the ocean. They argued that these waters needed to be 'moved' and used for industrial purposes (Middleton-Manning et al., 2018; Middleton-Manning, 2018; Claire and Surprise, 2022). California's lakes and wetlands were also deemed 'wastelands' that were potentially 'contaminating' for the white population, in particular (Nash, 2007).

Reclamation – the process of draining lakes and irrigating dry lands – became a cornerstone of the settling of the state's primarily arid central area. It subsequently became key to establishing California's burgeoning agricultural economy as one of the most lucrative in the world (Worster, 1985; Reisner, 1993; Arax, 2019). Reclamation was also part of the material and legal apparatus of Indigenous dispossession (Frank and Goldberg, 2011; Sepulveda, 2018; Akins and Bauer, 2021; Underhill, 2022). Even with these early reclamation projects, however, by the 1930s farmers were extracting groundwater at such an unsustainable rate that it threatened to cause the collapse of the agriculture sector (Reisner, 1993). Farmers and land speculators doubled down on the promotion of efforts to build state-wide water infrastructure that would use Northern California's rivers to supplement Central and Southern California's scarce water (Poupeau et al., 2019).

⁴ Importantly, these exchanges were only one phase in a much longer history of coloniality/modernity linked to European colonialism. We begin here because it is one set of 'critical junctures' that created material and discursive links across our cases. We do not mean to suggest, however, that the process of colonial/modern water projects began in the 19th century exclusively.

⁵ The material that undergirds this paper lies in our synthesis of conversations over two years of discussion; however, each of us engages in a combination of ethnographic, archival and critical pedagogical research in our respective research areas. We also come from an interdisciplinary set of theoretical backgrounds including anthropology, feminist theory, critical university studies, and community-based participatory research.

Over the next 30 years, the California legislature voted to build two large state-wide water projects to transfer surface water across the state, primarily for agricultural purposes; these were the Central Valley Project (CVP) and the State Water Project (SWP). In 1937, the Bureau of Reclamation broke ground on the CVP, one of the world's largest storage and transport water systems, which took five decades to construct. It consists of an intricate web of approximately 20 dams along the Trinity, Sacramento, American, Stanislaus and San Joaquin Rivers, 11 power plants, and 804 kilometres of canals. It regulates and diverts water across the Sacramento Valley into the San Francisco Bay Area and into the Central Valley (Bureau of Reclamation, 2022). In 1960, the California legislature – winning the vote by only a narrow margin – authorised the building of the SWP; this launched the construction of a vast system of dams, pumps and reservoirs to move water across almost 1,000 kilometres to Southern California's fields.

Though ostensibly about water, the infrastructure projects became ends in themselves through the promise of infusing federal capital into state economies. The idea of moving water unleashed almost unlimited political and economic capital, and water projects became part of a politician's dossier regardless of how economically, environmentally and hydrologically absurd the project was (Worster, 1985; Reisner, 1993).

By 1970, with one exception, every significant river in California had been dammed at least once, with the Stanislaus River dammed 14 times (Reisner, 1993). Originally built to support farmers' economic interests and to limit groundwater overdraft, the CVP and SWP instead allowed farmers to expand farmland production across the state, which only increased the demand for water. As a result, farmers turned again to groundwater. Instead of addressing the 1930s groundwater overdraft problem (Reisner, 1993), the CVP and SWP intensified it.

Today, California's agriculture industry produces two-thirds of the country's fruit and nuts, with exports of US\$27.72 billion (California Department of Food and Agriculture, 2020). The state is also in a groundwater overdraft crisis. Eighty-five percent of the water moved across California is used for agricultural purposes, yet growers continue to expand farmland and extract groundwater at exponential rates (Arax, 2019). Even with these two water projects pumping almost 10 million acre-feet per year (Bureau of Reclamation, 2022; Water Education Foundation, 2022), the increase in demand over the past two decades has exacerbated groundwater over-extraction.

The overuse of groundwater disproportionately benefits large-scale growers. California's groundwater has historically been unregulated; even after the 2014 passage of the Sustainable Groundwater Management Act (SGMA), enforcement is still decades away (Niles and Wagner, 2017). Access to groundwater is thus largely premised on having the capital to drill deeper and deeper. Across California, community wells are drying up as large-scale growers of pistachios, almonds and other water-intensive crops expand their drilling capacity. Growers rationalise drilling deeper wells as a necessary response to drought; however, understood as a manifestation of the coloniality of California's modern water infrastructure, this contemporary groundwater crisis is a settler-made inevitability (Underhill et al., 2022).

This has led to what can perhaps be seen as the latest instantiation of racial capitalist logics of accumulation in California (ibid), in that both farmland and water have become increasingly financialised and made into investment products themselves (Fairbairn et al., 2021). Investors can now buy 'water futures', while water districts are experimenting with 'water banks' in which surface water is injected underground in wet years, ostensibly to be removed in the future (Pulido-Velazquez et al., 2004). At least one water bank – the Kern Water Bank, which sprawls over 83 square kilometres in the Southern San Joaquin Valley – was recently found to be contaminated by the carcinogenic 1,2,3-TCP, and other banks have since also found TCP in their wells (Henry, 2022). This is an example of the irony of seeing water as a currency that can be invested, traded or banked. Groundwater has become a 'vertical frontier' of capital accumulation that deepens the settler colonial and racial capitalist impacts of water infrastructure; this can also be seen very clearly in surface water diversions (Underhill et al., 2022).

The chemical impact of long-term, large-scale agriculture is meanwhile accumulating in toxic groundwater. The Valley's small towns – many of them farmworker communities and communities of colour – struggle with a host of groundwater contamination issues, from arsenic to pesticide byproducts to nitrates (Balazs et al., 2011; Pace et al., 2022). Contamination, then, as an entangled discourse and material process, links California's toxic present to its long history of so-called reclamation, which shows the role of water (and now groundwater) in racial capitalist shifts in the land itself (Underhill, 2021). Aligned with the past 170 years of water management, however, the state legislature still frames the groundwater crisis as one that requires technological fixes such as more dams and water catchment and distribution systems, rather than a situation that calls for profound shifts in relations to water itself.

PALESTINE⁶

Since the early 20th century, Palestine has been the site of colonial, and settler colonial, extractivism and nation-state building. 1917 was a significant year for Palestine, which was then under British colonial rule. In that year, the Balfour Declaration was issued by the British government; this was a public statement that supported the establishment of a national home for the Jews in Palestine. What ensued was the erasure of Palestine and Palestinians at the expense of the establishment of a settler colonial project under a Zionist ideology (Khalidi, 2020). British and Zionist entities spoke of barren, desolate geography that required a transformation to modernity – essentially a transformation of the nature, people and geography of the place (Davis and Burke, 2011; Gasteyer et al., 2012). Conceptualisations of Palestine as 'wasted' space framed Zionist policy interventions that were aimed at creating a settler colonial society that replaced and excluded local identities and communities (Anton, 2008; Zakim, 2006; Temper, 2009). The journey of the consolidation of an Israeli (Zionist) waterscape and infrastructure is widely told as a story of the triumph of modernity and technology over nature; it features pioneering technologies and technological fixes that include drip irrigation, wastewater treatment and reuse, and desalination.

Zionism was portrayed in large part as a 'hydraulic mission'; it involved constructing mega-structures for modernising water supply, bolstering state and nation-building efforts, and realising dreams of irrigating the desert (Feitelson and Rosenthal, 2012). Water was essential for the realisation of such a society. Through intensive engineering and political efforts, water in all its forms, including surface and groundwater, had to be territorially secured and technologically manufactured and increased. One of the dominant imaginaries of the Zionist hydraulic mission was the aspiration to 'make the desert bloom'. As Zionist writing has proclaimed, "By applying capital and science, and by judiciously selecting profitable crops and choosing the right methods of farming, the Jews were able to increase appreciably the productivity of Palestinian agriculture though only after years of hard pioneering exertion" (Dorra, 1946, quoted in Weinstock, 1973: 49).

Following the end of the British colonial mandate over Palestine, the US model as a source of expertise in rural development increased dramatically (Tsedell, 2017). Zionist leadership began inviting US agricultural experts and engineers to visit Israel and outline the potential of replicating the California model of making the desert bloom (Karlinsky, 2000). The US/Zionist collaborations and American assistance on water resource development began in the 1920s and 1930s when Elwood Mead, who later became the Commissioner of the United States Bureau of Reclamation, visited and advised Zionists (Rook, 2000). Another prominent figure in discourses around water management was Walter Lowdermilk; in the 1940s, he was commissioned by the Jewish Agency to carry out an exploration of the potential of

⁶ Palestine here refers to the geographical area of the British colonial Mandate for Palestine. Israel as a state was created in 1948; today Israel controls all of the geography of Mandatory Palestine under differentiated administrations. For the sake of clarity, 'Israel' in this paper refers to the action of the Israeli state, while 'Palestine' is used to describe the geographical area known as Palestine.

Palestine as a site of land and water abundance.⁷ What unified those plans is that although they were not implemented, they helped shape the development of future Israeli water plans; these involved channelling water out of river basins and using all available surface and groundwater sources for irrigation and electricity production. In essence, through entrenched narratives of water abundance and prosperity, Zionist imaginaries of Palestine as a potentially water-rich geography, together with their confidence in the ability of technology to increase water availability, were constructed to aid the colonisation of Palestine and to ease the immigration of Jewish Zionists (Alatout, 2009). With the clear support of prominent US hydrocrats, Zionists colonised Palestine with a clear fixation on control over land and water. The Israeli kibbutzim are communities that follow a cooperative-socialist agricultural development model; these were the settler geographies where early groundwater exploration began to take place as more reliable water supplies were sought. Ideologically, Zionist – and even future Israeli – narratives of modernisation relied on such ideas of agricultural development and resource exploitation to achieve a physical "replanting of national roots" (Lipchin, 2007: 11; Temper, 2009); these narratives also served political and security ends (Wolf, 1995).

In the years preceding the 1948 war that led to the creation of Israel and to the *Nakba* – the displacement of hundreds of thousands of Palestinians – a clear and systematic process of water institutionalisation was carried out. The Zionist water company Mekorot, for example, which became the Israeli state water company after 1948, exclusively developed new water sources and carried out groundwater explorations for the sole benefit of Zionist outposts and settlements. Mekorot required extensive investment in irrigation technology and groundwater exploration; its aim was to enable the expansion of settlements into arid areas through moving water from places where it was abundant. Ensuring a stable water supply became the main concern of the state, and since 1948 a water scarcity narrative has dominated (Alatout, 2008).

