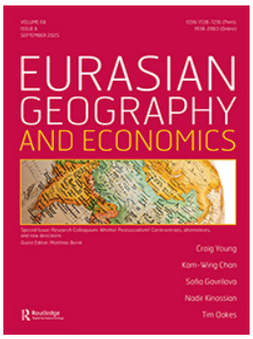

Routledge
Taylor & Francis Group

Eurasian Geography and Economics

ISSN: 1538-7216 (Print) 1938-2863 (Online) Journal homepage: www.tandfonline.com/journals/rege20

# Out of one, many: hydro-economic logics in a World Bank-financed irrigation project in Romania

Bogdan Iancu & Monica Stroe

**To cite this article:** Bogdan Iancu & Monica Stroe (27 Jun 2025): Out of one, many: hydro-economic logics in a World Bank-financed irrigation project in Romania, Eurasian Geography and Economics, DOI: 10.1080/15387216.2025.2525833

**To link to this article:** https://doi.org/10.1080/15387216.2025.2525833



Published online: 27 Jun 2025.

EURASIAN GEOGRAPHY AND ECONOMICS
https://doi.org/10.1080/15387216.2025.2525833

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

OPEN ACCESS Check for updates

# Out of one, many: hydro-economic logics in a World Bank-financed irrigation project in Romania

Bogdan Iancu and Monica Stroe

Department of Sociology, National University of Political Studies and Public Administration, Bucharest, Romania

**ABSTRACT**

The study of irrigation systems has been relatively absent from research into socio-ecological transitions in ex-socialist countries, with a few exceptions. Using a World Bank designed and financed irrigation system constructed by a British contractor in 1974 in southern Romania as an entry point, we work with what we term "hydro-economic logic" to understand the economic and ecological transformations supported by large-scale irrigation systems in the context of rapid post-socialist change. While the socialist-era hydro-economic logic reflected the property regime over land during state-socialism, post-1990 processes of government-backed land restitution and land privatization, the collapse of the vertically-integrated economy that accompanied the network of the canals, pumps and pipes, and the advent of European Union farm payment schemes, created three distinct hydro-economic logics: independent vertical irrigation by small landholders; land grabbing next to the canals; and water grabbing by large agro-industrial business. This suggests that a long-term analysis of infrastructure systems yields unique insights into their changing techno-political rationalities and world-making capacities and may help future efforts to assess the ecological legacies of high modernist infrastructural mega-projects.

**ARTICLE HISTORY**
Received 30 January 2024
Accepted 23 June 2025

**KEYWORDS**
Water; World Bank; agriculture; land; irrigation; Romania

## Introduction: temporal change and the splintering of an irrigation system

As modernizing projects, state-socialist countries extensively re-worked landscapes, including by channeling flows of water into productive agricultural activities through the creation of irrigation systems (Scott 1998; Brite 2018; Kuns 2018). Some famous cases, such as cotton irrigation around the Aral Sea (Babadjanov and Petrick 2025; Obertreis 2017) stand out, especially due to their negative ecological impact. Smaller scale and less famous irrigation systems, on the other hand, despite their proliferation, have been relatively ignored, both in the political economy and political ecology studies of post-socialist transition, with some notable exceptions (see, for instance: Kuns 2018; Theesfeld 2001).

**CONTACT** Bogdan Iancu bogdan.iancu@politice.ro Department of Sociology, National University of Political Studies and Public Administration, Blvd. Expozitiei 30A, 012104, Bucharest, Romania

As in other parts of the world, in the 1960s and 1970s some state-socialist countries contracted World Bank loans for constructing irrigation systems. To understand the reshaping of a large irrigation system over time, we use a 1970s World Bank loan and technical assistance to the Romanian Government, contracted to a British construction group, in southern Romania as an entry point. Therefore, this study asks: How does an irrigation system designed for a state-socialist political economy change? How are its material components abandoned, maintained, and re-used? What new hydro-economic logics emerge from the initial design during the massive post-socialist changes to property and economic changes, such as the unmaking of state-socialist economies, European Union (EU) integration, and the adoption of EU farm payment schemes?

Seeking to inject a temporal dimension into the analysis of large-scale irrigation systems, we examine how shifting property relations and the political and economic foundations of the local environment have transformed the lives of residents shaped around the irrigation system. The rapid change of the infrastructure that we analyze here led to new material, economic, and political arrangements, different from the initial technical and ecological setup of the infrastructure project.

We work with the notion of what we term "hydro-economic logic", understood as the intersection of labor, water, land technology, financing, and economic value. Hydro-economic logics can be understood as the emergent properties (in critical realist terms) of the irrigation systems' infrastructure and the broader cultural political economy that defines its functioning (Mollinga 2019). Since its construction until the fall of socialism in 1989, there was one such hydro-economic logic, scripted by the initial plans and design of the project. After the 1990s it was replaced by three different hydro-economic logics: (1) the drilling of individual vertical boreholes used privately by small-scale agricultural entrepreneurs; (2) accumulation of the land next to still functional canals by land-grabbers; and (3) water-grabbing by large