Surface water was extensively secured by the National Water Carrier (NWC); it expanded the Israeli settlement frontier in the Naqab/Negev in the south by pumping water from the tributaries of the Jordan River and from Lebanon and Syria to the north (Zeitoun et al., 2012). Built between 1953 and 1964, the NWC is Israel's largest infrastructural project; its aim is to regulate flow and make the desert bloom. Diverting 350 million cubic metres (Mm³) annually from the Jordan River Basin toward Israeli coastal cities and Al Naqab (Negev) and causing long-term environmental deterioration to the lower Jordan River, this infrastructure project also provoked Jordan and Syria into intensifying unilateral water withdrawals from the same river basin (ibid).

Groundwater was also extensively abstracted to provide water for booming agricultural demand. By the 1960s, groundwater abstraction had exceeded natural replenishment and was causing alarm in terms of sustainable use and quality issues (Furman and Abbo, 2013). Israel's Water Law of 1959 further contributed to this state-centric management of water. The law stipulated that all water is the property of the state, and groundwater drilling and pumping thus came to be exclusively carried out by government institutions to the exclusion of Palestinian communities, farmers and other water users (Galnoor, 1978; Laster and Livney, 2009). Palestinians continue to be denied access to, and control over, significant surface and groundwater sources through the systematic weaponisation of this Water Law, which entrenches a reality of unequal water supply and distribution. Israel, for example, acquires 80% of its water from occupied territories and neighbouring Arab states through exercising physical and territorial control over water as much as ideational and sanctioned discourses around water security (Zeitoun et al., 2013). The Western Aquifer, the richest groundwater aquifer in the occupied West Bank,

⁷ Dubbed "the father of Israel water plans" (JNS, 2018), Lowdermilk was popular for glowingly describing Jewish land and water reclamation as being the emancipation of land that had suffered from neglect and destruction under Arab/non-Jewish rule. The Lowdermilk plan of 1949 constituted both ideological and technical support for the Zionist project; it was initially adopted as a water resource plan, but later was technically and scientifically complemented by the technical plans of Hayes and Savage, which were funded by the Commission on Palestine Surveys in the US (Schmida, 1984).

is currently controlled by Israel, which extracts 94% of its water; Palestinians, meanwhile, extract only 6% (UN-ESCWA and BGR, 2013). The Gaza Strip, which has been under siege by Israel since 2007, has been the site of a compounded water and public health crisis. Gaza's main source of water is a shallow aquifer that has been suffering from decades of over-extraction and acute pollution by seawater intrusion. With the population of the Gaza Strip reaching 2 million, the UN has warned that 97% of water from the coastal aquifer has been deemed unfit for human consumption due to decades of siege and Israeli hydro-hegemony (al-Shalalfeh et al., 2018).

Today, the coloniality of modern water remains clearly entrenched in Israeli policy-making and agro-technological exports. For decades, Israel has established its reputation as a hub for agro-exports and technology innovation. In 2020, Israeli agricultural exports amounted to billions of US dollars. That year, the European Union imported 30% of Israeli agritech exports; this was followed by Asia at 22%, South and Central America at 20%, and the United States at 18% (WhoProfits, 2021). Agritech is thus ranked as one of the most profitable sectors in the Israeli economy. In terms of so-called 'agro-diplomacy', Israel has been exporting its agribusiness and associated technologies globally; this has been accompanied by detrimental impacts on local communities and ecosystem health, and the continuing denial of Palestinian rights to land and resources (GRAIN, 2022).

PERU

The modernisation of Peruvian agriculture began at the beginning of the 20th century, part of the trend of modernisation across Latin America (Baud, 1998). Peru was facing serious economic and political problems due to its defeat in the Pacific War (Manrique, 2022). The government of President López de Romaña – an engineer and sugar plantation owner – represented the Creole oligarchy; it promoted the export of sugar and cotton from coastal areas as a way out of Peru's dire financial situation (Basadre, 1968).

This required the modernisation of coastal agriculture; the area's soils were fertile and suitable for large-scale production but were limited by aridity. In the summer, the region's rivers depended on rainfall from the high Andes. There were thus calls for new water sources and for agricultural modernisation to replace the predominantly traditional practices. Irrigation was controlled by landowners and infrastructure maintenance was carried out by Indigenous communities (Keith, 1976). Overall irrigation management was shared by both and, while there was conflict, they remained interdependent (Oré, 1989). The knowledge and technology of the Indigenous Andean communities was a legacy of pre-Hispanic coastal cultures (Tello, 2002; Ravines R and Solar La Cruz F, 1980) and the Andean water cosmogony (Gelles, 2000; Sherbondy, 1982; Escate et al., 2022).

In 1902, US engineer Charles Wood Sutton compiled information about Peru's coastal rivers with a view to developing future irrigation projects through water transfer from the high Andes to the coast. Sutton's technical capabilities were as strong as his political convictions; he felt that water control and administration should be in the hands of the state. He proposed developing medium-sized farms with modern technology and irrigation projects (Oré, 2005; Sutto, 1929).

That year, Peru enacted its first Water Code. It promoted the cultivation of barren lands on the coast – mostly communal lands – by keeping control of water in landowners' hands and recognising the irrigation infrastructure work by Indigenous communities (Basadre, 1968). In the same year, the School of Agriculture was created in Lima with professors from Belgium, France and the US. Its courses focused on export crops, new irrigation techniques, and the design of modern hydraulic infrastructure for the coast (Oré and Rap, 2009).

In 1910, under President Leguía, technical commissions led by engineers were assigned to the coastal valleys, and state intervention in irrigation management began. These commissions installed irrigation, maintained and modernised infrastructure, and implemented a water tariff. This sparked conflict with

members of Indigenous communities who were displaced from irrigation maintenance and forced to pay the tariff. During the second Leguía government (1919-1930), the technical commissions were expanded and the first coastal irrigation projects were executed, with Sutton as one of the main advisors (Oré, 2005; Glave, 1986). Peruvian engineers thus consolidated their technical expertise and, in the process, the hydraulic mission became closely linked to state growth and to the emergence of Peru's hydraulic bureaucracy (Molle et al., 2009).

In 1930, the state began a water transfer project from Lake Choclococha in Huancavelica to the Ica Valley, eventually expanding Ica's cotton-producing frontier by 10,000 hectares (ONERM, 1971). The lands were owned by the Tate Indigenous community, but they were not cultivated, so the State could expropriate them. However, as the project neared completion in the 1950s, local landowners and merchants invaded the Tate communal lands in an attempt to exploit them and gain state recognition as owners (Oré, 2005).

The problem for landowners, merchants and the Tate community was the lack of irrigation channels on the communal lands. In 1935 a US company introduced motorised pumps for groundwater access. This technology was prohibitively costly for the Tate community but allowed local landowners and wealthy merchants to exploit the communal lands. The community responded in two ways; first, it sued the state to gain recognition as landowners; second, it utilised traditional know-how to expand a major irrigation channel that would carry water to their communal lands and enable their return. Ultimately, however, the state threw out the lawsuit and put their communal Indigenous lands up for sale (Oré and Rochabrún, 1990). In the 1960s, new cotton *haciendas* emerged in Ica; they featured modern technology, groundwater access and an increased supply of surface water from Lake Choclococha.

Another critical juncture for Peru came in the 1990s (Tanaka, 2009) when the Fujimori government promoted foreign investment, downsized state institutions, transferred water management to local irrigation user organisations, and encouraged the privatisation of natural resources other than water (Marshall et al., 2012).

In 2003, regional governments were created to promote decentralisation (Gonzalez de Olarte, 2021). Various aspects of irrigation management, such as special irrigation projects, were devolved to these regional governments (Oré and Geng, 2018). In 2009, the new Water Resource Law (29338/2009) was promulgated; it ruled out privatisation and enshrined water resources as a public good. A new management framework for irrigation was created at the national and regional levels (Lynch, 2014) which emphasised the hydrographic basin and the need for integrated water resource management. Basin Councils were formed at the national level. The law also recognised groundwater for the first time; it stressed the aquifer as a management unit, the need for extraction measurement, and the acknowledgement of groundwater user organisations (Oré et al., 2014).

Once this new law was enacted, the state received significant loans from international organisations for its application (French, 2016); this bolstered the hydraulic bureaucracy and returned the state to water control – but for private benefit.

During these years, Ica enjoyed unprecedented agro-export success. It positioned itself in the international market for asparagus, avocados, grapes, blueberries and citrus fruits. Central to this was the intensive exploitation of groundwater using high-tech irrigation equipment of Israeli origin. Agro-export businesses expanded onto vacant land in a programme to 'green the desert' (Oré and Geng, 2018; Damonte and Gonzales, 2018; Marshall, 2014).

A discourse promoted by agro-exporters permeated the Iqueño social imaginary of the population of Ica, expressed in sayings like "We want to be like California" and "Ica, the engine of national progress". Agro-exporters created Ica's first groundwater user organisation, Junta de Usuarios de Aguas Subterráneas del Valle de Ica (JUASVI), which exerted its influence on irrigation user organisations and local authorities, and on regional and central governments. JUASVI's influence prevented regulation of its water extraction; this resulted in high concentrations of land and water among its members and conflicts with smaller

farmers and with Ica's urban population (Oré and Geng, 2018; Damonte, Gonzales and Lahud et al., 2016; Oré and Damonte, 2014; Damonte, Pacheco and Gonzales, 2014).

Intensive exploitation also caused the water table to plummet, and in 2010 the regional government declared a water emergency in Ica. Engineers from the special irrigation project proposed a new Huancavelica-Ica transfer project, since "Ica is the engine of progress (...) and up in the high-Andean area there are only a few families, alpacas, llamas and a few sheep" (Ica Regional Government, 2018).

This attitude shows the invisibilisation of high-Andean populations and reflects Peru's internal colonialism. The Huancavelica peasant communities rejected the project, sparking a severe conflict between Ica and Huancavelica. The communities took their case to the Latin American Water Tribunal in Mexico, which ultimately ruled in their favour (Oré and Geng 2018; Defensoria del Pueblo, 2016; Salazar and Rivera, 2015; Guerrero and Verzijl, 2015).

Peasant communities are a new actor in the Ica basin. This has led to a new agenda which insists that irrigation projects should benefit both Ica (on the coast) and Huancavelica (in the Andes). Amid the COVID-19 pandemic, their discourse on natural resource justice, equity and sustainability extended to health. This implies a new critical juncture in which internal colonialism is beginning to be challenged by high Andean populations far from the coast and from Peru's capital.

DISCUSSION: COLONIAL/MODERN WATER AS A GLOBAL ARCHITECTURE

Across these locations, settler/colonial regimes perceived water as 'wasted' if it was not captured and transported to fertile arid lands to feed a lucrative agro-export industry. In California, engineers, governments and corporations banded together (not without conflict) to construct elaborate water transport systems that dispossessed Indigenous nations, endangered wildlife and riparian areas, and flooded/drained previously rich ecosystems. In Palestine, water was used to impose a Zionist nation-state through similar water-moving technologies. In Peru, the government and private sector also joined forces to supply water to global agro-export operations while dispossessing Tute communities and overriding longstanding water management practices.

Importantly, not only were these transformations an *effect* of hydraulic engineering practices that were premised on modern water; the control of water was also used as a *tool* with which to extend state-building and settler colonial sovereignty claims, which pulled local economies into a global racial capitalist structure. Water infrastructure does political work beyond increasing irrigated acreage or flood control; it also enacts changes that are not immediately visible as hydraulic (Molle et al., 2009; Ingold, 2009). As a function of the global architecture of coloniality/modernity, water infrastructure becomes a mode of rationalising Indigenous dispossession, it transforms landscapes into colonial visions of productivity, it centralises epistemological power within the realm of scientific experts, and it pulls local relations into global agro-export economies. Below, we outline connections across California, Palestine and Peru, foregrounding the complexities of each case and attending specifically to the turn to groundwater extraction; our aim is to render visible the entanglements of coloniality/modernity.

Making the desert bloom

A common phrase across all three countries was 'making the desert bloom', a modernist vision of transforming what are perceived to be useless and barren landscapes into abundant, blossoming environments. Hydrologists, engineers and politicians identified fertile soil and areas for settlement far from water resources. Many, as a result, dedicated their professional careers to moving water great distances to support agricultural production and settlement. This vision understood water to be only a resource, something that could and should be moved and utilised for economic gain. In this view, water that ran undisturbed in river channels was 'wasted', in the same way that deserts were 'wastelands', and both required the labour of 'improvement'.

As decolonial scholars highlight, however, the production of modernity also requires the various forms of destruction and domination that accompany coloniality. Coloniality/modernity, as a dominant social, political and epistemological framework, frames Indigenous nations and the existing land-based practices of local communities as pre-modern and problematic; it works to realign relations into ones of domination for the exploitation of labour. Making the desert bloom through water infrastructure thus required active wastelanding of areas that had previously been wetlands, riparian areas and riverine ecosystems. Indigenous sovereignty and communal landholdings have also been ignored or undermined through breaking treaties, dissolving lawsuits, and forcibly dispossessing people from their land. This active process of wastelanding is not merely a result of colonial/modern water, it is constitutive of it.

For instance, while water from the Central Valley Project and the State Water Project made the desert bloom in Southern California, Colorado, Utah and Arizona, the construction of California's aqueducts also required flooding Indigenous lands and minimising or outright denying the water claims of Indigenous nations (Middleton-Manning, 2018; Curley, 2021). The Oroville Dam, built in 1967 and crucial to the SWP, flooded the land of the Mountain Maidu people, while the ancestral lands of the Winnemem Wintu were bulldozed, flooded or taken as state Forest Service lands during CVP construction (Middleton-Manning et al., 2018; Dallman et al., 2013; Claire and Surprise, 2022). By 1944, 90% of Winnemem Wintu lands along the McCloud River had been permanently flooded. Although the CVP outlined provisions to provide new lands for the Winnemem Wintu, the US federal government never realised these promises.

The coloniality of these modern water projects is also evident in decreasing water quality. Agribusiness entails heavy use of pesticides and fertilisers, while groundwater overdraft pulls naturally occurring heavy metals like arsenic into the groundwater. By the time the CVP was completed, fertiliser use had already tripled because soils had become exhausted (Claire and Surprise, 2022; Reisner, 1993). Since the 1970s, fish, including Chinook salmon and other species, have significantly declined because dams interrupt riparian environments and because rivers themselves have become increasingly contaminated. Finally, drinking water quality has become a major environmental justice issue across the Central Valley; this problem disproportionately affects communities of colour, as well as farmworker and low-income communities (Pace et al., 2022; Underhill and Esparza, 2021; Balazs et al., 2011; Burow et al., 2008).

In Palestine, the slogan 'making the desert bloom' continues to accompany the Zionist settlement programme in Palestine. At best, it describes Palestinian agricultural production as primitive and seeks to guide them into modernity through technological advancements; at worst, it completely denies their existence and links Zionism to reclaiming an empty land for a Jewish state (George, 1979). In essence, this conflates irrigation projects and nation-state building. As a result, land was transformed completely to make a Zionist nature, one where Indigenous Palestinian communities are indefinitely displaced.

This proliferation of the Israeli agricultural sector could not have happened without reliance on extractivist practices in occupied territories. First, most agricultural production happens on occupied lands in Palestine and in the occupied Golan Heights; second, for decades water has been unequally extracted for use in Jewish-only settlements while being denied to Palestinian farmers (al-Butmeh et al., 2019; Messerschmid, 2014), a condition that has been compared to apartheid. The richest groundwater lies in occupied territory. The occupied West Bank receives most of the precipitation and 80% of aquifer recharge occurs there; however, 80% of groundwater storage lies within Israeli areas (Gasteyer et al., 2012; Rudolph and Kurian, 2022). Third, water infrastructure has been a core technology of settler re-territorialisation in the occupied Arab territories; at the same time, the local water infrastructure of the Indigenous Arab populations has been rendered illegal and/or marginal (Yiftachel, 2006). Thousands of water structures belonging to Palestinians have been demolished throughout the West Bank and Jerusalem, and inside Israel (OCHA, 2019). Israel's military and administrative control and its programme of settler colonial expansion in the occupied Arab territories have turned them into sites of ethnic cleansing, progressively erasing what remains of Palestinian and Arab presence. In the meantime, it has

heavily invested in illegal Jewish settlement expansion and development, especially of agro-industrial sectors that dominate the landscape and continue to make exclusive use of water and land resources.

As these examples from California and Israeli-occupied Palestine show, hydraulic projects were initiated through discourses of ethno-nationalist democracy and agricultural economies, dispossessing Indigenous peoples and extending settler sovereignty. Today, groundwater over-extraction builds on these longer histories of using irrigation as a mechanism of extending settler relations to land (Middleton-Manning 2018; Underhill et al., 2022). Israel, for instance, uses technologies of groundwater exploitation at the expense of the Palestinian people, their natural resources, and their right to self-determination and resources; in California, agribusiness corporations extract groundwater as local community wells go dry.

The turn to groundwater over-extraction exemplifies the dynamics of coloniality/modernity, in that the colonial conditions that are central to modernity are subsumed within modernity's discourses of universal progress. Groundwater over-extraction is imagined as a solution to the very problems that modern water projects have created, a now-global pressure to keep the desert blooming. From their settler colonial origins of water exploitation, Israel, Peru and California all continue to invest intensively in groundwater exploitation in order to increase export-oriented agricultural production.

Making colonial/modern hydraulic experts

The circulation of settler colonial hydraulic engineering practices between places like Peru, California and Israeli-occupied Palestine is intimately connected to the expansion of hydraulic expertise based on Western science. The development of modern universities provided a basis and an institutional network through which colonial/modern 'knowledge' could develop (Boggs and Mitchell, 2018; Mitchell, 2013; Sabati, 2019). In the US, the passage of the Morrill Land Grant Act of 1862 was key to creating a national funding source to develop new 'scientific' ways of managing the land and new fields such as the mechanical arts. While public land grant colleges continue to be lauded as democratising and public-facing institutions, the Morrill Act was in fact a key method for securing white settlement through distributing stolen Indigenous lands (Fairbanks, 2015; Stein, 2020); at the same time, it generated a nexus of institutions which expanded the reach of the Western knowledge formations that justified these same violent political structures. These institutions were key to growing the technical expertise necessary for large-scale water infrastructure projects.

US and European engineers also travelled around the world to export the emergent fields of agricultural science and engineering, and to disseminate the colonial/modern ways of relating to water and land that were necessary for developing global agro-export economies (Teisch, 2011). Latin American engineers not only received expertise but helped advance and shape it (Chastain and Loreck, 2020); they were part of a continuous global-level co-construction of ideas, technologies and practices. In the process, specific bureaucracies of water engineering – what Molle et al. (2009) might call hydrocracies – emerged in and alongside state and colonial investments in water.

In each case, this circulation and co-construction of water knowledge also produced pools of experts and institutions to realise the infrastructures and imaginaries of modern water. Former professor and California engineering expert Elwood Mead, for example, left a prestigious teaching post at the University of California, Berkeley in 1923 to serve as a hydraulic technical expert to government officials in locations like Australia, Singapore, Java and Calcutta; this was in addition to his work advising on the Zionist occupation of Palestinian lands (Teisch, 2011).

US engineer Charles Sutton was central to Peru's emergent Escuela de Agricultura (Oré and Rap, 2009), which became critical to hydraulic transformations in the country. In Palestine, Zionist occupation was bolstered by scientific research on wheat production, which "remade Palestine as a region sought for colonisation" (Tsedell, 2017: 43). New fields of study such as dryland farming emerged to support American, Zionist and other settler entities in their carving out of new agricultural frontiers,

even in regions that were deemed water-scarce (Teddell, 2015); in this way, the epistemologies of colonial/modern water materially supported the desire to make the desert bloom.

With the current deepening reliance on groundwater, geological and engineering expertise has grown into a wide array of technologies to sense, predict, and extract groundwater within engineering and geology disciplines. With the growth of these technologies, groundwater over-extraction remains a form of producing profit; however, producing further forms of knowledge has also become an industry of its own (Fairbairn et al., 2021; Kroepsch, 2018; Kinchy et al., 2018; Sugg et al., 2015). In response to California's 2014 Sustainable Groundwater Management Act, groundwater engineers joked to one author that it should be called the 2014 Groundwater Hydrologist Employment Act. Rather than correcting relationships to groundwater, the legislation primarily functions to propel the next generation of groundwater hydrology (Underhill, 2021).

In Peru's Ica Valley, similarly, the regional hydraulic bureaucracy that was tasked with monitoring surface and groundwater has turned away from this supervisory role; instead, it uses its scientific and regulatory expertise to promote and support agro-export business. This continual re-turning to scientific and engineering approaches to groundwater attempts to undermine local, grounded and community-based ways of understanding groundwater, even as it reinvests in the conditions and assumptions that deepen the global groundwater crisis (Balderson, 2022; Escate et al., 2022).

In sum, creating hydraulic experts was foundational to the global dissemination of colonial/modern ways of relating to, and managing, water; it remains core to groundwater extraction today. US investments in a system of 'public' higher education provided the resources to grow and develop these emergent knowledges, technologies and practices, which could then be transposed to other locations. The global export of Western knowledges was also propelled by their purported *universality*; this masked both their cultural specificity and the political project of coloniality/modernity that they reproduced. Contemporary groundwater hydrology is propelled by the promise that further investing in epistemologies of modernity can solve or erase the ruins of coloniality. Ultimately, the global circulation of groundwater expertise – and its acceleration due to the water scarcity that it has produced – elucidates the vicious cycle of coloniality/modernity as an entwined and global architecture.

Transforming land and water toward nation/state dominance

The role of water in asserting and maintaining state power has been well articulated in the literature (see, for example, Molle et al., 2009). Indeed, each of our cases shows that ways of relating to water – policed or restricted by the producing or disallowing of particular water infrastructures – are central to conflicts over settler/colonial state power. Our cases further show, however, the emerging role of *groundwater* in asserting nation-state dominance over neighbouring territories.

This comes across particularly saliently in the current settler colonial conditions of Palestine where, in 1964, Israel diverted water from the Jordan River through its National Water Carrier. By constructing this large aqueduct, Israel exerted its power above the interests of Syria, Lebanon, Jordan and the Palestinian territories. This ensured that Israeli national priorities trumped the Arab-state and Johnston-mission framing of water as a tool for cooperation and regional stability. The transboundary ramifications of such projects also have local and direct impacts on communities and populations that are deprived of the right to infrastructure. Palestinian aspirations for water infrastructure development are now highly restricted or, if attempted, are completely denied and demolished; this is shown in examples from Palestine (Dajani, 2020) and from other occupied territories like the Syrian Golan Heights (Dajani and Mason, 2018).

The enduring coloniality of settler colonial water infrastructures can be seen in the development of new water sources. While Israel boasts its start-up legacy in developing new water through desalination and wastewater treatment and reuse, it continues to hold its grip over surface and groundwater, using them as bargaining chips in negotiations with Palestinians (Braverman, 2020). Israel now relies on desalination for 70% of its drinking water needs; this shows the extent to which colonialism is embedded

in Israeli water policy, where inequality of supply and water commodification continue unabated, even though technological fixes have increased water availability.

In Peru, the conflict is not between two nations, but rather between two zones within one country. Groundwater, however, still functions as a form of national (and in this case, state) control. Politicians tend to divide the country into two: coastal Peru, which was modernised and to which water was diverted, and more rural places in the Amazon or the mountains. The dangerous drop in Ica's water table due to over-extraction of groundwater led to a new engineering plan to transfer water from Huancavelica to the Ica Valley. Though the peasant communities and regional government in Huancavelica ultimately stopped the project, this story illustrates the role of water and water diversions in propagating/shifting political power from one region to another. Peru also had a law that the state could not remove Indigenous people from their land; the state thus began to control water instead and charged for water access, a process of slow dispossession that is aligned with Israel's prohibition on Palestinians drilling groundwater wells. In this case, rather than a settler colonial situation, Peru's growing and evolving hydraulic bureaucracy has nevertheless propelled a form of coloniality *within* the country (Quijano, 2007), wherein the Tate and other Indigenous groups have been racialised and marginalised in and through the control of groundwater.

Transforming land and water toward a racial capitalist global export economy

The weaponisation of water – and now groundwater – has not only been utilised as a tool to create national boundaries; it also propels the system of global racial capitalism. In the making of each territory through the movement of water, capitalism – understood from the outset to be a racial and colonial structure of labour and dispossession – is the driving force for reorganising land and water. Decolonial frameworks clearly articulate the role of labour and capitalist exploitation in global conditions of coloniality/modernity; colonial/modern water functions in similar ways.

In Peru, the push toward modernisation was propelled by competition with other Latin American countries such as Chile and Colombia for a share of the global agro-export economy. Given their growth internationally, Peruvian agro-exporters now require more labour from the high Andes and Amazonia. These workers settle on lands marked by lack of access to basic services, further transforming Ica's landscape. The disproportionately female workforce endures inadequate working conditions, low wages and long workdays. The migrants, who bring their culture and language to Ica, have suffered racism from the agro-exporters and the local population; they have nonetheless emerged as important national-level political actors.

Both Israeli and US settler colonial processes fundamentally require new frontiers and zones of capital accumulation. In the California context, this economic system produces and requires farm labour that is racialised as exploitable, while Israel's agro-export model not only exploits Palestinian labour but also illegally appropriates land and water. The role of water in the production of national territory highlights the entanglement of these processes with larger global racial capitalist systems.

In all three cases, the large surface water infrastructure projects are deeply entangled with global agro-export economies. Even as these water projects generate electricity, allocate water for residents and industry, and produce land for settlement, the majority of their water is used for private corporate interests. In California, 85% of the water that is moved through the Central Valley Project and the State Water Project is used by private farmers, primarily large agribusiness corporations. In Peru, similarly, though the large coastal irrigation projects were accompanied by discourses of progress and development, these projects ultimately benefited primarily national and international agro-export companies.

Today, as part of the insidious nature of racial capitalism's shifting logics, large-scale agro-export industries require even more water, which has pushed global conditions toward a groundwater crisis. A colonial/modern analysis, however, shows that current groundwater crises reflect only the latest

moment in racial capitalist processes of landscape change. As described above, reclamation in California – the draining of lakes and wetlands in the late 1800s – was premised on concerns over these ancestral lakes being 'contaminating', particularly to the white race, an idea that was carried (by Elwood Mead and others) to reclamation projects in other colonial contexts. Today, the impacts of reclamation include profound chemical toxicity and lack of access to water, that disproportionately affect communities of colour and low-income communities. Scholars of racial capitalism have emphasised that this is not only 'racist capitalism' – capitalism with racist impacts – but that racial capitalism instead moves by creating racial categories and then leveraging that differentiation through extreme disparities in life outcomes. Over the last 150 years, the shifts in which racialised groups are considered contaminating, contaminated, or requiring protection from contamination show the differentiation of racial capitalism as an ongoing process.

The power of racial capitalism also emerges in responses to groundwater scarcity that call for further infrastructure and technological fixes. This impulse relies on the conviction that there will always be enough water to quench the thirst of an ever-expanding global economy, given sufficient technical fixes and enough investments in infrastructure (Molle et al., 2009). When the agro-export economy feels the limits of production due to water scarcity, even that scarcity can become a tool of capital accumulation through investing in further technologies; thus, even its uncertainty can become profitable through investment products such as water futures. In Israel, for instance, investments in not only groundwater extraction but in desalination and other technological advances become the 'fix' by which current water practices could be sustained, even while developing a triumphalist identity as a 'start-up nation'.

These examples highlight the production of new zones of capital accumulation which privilege some places at the expense of others. While each process is embedded in the historicity of place, we can see across cases how these processes have generated racialised labour structures, reorganised human relationships with more-than-human ecological systems, and imposed a system that expanded the coloniality of modern water.

Locating the coloniality of groundwater

Our cross-case approach also highlights some constitutive differences in the coloniality of groundwater. In Peru, while surface water is closely regulated, groundwater is in many ways defined by its non-regulation. Surface water irrigation is subject to seasonal variability and is regulated through usufruct, with infrastructure, maintenance and distribution controlled collectively by traditional user organisations (Boelens and Hoogendam, 2001). Groundwater can be exploited on an individual basis, however, and is not restricted by the seasons. Access does not depend on membership in a user organisation, although that can provide political benefits. Groundwater is thus associated with coloniality in that the powerful or wealthy can access modern technologies; this allows for a greater unrestricted supply of water with no need to coordinate with other users. It is the disproportionate role played by private capital that most defines the coloniality of groundwater in this context; it has propelled the over-extraction of groundwater to produce water-intensive crops such as asparagus, avocados and berries.

In contrast, in Palestine, the coloniality of groundwater in fact stems directly *from* state control. The Israeli state laid claim to *all* water through its 1959 Water Law, including groundwater. It thus allocates groundwater only to those whose use they favour, and this consistently prevents Palestinians from drilling wells. The Eastern Aquifer System, for example, lies entirely within the West Bank territory and was used exclusively by Palestinian villagers and farmers until 1967. After 1967, Israel expanded its control over this aquifer and began to tap it, mainly to supply Israeli settlements that had been established in the area (Isaac, 2000). In the Western Aquifer, meanwhile, historical Israeli over-pumping since before 1948 heavily restricts Palestinian access to that groundwater. Israelis exploit the aquifers of this basin through 300 deep groundwater wells to the west of the Green Line, as well as through

Mekorot's deep wells within the West Bank boundary. Palestinians, on the other hand, consume only about 7.5% of its safe yield (ibid).

Initially through a set of military orders, the Israeli government established control over water development and management, heavily restricting the development of groundwater sources. Following the occupation, the Israeli government transferred authority over all water sources in the West Bank to Mekorot. This reduced Palestinians to mere water users and subsumed their water infrastructure under Israeli water authorities. Messerschmid describes the situation as a 'deep freeze' of the Palestinian quest to develop groundwater, "as if the waters themselves had been ordered to stop running" for them (Messerschmid, 2014). The blatant coloniality visible in water governance in Palestine extends to a situation where Palestinians are coerced into cooperation with Israelis over groundwater use and access under asymmetrical hard, soft and ideational power (Zeitoun and Warner, 2006). This entails purchasing the groundwater under their feet and negotiating the construction, the operation and maintenance, and the development of any water infrastructure in the occupied West Bank (Selby, 2013).

In California, we see a combination of private and state forces propelling the coloniality of groundwater. Like Peru, California's groundwater has historically been unregulated; California was the last Western US state to have *no* comprehensive groundwater policy, which changed only in 2014 with the introduction of the Sustainable Groundwater Management Act. The state, however, has played a major role in producing the current unequal access to groundwater. Throughout the early development of the settler state, groundwater access was assumed to follow private ownership of land, and this form of rights remains. As the state developed, however, the idea of the 'prescriptive right' to water came to dominate extraction practices. Based on real property law, this right asserts that appropriators who take more than their share of water over a period of five years can legally gain the rights to that groundwater by the very fact that they had been openly taking groundwater whose rights belonged to another. By tying groundwater rights either to property ownership or to the ability to appropriate it through extraction, these legal standards tied groundwater rights to landowners and to those with the capital to extract it. This essentially led to a 'pumping race' in which those with the most capital to invest in deeper or more powerful wells did so in order to gain a larger share of the total amount. Ultimately, this legal orientation, which prioritises the *development* of resources rather than their wise use, led to today's deeply unequal groundwater rights.

The place-based differences in how the coloniality of groundwater plays out highlight the constitutive role of each location's unique colonial history and present. Rather than a universal concept, colonial/modern water highlights both the *attempts* at universality of modern water and the concrete specificities of its effects.

CONCLUDING THOUGHTS: EXPANDING ALTERNATIVES TO COLONIAL/MODERN WATER

These three cases show us how coloniality is embedded in global groundwater over-extraction and the ways in which coloniality/modernity is a useful and necessary framework for understanding modern (ground)water. Decolonial scholars articulate the ways in which colonialism is never only a question of sovereignty or political power; it is a global architecture and a system that produces certain worlds and ways of relating while at the same time foreclosing others. While none of the information in our cases is new, the *synthesis* across localities afforded by coloniality/modernity becomes an important contribution. This synthesis not only generates analytic links across surface and groundwater; it also implicates universities as sites of modern knowledges, racial capitalism, the legal and material processes of Indigenous dispossession, and profound ecological change.

'Modern water', through this analysis, is more than a limited way of knowing water; it goes further than reducing water to merely a resource, and it is not just the foundation for hydraulic bureaucracies. Modern water, rather, is a fundamental part of the onto-epistemological worlding of coloniality/modernity. It provides the conceptual (and material) grounding for the organising of colonial/modern

worlds. In other words, ecological destruction, exploitation and Indigenous dispossession are not simply effects of the hydraulic mission; rather, water is part of this *engine* of world-making and world-destroying that ultimately organises social and environmental relations into relationships of exploitation and accumulation. Lugones (2007) argues that the conceptualisation of 'gender' as a separate category is itself part of a colonial/modern epistemology; in the same way, a focus on modern water decontextualised from its constitutive coloniality participates in forms of colonial unknowing and erasures of racial-colonial violence (Vimalassery et al., 2016; Byrd et al., 2018).

In this way, our analysis also extends the verticality and temporality of modern water and the impacts of hydraulic bureaucracies. While most writing on the hydraulic mission has focused on large-scale damming and surface water infrastructures, groundwater over-extraction can be seen as an extension and complication of this process. Coloniality/modernity scholarship, in conjunction with Indigenous scholarship, consistently emphasises the *ongoingness* of colonialism; that is, it is not a periodised event or time in history, but rather is an ongoing structure that changes shape to incorporate changing conditions (Kauanui, 2016; Wolfe, 2006). This understanding of ongoing, shifting colonial formations punctuates the scale, scope and necessary transformations of what has been dubbed a 'contemporary groundwater crisis'.

Working with the interlinked architecture that coloniality/modernity scholarship describes allows us to attend to the global nature of groundwater over-extraction in ways that do not universalise, but rather trace, linkages in the production of distinct places through relational global processes. This is, in fact, one goal of this Special Issue itself. Tracing three different cases through the same lens allows us to highlight the specificities of how colonial/modern water functions in the context of three different colonial histories and formations.

Colonial formations are always partial, contingent and full of cracks and 'otherwises'; the coloniality of modern water is no exception. This paper focused on describing and documenting the coloniality of groundwater in order to destabilise the assumptions of 'common sense' that it produces. Though modernity/coloniality pretends to be a universal fact, when we destabilise it, we can begin to open space to lift up other possibilities. Water scarcity and the crises it is generating in California, Palestine, Peru and elsewhere is not necessarily inevitable; there have always been, and continue to be, ways of knowing, relating to, and managing water that do not rely on essentialising abstractions or extractive relationships. The compounding effects of climate change, groundwater over-extraction, and surface water scarcity are also rendering visible the limits of colonial/modern water systems that engage water as a moveable and ever-extractable resource.

In California, the Winnemem Wintu have not stopped working to recover and care for their ancestral lands and waters and to bring the salmon back. In 2004, the Māori of New Zealand connected with the Winnemem Wintu and shared that the ancestral salmon of the McCloud were swimming in New Zealand rivers and that they would care for them until they could return. Through this collaboration, the Winnemem Wintu are working hard to "dance the salmon home" (Middleton-Manning, et al., 2018: 182). In addition, a recent petition jointly filed by the Winnemem Wintu Tribe, the Shingle Springs Band of Miwok Indians and other partners calls for the State Water Board to consult with Tribes and together to set water quality standards in the Northern California delta region that recognise tribal uses of water (James, 2022).

In California's Central Valley, which has long relied on contaminated groundwater basins, residents and environmental justice advocates are using natural dyes as an embodied way of not only measuring and communicating groundwater contamination, but as spurring capacity-building, artistic engagement and joy, in that way connecting the histories of the land to their communities' histories of migration. If, as public artist Michelle Glass says, natural dyes show the colour story of the land, contaminants are now part of that colour story; however, they still work with those colours to produce powerful public art installations, celebrations and ceremonies (Underhill and Esparza, 2021).

In Peru, the agri-export 'miracle' in Ica, whose expansion led to today's subterranean problems, was one of the bastions of the neoliberal economic policy first introduced three decades ago. Now aggravated by the pandemic and the global economic downturn, this policy seems to have reached its limits. The pandemic precipitated the protest of agri-export workers, who opened up new discourses, such as the right to justice and equity. They thus emerged as a new political actor, forcing the repeal of the agri-export worker's law and compelling companies to recognize their labour rights. Furthermore, these workers have been at the forefront of mobilizations against the Executive Branch and Congress in December 2022 and January 2023.

The future in Ica is uncertain. We are at a complex critical juncture, but there is a clear need for a new social compact that regulates the agri-export model in terms of groundwater exploitation while guaranteeing the labour rights of its workers, the right to irrigation for small farmers, and the right to water for Ica's urban population.

In Peru as we write, mass mobilizations have ground the country to a halt. The country is going through a moment of extreme upheaval and political crisis, in which agri-export workers and the peasant populations of the high Andes and Amazonia – whose political power has long been overlooked by the state – are challenging the capital's governing creole elite and their homogenous focus.

In Palestine, alternatives are visible in a return to the land that is putting agro-ecological sustainability and water sovereignty at the forefront of the struggle against settler colonial rule (Ajl, 2021; Seidel, 2021). While Israeli infrastructures work to disallow Arab access to, and relationships with, water, residents of Palestine and other occupied territories such as the Syrian Golan Heights are engaging in tactics that oppose the enduring coloniality of modern water imposed by Israel. Stateless Jawlani farmers, for example, have demonstrated how the Israeli military occupation and its hegemony over water resources can be rejected through building 'counter-infrastructures' – that is, community-led water structures that not only claim rights to water against the hegemony of the state but also allow for counter-worldviews to take shape in physical and ideational forms (Mayaux et al., 2022). These counter-infrastructures produce relationships with water that maintain Arab agriculture and economic survival through planting profitable crops such as apples and olives; they also function as a collective action against Israeli colonisation (Dajani and Mason, 2018).

We view these examples as important reference points for challenging the coloniality of modern water and ushering in more sustainable forms of knowing, relating to, and using water.

ACKNOWLEDGEMENTS

We would like to acknowledge the Transformations to Groundwater Sustainability (T2GS) international collaborative for the generative discussions since 2018. It was during these initial encounters that we began to explore these topics and develop cross-case analyses of California's travelling imaginaries. In particular, thank you to Marcel Kuper, Margreet Zwarteveen, and Lowe Börgeson for their attentive remarks and feedback through the development of these ideas. In addition, we would like to thank the other members of the California T2GS team for their intellectual support: the project's PI, Flora Lu, and Aysha Peterson, Michelaina Johnson, Kira Cragun-Rehders, Alyssa Najera and Anna Geiger.

REFERENCES

- Ajl, M. 2021. Does the Arab region have an agrarian question? *The Journal of Peasant Studies* 48(5): 955-983.
- al-Butmeh, A.; al-Shalalfeh, Z.; Zwahre, M. and Scandrett, E. 2019. The environment as a site of struggle against settler-colonisation in Palestine. In Harley, A. and Scandrett, E. (Eds), *Environmental justice, popular struggle and community development*, pp. 153-172. Bristol: Policy Press.
- al-Shalalfeh, Z.; Napier, F. and Scandrett, E. 2018. Water nakba in Palestine: Sustainable development goal 6 versus Israeli hydro-hegemony. *Local Environment* 23(1): 117-124.

- Alatout, S. 2008. 'States' of scarcity: Water, space, and identity politics in Israel, 1948-59. *Environment and Planning D: Society and Space* 26(6): 959-982.
- Alatout, S. 2009. Bringing abundance into environmental politics: Constructing a Zionist network of water abundance, immigration, and colonization. *Social Studies of Science* 39(3): 363-394.
- Akins, D. and Bauer, W. 2021. *We are the land: A history of native California*. Berkeley: University of California Press.
- Arax, M. 2019. *The dreamt land: Chasing water and dust across California*. New York: Knopf.
- Anton, G. 2008. Blind modernism and Zionist waterscape: The Huleh drainage project. *Jerusalem quarterly* 35(Autumn 2008): 76-92.
- Balazs, C.; Morello-Frosch, R.; Hubbard, A.; Ray, I. 2011. Social disparities in nitrate-contaminated drinking water in California's San Joaquin Valley. *Environmental Health Perspectives* 119(9): 1272-78.
- Balderson, U. 2022. Water storage reservoirs in Mataquita: Clashing measurements and meanings. In Alderman, J. and Goodwin, G. (Eds), *The social and political life of Latin American infrastructures*, pp. 79-100. London: University of London Press.
- Barker, J. 2019. Confluence: Water as an analytic of indigenous feminisms. *American Indian Culture and Research Journal* 43(3): 1-40.
- Basadre, J. 1968. *Historia de la república del Peru*. Lima, Peru: Editorial Universitaria.
- Baud, M. 1998. The quest for modernity: Latin American technocratic ideas in historical perspective. In Centeno, M. and Silva, P. (Eds), *The politics of expertise in Latin America*, pp. 13-35. Latin American Studies Series. London: Palgrave Macmillan.
- Boggs, A. and Mitchell, N. 2018. Critical university studies and the crisis consensus. *Feminist Studies* 44(2): 432-63.
- Boelens, R. and Hoogendam, P. 2001. *Derechos de agua y acción colectiva*. Lima, Peru: IEP.
- Boelens, R.; Escobar, A.; Bakker, K.; Hommes, L.; Swyngedouw, E.; Hogenboom, B.; Huijbens, E.H.; Jackson, S.; Vos, J.; Harris, L.M. and Joy, K.J. 2022. Riverhood: Political ecologies of socationature commoning and translocal struggles for water justice. *The Journal of Peasant Studies*, pp. 1-32, <https://www.tandfonline.com/doi/full/10.1080/03066150.2022.2120810>.
- Braverman, I. 2020. Silent springs: The nature of water and Israel's military occupation. *Environment and Planning E: Nature and Space* 3(2): 527-551.
- Bureau of Reclamation. 2022. Central Valley Project: Projects and facilities. <https://www.usbr.gov/projects/index.php?id=506>. (accessed 14 December 2022)
- Burow, K.R.; Shelton, J.L. and Dubrovsky, N.M. 2008. Regional nitrate and pesticide trends in groundwater in the eastern San Joaquin Valley, California. *Journal of Environmental Quality* 37(S5): S249-S263.
- Byrd, J.; Goldstein, A.; Melamed, J. and Reddy, C. 2018. Predatory value: Economies of dispossession and disturbed relationalities. *Social Text* 36(2): 1-18.
- Cacho, L.M. 2015. *Social death: Racialized rightlessness and the criminalization of the unprotected*. New York: NYU Press.
- California Department of Food and Agriculture. 2020. *California Agricultural Statistics Review, 2019-2020*. State of California: California Department of Food and Agriculture, https://www.cdffa.ca.gov/Statistics/PDFs/2020_Ag_Stats_Review.pdf (accessed 14 December 2022)
- Chastain, A. and Lorek, T. 2020. *Itineraries of expertise: Science, technology, and the environment in Latin America*. Pittsburgh: University of Pittsburgh Press.
- Claire, T. and Surprise, K. 2022. Moving the rain: Settler colonialism, the capitalist state, and the hydrologic rift in California's Central Valley. *Antipode* 54(1): 153-173.
- Curley, A. 2021. Unsettling Indian water settlements: The Little Colorado River, the San Juan River, and colonial enclosures. *Antipode* 53(3): 705-723.
- Daigle, M. 2018. Resurging through Kishiichiwan: The spatial politics of Indigenous water relations. *Decolonization: Indigeneity, Education & Society* 7(1): 159-72.
- Dajani, M. 2020. Thirsty water carriers: The production of uneven waterscapes in Sahl al-Battuf. *Contemporary Levant* 5(2): 97-112.

- Dajani, M. and Mason, M. 2018. Counter-infrastructure as resistance in the hydrosocial territory of the occupied Golan Heights. In Menga, F. and Swyngedouw, E. (Eds), *Water, technology and the nation-state*, pp. 131-146. Abingdon: Routledge.
- Damonte, G.; Gonzales, I. and Lahud, J. 2016. La construcción del poder hídrico: Agroexportadores y escasez de agua subterránea en el Valle de Ica y Las Pampas de Villacurí. *Anthropologica* 34(37): 87-114.
- Damonte G. and Gonzales I. 2018. Políticas públicas, relaciones de poder y conflicto de intereses en la gestión de aguas subterráneas en Ica. In Oré, M.T. and Muñoz, I. (Eds), *Aguas en disputa: Ica y Huancavelica, entre el entrapamiento y el diálogo*, pp. 75-112. Lima: Fondo Editorial de la Pontificia Universidad Católica del Perú.
- Damonte, G.; Pacheco, E. and Grados, C. 2014. Dinámicas de concentración y escasez de agua: El boom agroexportador y los pequeños propietarios en las zonas media y alta del río Ica. In Oré, M.T. and Damonte, G. (Eds), *¿Escasez de agua? Retos para la gestión de la cuenca del río Ica*, pp. 127-171. Lima, Peru: Fondo Editorial Pontificia Universidad Católica del Perú.
- Dallman S.; Ngo M.; Laris P. and Thien D. 2013. Political ecology of emotion and sacred space: The Winnemem Wintu struggles with California water policy. *Emotion, Space, and Society* 6(1): 33-43.
- Davis, D.K. and Burke, E. 2011. *Environmental imaginaries of the Middle East and North Africa*. Athens: Ohio University Press.
- Day, I. 2016. *Alien capital: Asian racialization and the logic of settler colonial capitalism*. Durham: Duke University Press.
- da Silva, D.F. 2007. *Toward a global idea of race*. Minneapolis: University of Minnesota Press.
- Defensoria del Pueblo. 2016. Conflicto por la gestión del agua entre Ica y Huancavelica: la apuesta por un diálogo genuino. <https://defensoria.gob.pe/modules/Downloads/conflictos/2017/Conflicto-por-la-gestion-del-agua-entre-ica-y-Huancavelica--la-apuesta-por-un-dialogo-genuino.pdf> (accessed 14 December 2022)
- Diver, S.; Ahrens, D.; Arbit, T. and Bakker, K. 2019. Engaging colonial entanglements: 'Treatment as a state' policy for indigenous water co-governance. *Global Environmental Politics* 19(3): 33-56.
- Escate, L.R.; Hoogesteger, J. and Boelens, R. 2022. Water assemblages in hydrosocial territories: Connecting place, space, and time through the cultural-material signification of water in coastal Peru. *Geoforum* 135: 61-70.
- Escobar, A. 2004. Beyond the Third World: Imperial globality, global coloniality and anti-globalisation social movements. *Third World Quarterly* 25(1): 207-30.
- Fairbairn, M.; LaChance, J.; De Master, K.T. and Ashwood, L. 2021. In vino veritas, in aqua lucrum: Farmland investment, environmental uncertainty, and groundwater access in California's Cuyama Valley. *Agriculture and Human Values* 38(1): 285-299.
- Fairbanks, R.B. 2015. The Morrill Land-Grant Act and American Cities: The neglected story. In Marcus, A.I. (Ed), *Science as service: Establishing and reformulating American land-grant universities, 1865-1930*. Tuscaloosa: University of Alabama Press.
- Feitelson, E. and Rosenthal, G. 2012. Desalination, space and power: The ramifications of Israel's changing water geography. *Geoforum* 43(2): 272-284.
- Flyvbjerg, B. 2006. Five misunderstandings about case-study research. *Qualitative Inquiry* 12(2): 219-245.
- Frank, G. and Goldberg, C. 2011. *Defying the odds: The Tule River Tribe's struggle for sovereignty in three centuries*. New Haven: Yale University Press.
- French, A. 2016. ¿Una nueva cultura de agua?: Inercia institucional y la gestión tecnocrática de los recursos hídricos en el Perú. *Anthropologica* 34(37): 61-86.
- Furman, A. and Abbo, H. 2013. Groundwater management in Israel. In Becker, N. (Ed), *Water policy in Israel: Context, issues, and options*, pp. 125-136. Dordrecht: Springer.
- Galnoor, I. 1978. Water policymaking in Israel. *Policy Analysis* 4(3): 339-367.
- Gasteyer, S.; Isaac, J.; Hillal, J. and Walsh, S. 2012. Water grabbing in colonial perspective: Land and water in Israel/Palestine. *Water Alternatives* 5(2): 450-68.
- Garrido, S. 2014. Water management, Spanish irrigation communities and colonial engineers. *Journal of Agrarian Change* 14(3): 400-418.

- Gelles, P. 2000. *Water and power in Highland Peru: The cultural politics of irrigation and development*. New Brunswick: Rutgers University Press.
- George, A. 1979. "Making the desert bloom". A myth examined. *Journal of Palestine Studies* 8(2): 88-100.
- Gilmore, R.W. 2007. *Golden gulag: Prisons, surplus, crisis, and opposition in globalizing California*. Berkeley: University of California Press.
- Giordano, M. 2009. Global groundwater? Issues and solutions. *Annual Review of Environment and Resources* 34(1): 153-78.
- Glave, M. 1986. El agrarismo Suttoniano y el conflicto de las aguas de 1928-1930 en el departamento de Lambayeque. *Avances de Investigación* 1: 62 -117.
- Gonzales de Olarte, E. 2021. *Economía regional y urbana: El espacio importa*. Lima: Fondo Editorial Pontificia Universidad Católica del Perú.
- GRAIN. 2022. *Farms, arms and Israel's agro-diplomacy*. <https://grain.org/en/article/6878-farms-arms-and-israel-s-agro-diplomacy> (accessed 14 December 2022)
- Griffith, J. 2017. Hoover Damn: Land, labor, and settler colonial cultural production. *Cultural Studies – Critical Methodologies* 17(1): 30-40.
- Guerrero, A. and Verzijl, S. 2015. Struggle and success in an inter-regional water conflict in the Peruvian Andes. *Ileia*: <https://www.ileia.org/2015/09/22/struggle-success-inter-regional-water-conflict-peruvian-andes/>
- Hartman, S. 1997. *Scenes of subjection: Terror, slavery, and self-making in nineteenth-century America*. New York: Oxford University Press.
- Hartwig, L.D.; Jackson, S.; Markham, F. and Osborne, N. 2021 Water colonialism and indigenous water justice in south-eastern Australia. *International Journal of Water Resources Development* 38(1): 30-63.
- Hayman, E.; James, C. and Wedge, M. 2018. Future rivers of the Anthropocene or whose Anthropocene is it? *Decolonization: Indigeneity, Education & Society* 7(1): 77-92.
- Henry, L. 2022. 'Massive dollars' needed to clean tainted groundwater from Kern County's banking projects. The Bakersfield Californian. 25 February 2022. https://www.bakersfield.com/columnists/lois-henry/lois-henry-massive-dollars-needed-to-clean-tainted-groundwater-from-kern-county-s-banking-projects/article_28804a3a-9667-11ec-995c-9ff292275053.html (accessed 14 December 2022)
- Ica Regional Government. 2018. Proyecto Tambo Ccarachocha (PETAC). Lima, Peru. <https://www.petacc.gob.pe/> (accessed 14 December 2022)
- Ingold, A. 2009. To historicize or naturalize nature: Hydraulic communities and administrative states in nineteenth-century Europe. *French Historical Studies* 32(3): 385-417.
- Isaac, J. 2000. The essentials of sustainable water resource management in Israel and Palestine. *Arab Studies Quarterly* 22(2): 13-31.
- Jackson, S. and Head, L. 2020. Australia's mass fish kills as a crisis of modern water: Understanding hydrosocial change in the Murray-Darling Basin. *Geoforum* 109(February): 44-56.
- James, I. 2022. Delta water crisis linked to California's racist past, tribes and activists say. *Los Angeles Times*. 26 May 2022. www.latimes.com/california/story/2022-05-26/california-delta-water-policy-tied-to-racist-past-tribes-say (accessed 14 December 2022)
- JNS. 2018. Walter Lowdermilk (1888-1974). 22 April 2018. <https://www.jns.org/walter-lowdermilk-1888-1974/>, (accessed on 14 December 2022)
- Karlinsky, N. 2000. California dreaming: Adapting the "California Model" to the Jewish citrus industry in Palestine, 1917-1939. *Israel Studies* 5(1): 24-40.
- Kauanui, J.K. 2016. "A structure, not an event": Settler colonialism and enduring indigeneity. *Lateral* 5(1): 1-8.
- Keith, R. 1976. *Conquest and agrarian change. The emergence of the hacienda system on the Peruvian coast*. Cambridge: Harvard University Press.
- Khalidi, R. 2020. *The hundred years' war on Palestine: A history of settler colonialism and resistance, 1917-2017*. New York: Metropolitan Books.
- Kinchy, A.; Phadke, R. and Smith, J. 2018. Engaging the underground: An STS field in formation. *Engaging Science, Technology and Society* 4: 22-42.

- Kroepsch, A. 2018. Groundwater modeling and governance: Contesting and building (sub)surface worlds in Colorado's northern San Juan Basin. *Engaging Science, Technology, and Society* 4: 43-66.
- Kuper, M.; Mayaux, P.-L. and Benmihoub, A. 2023. The persistent appeal of the California agricultural dream in North Africa. *Water Alternatives* 16(1): 1-26.
- Laster, R. and Livney, D. 2009. Israel: the evolution of water law and policy. In Dellapenna, J.W. and Gupta, J. (Eds), *The evolution of the law and politics of water*, pp. 121-137. Dordrecht: Springer.
- Linton, J. 2010. *What is water?: The history of a modern abstraction*. Vancouver: UBC Press.
- Lipchin, C. 2007. Water, agriculture and Zionism: Exploring the interface between policy and ideology. In NATO Advanced Study Institute on Integrated Water Resources Management and Security in the Middle East and Lipchin, C. (Eds). *Integrated water resources management and security in the Middle East*, pp. 251-267. Dordrecht: Springer.
- Lowe, L. 2015. *The intimacies of four continents*. Durham: Duke University Press.
- Lugones, M. 2007. Heterosexualism and the colonial/modern gender system. *Hypatia* 22(1): 186-209.
- Lugones, M. 2008. The coloniality of gender. *Worlds and Knowledges Otherwise*. 2(2): 1-17.
- Lynch, B. 2014. Introducción. La reforma del agua del Peru y sus implicaciones para el poder y equidad en la cuenca hidrográfica de Ica. In Oré, M.T. and Damonte, G. (Eds), *¿Escasez de agua? Retos para la gestión de la cuenca del río Ica*, pp. 25-54. Lima: Fondo Editorial Pontificia Universidad Católica del Peru.
- Maldonado-Torres, N. 2007. On the coloniality of being. *Cultural Studies* 21(2-3).
- Manrique, N. 2022. *Campesinado y nación. Las guerrillas indígenas en la guerra con Chile*. Lima: Editorial Taurus.
- Marshall, A. 2014. *Apropiarse del desierto. Agricultura globalizada y dinámicas socioambientales en la costa peruana. El caso de los oasis de Virú e Ica-Villacuri*. Lima: Institut français d'études andines.
- Marshall, A.; Mesclier, E. and Chaléard, J.-L. 2012. Small producers in the Peruvian export model: Between subordination and one's own strategies. *Autrepart* 62 (3): 57-73.
- Mayaux, P.L.; Dajani, M.; Cleaver, F.; Naouri, M.; Kuper, M. and Hartani, T. 2022. Explaining societal change through bricolage: Transformations in regimes of water governance. *Environment and Planning E: Nature and Space*, 0(0): 1-24.
- Middleton-Manning, B.R. 2018. *Upstream: Trust lands and power on the Feather River*. Tucson: University of Arizona Press.
- Middleton-Manning, B.R.; Gali, M.S. and Houck, D. 2018. Holding the headwaters: Northern California Indian resistance to state and corporate water development. *Decolonization: Indigeneity, Education & Society* 7(1): 174-198.
- Melamed, J. 2011. *Represent and destroy rationalizing violence in the new racial capitalism*. Minneapolis: University of Minnesota Press.
- Messerschmid, C. 2014. Hydro-apartheid and water access in Israel-Palestine: Challenging the myths of cooperation and scarcity. In Turner, M. and Schweiki, O. (Eds): *Decolonizing Palestinian political economy: De-Development and Beyond*, pp. 53-76. London: Palgrave Macmillan.
- Mignolo, W. 2007. Delinking the rhetoric of modernity, the logic of coloniality, and the grammar of decoloniality. *Cultural Studies* 21(2-3): 449-514.
- Mignolo, W. 2011. *The darker side of western modernity: Global futures, decolonial options*. Durham: Duke University Press Books.
- Mitchell, N. 2013. The object of 'object lessons': Thoughts and questions. *Feminist Formations* 25(3): 180-89.
- Molle, F.; Mollinga, P. and Wester, P. 2009. Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power. *Water Alternatives* 2(3): 328-349.
- Nash, L. 2007. *Inescapable ecologies: A history of environment, disease, and knowledge*. Berkeley: University of California Press.
- Niles, M. and Wagner, C. 2017. Farmers share their perspectives on California water management and the Sustainable Groundwater Management Act. *California Agriculture* 72(1): 38-43.

- OCHA (United Nations Office for the Coordination of Humanitarian Affairs). 2019. Demolitions in West Bank undermine access to water. <https://www.ochaopt.org/content/demolitions-west-bank-undermine-access-water> (accessed December 15, 2022)
- ONERM (Oficina Nacional de Evaluación de Recursos Naturales). 1971. *Inventario, evaluación y uso racional de los recursos naturales de la costa. Cuenca del río Ica*. Volume 1. Lima, Peru.
- Oré, M.T. 1989. *Riego y organización: Evolución histórica y experiencias*. Lima, Peru: Soluciones Prácticas.
- Oré, M.T. 2005. *Agua bien común y usos privados: riego, Estado y conflictos en La Achirana del Inca*. Lima, Peru: Fondo Editorial Pontificia Universidad Católica del Peru.
- Oré, M.T.; Bayer, D.; Chiong, J. and Rendón, E. 2014. Emergencia hídrica y conflictos por el agua en una cuenca peruana: La cuenca del Río Ica. In Guevara Gil, A. and Verona, A. (Eds): *El derecho frente a la crisis del agua en El Peru: Primeras Jornadas de Derecho de Aguas*, pp. 269-294. Lima, Peru: Pontificia Universidad Católica del Peru.
- Oré, M.T. and Damonte, G. (Eds). 2014 *¿Escasez de agua? Retos para la gestión de la cuenca del río Ica*. Lima, Peru: Fondo Editorial Pontificia Universidad Católica del Peru.
- Oré, M.T. and Geng, D. 2018. Los conflictos por el agua entre gobiernos regionales: Retos para la formación de los Consejos de Recursos Hídricos. In Oré, M.T and Muñoz, I. (Eds). *Aguas en disputa: Ica y Huancavelica, entre el entrapamiento y el diálogo*, pp. 203-252. Lima, Peru: Fondo Editorial de la Pontificia Universidad Católica del Peru, Cooperación Alemana GIZ.
- Oré, M.T. and Rap, E. 2009. Políticas neoliberales de agua en el Peru. Antecedentes y entretelones de la ley de recursos hídricos. *Debates en Sociología* (34): 32-66.
- Oré, M.T. and Rochabrún, G. 1990. Water, myth and technology in a Peruvian Coastal Valley. In Gamser, M.; Appleton, H. and Carter, I. (Eds). *Tinker, tiller, technical change: Technologies from the people*, pp. 212-220. London: Intermediate Technology Publications.
- Pace, C.; Balazs, C.; Bangia, K.; Depsky, N.; Renteria, A.; Morello-Frosch, R. and Cushing, L.J. 2022. Inequities in drinking water quality among domestic well communities and community water systems, California, 2011–2019. *American Journal of Public Health* 112(1): 88-97.
- Poupeau, F.; O'Neill, B.; Cortinas Muñoz, J.; Coeurdray, M. and Benites-Gambirazio, E. 2019. *The field of water policy: Power and scarcity in the American Southwest*. London: Routledge.
- Pulido-Velazquez, M.; Jenkins, M. and Lund, J. 2004. Economic values for conjunctive use and water banking in Southern California. *Water Resources Research* 40(W03401): 1-15.
- Quijano, A. 2007. Coloniality and modernity/rationality. *Cultural Studies* 21(2-3): 168-178.
- Quijano, A. 2001. Colonialidad del poder, globalización y democracia. *Revista de Ciencias Sociales de La Universidad Autónoma de Nuevo León* 4(7-8): 1-23.
- Quijano, A. 2000. Colonialidad del poder y clasificación social. *Journal of World Systems Research* xi(2): 342-386.
- Ravines, R. and Solar La Cruz, F. 1980. Hidráulica agrícola prehispánica. *Allpanchis* 12(15): 69-81.
- Reisner, M. 1993. *Cadillac desert: The American West and its disappearing water*. New York: Penguin.
- Robinson, C. J. 1983. *Black Marxism: The making of the Black radical tradition*. Chapel Hill: University of North Carolina Press.
- Rook, R. E. 2000. An American in Palestine: Elwood Mead and Zionist Water Resource Planning, 1923-1936. *Arab Studies Quarterly* 22(1): 71-89.
- Rudolph, M. and Kurian, R. 2022. Hydro-hegemony, water governance, and water security: Palestinians under Israeli Occupation in the Jordan Valley, West Bank. *Water Alternatives* 15(1): 73-92.
- Sabati, S. 2019. Upholding 'colonial unknowing' through the IRB: Reframing institutional research ethics. *Qualitative Inquiry* 25(9-10): 1056-64.
- Sabati, S.; Beckett, L.; Cragun-Rehders, K.; Najera, A.; Hise, K. and Geiger, A. 2021. Distilling pedagogies of critical water studies. *Teaching in Higher Education* 26(7-8): 1098-1112.
- Salazar, B. and Rivera, N. 2015. Ica y Huancavelica enfrentados por el agua: ¿Cómo evitar el conflicto social? *La Revista Agraria* 15(170): 14-15.
- Schmida, L. 1984. Israel's drive for water. *The Link* 17(4): 3-4.

- Seidel, T. 2021. Settler colonialism and land-based struggle in Palestine: Toward a decolonial political economy. In Tartir, A.; Dana, T. and Seidel, T. (Eds), *Political economy of Palestine*, pp. 81-107. New York: Palgrave Macmillan.
- Selby, J. 2013. Cooperation, domination and colonisation: The Israeli-Palestinian joint water committee. *Water Alternatives* 6(1): 1-24.
- Sepulveda, C. 2018. Our sacred waters: Theorizing Kuuyam as a decolonial possibility. *Decolonization: Indigeneity, Education & Society* 7(1): 40-58.
- Sherbondy, J. 1982. El regadío, los lagos, y los mitos de origen. *Allpanchis* 8(2): 3-32.
- Stein, S. 2020. A colonial history of higher education present: Rethinking land-grant institutions through processes of accumulation and relations of conquest. *Critical Studies in Education* 61(2): 212-228.
- Sugg, Z.; Varady, R.; Gerlak, A. and de Grenade, R. 2015. Transboundary groundwater governance in the Guarani aquifer system: Reflections from a survey of global and regional experts. *Water International* 40(3): 377-400.
- Sutton, C. 1929. Informe del ingeniero Charles W. Sutton al director de aguas sobre proyectos de irrigación para el valle de Ica. Memorias e informes del Archivo Sutton. 1929. En Archivos Sutton de la Autoridad Nacional del Agua.
- Swearingen, W.D. 1987. *Moroccan mirages: Agrarian dreams and deceptions, 1912-1986*. New Haven: Princeton University Press.
- Tanaka, M. (Ed). 2009. *La nueva coyuntura crítica en los países andinos*. Lima, Peru: IEP.
- Teisch, J.B. 2011. *Engineering nature: Water, development, and the global spread of American environmental expertise*. Chapel Hill: University of North Carolina Press.
- Tello, J.C. 2002. Arqueología de la cuenca del río Grande de Nasca. Cuadernos de Investigación del Archivo Tello, N.º3 Museo de Arqueología y Antropología de la Universidad Nacional Mayor de San Marcos.
- Temper, L. 2009. Creating facts on the ground: Agriculture in Israel and Palestine (1882-2000). *Historia agraria: Revista de agricultura e historia rural* 48: 75-110.
- Tesdell, O.I. 2015. Territoriality and the technics of drylands science in Palestine and North America. *International Journal of Middle East Studies* 47(3): 570-573.
- Tesdell, O. 2017. Wild wheat to productive drylands: Global scientific practice and the agroecological remaking of Palestine. *Geoforum* 78: 43-51.
- Troen, S.I. 2000. Frontier myths and their applications in America and Israel: A transnational perspective. *Israel Studies* 5(1): 301-329.
- Underhill, V. 2021. Like oil and water: Fracking, groundwater, and racialized landscapes of extraction in California's San Joaquin Valley. PhD dissertation. University of California, Santa Cruz.
- Underhill, V. 2022. From Kern Island to the streets of Bakersfield: Logics of contamination, embodied empiricisms, and the afterlives of reclamation. *Catalyst: Feminism, Theory, Technoscience* 8(2): 1-32.
- Underhill, V. and Esparza, R. 2021. Wildflowers and water: Desire, joy, and creativity in environmental justice organizing. *Environmental Justice* 15(2): 115-120.
- Underhill, V.; Sabati, S. and Beckett, L. 2022. Against settler sustainability: California's groundwater as a vertical frontier. *Environment and Planning E: Nature and Space* 0(0): 36. <https://doi.org/10.1177/25148486221110434>
- UN-ESCWA and BGR (United Nations Economic and Social Commission for Western Asia; Bundesanstalt für Geowissenschaften und Rohstoffe). 2013. *Inventory of shared water resources in western Asia*. Beirut: United Nations.
- Vázquez, R. 2011. Translation as erasure: Thoughts on modernity's epistemic violence. *Journal of Historical Sociology* 24(1): 27-44.
- Vimalassery, M.; Pegues, J.H. and Goldstein, A. 2016. Introduction: On colonial unknowing. *Theory & Event* 19(4): 1-16.
- Water Education Foundation. 2022. State Water Project. <https://www.watereducation.org/aquapedia/state-water-project> (accessed December 14, 2022)
- Weinstock, N. 1973. The impact of Zionist colonization on Palestinian Arab society before 1948. *Journal of Palestine Studies* 2(2): 49-63.

- WhoProfits. 2021. Agribusiness as usual: Agricultural technology and the Israeli occupation. <https://www.whoprofits.org/report/agribusiness-as-usual/> (accessed January 12, 2023)
- Wilson, N.; Montoya, T.; Arseneault, R. and Curley, A. 2021. Governing water insecurity: Navigating indigenous water rights and regulatory politics in settler colonial states. *Water International* 46(6): 783-801.
- Wolf, A. 1995. *Hydropolitics along the Jordan River: Scarce water and its impacts on the Arab-Israeli conflict*. Tokyo: United Nations University Press.
- Wolfe, P. 2006. Settler colonialism and the elimination of the native. *Journal of Genocide Research* 8(4): 387-409.
- Worster, D. 1985. *Rivers of empire: Water, aridity, and the growth of the American West*. Oxford: Oxford University Press.
- Wynter, S. 2003. Unsettling the coloniality of being/power/truth/freedom: Towards the human, after man, its overrepresentation - An argument. *CR: The New Centennial Review* 3(3): 257-337.
- Yiftachel, O. 2006. *Ethnocracy: Land and identity politics in Israel/Palestine*. Philadelphia: University of Pennsylvania Press.
- Zakim, E. 2006. *To build and be built: Landscape, literature, and the construction of Zionist identity*. Philadelphia: University of Pennsylvania Press.
- Zeitoun, M. and Warner, J. 2006. Hydro-hegemony – A framework for analysis of trans-boundary water conflicts. *Water Policy* 8(5): 435-460.
- Zeitoun, M.; Eid-Sabbagh, K.; Dajani, M. and Talhami, M. 2012. *Hydropolitical baseline of the upper Jordan River*. Beirut, Association of the Friends of Ibrahim Abd el Al, [https://ueaeprints.uea.ac.uk/id/eprint/37960/1/ujr_hydropol_baseline_-_executive_summary_\[slim\]_\(2012\).pdf](https://ueaeprints.uea.ac.uk/id/eprint/37960/1/ujr_hydropol_baseline_-_executive_summary_[slim]_(2012).pdf)
- Zeitoun, M.; Eid-Sabbagh, K.; Talhami, M. and Dajani, M. 2013. Hydro-hegemony in the Upper Jordan waterscape: Control and use of the flows. *Water Alternatives* 6(1): 86.
- Zwarteveen, M.; Kemerink-Seyoum, J.S.; Kuper, M.; Herrera, C.O.; Dajani, M.; Lu, F.; Cleaver, F.; Hartani, T.; Börjeson, L.; De Bont, C; Mlimbila, E.; Joseph, K.; Komakech, H.; Aslekar, U.; Joshi, D.; Deshmukh, R.; Kulkarni, S.; Kulkarni, H.; Leonardelli, I.; Bhat, S.; Sachin, B.; Saidani, A.; Bossenbroek, L.; Ftouhi, H.; Kadiri, Z.; Peterson, A.; Beckett, L.; Johnson, M.; Oré, M.T.; Verzijl, A.; Domínguez-Guzmán, C. and Chitata, T. 2021. Transformations to Groundwater Sustainability: From individuals and pumps to communities and aquifers. *Current Opinion in Environmental Sustainability* 49: 88-97.

THIS ARTICLE IS DISTRIBUTED UNDER THE TERMS OF THE CREATIVE COMMONS ATTRIBUTION-NONCOMMERCIAL-SHAREALIKE LICENSE WHICH PERMITS ANY NON COMMERCIAL USE, DISTRIBUTION, AND REPRODUCTION IN ANY MEDIUM, PROVIDED THE ORIGINAL AUTHOR(S) AND SOURCE ARE CREDITED. SEE [HTTPS://CREATIVECOMMONS.ORG/LICENSES/BY-NC-SA/3.0/FR/DEED.EN](https://creativecommons.org/licenses/by-nc-sa/3.0/fr/deed.en)

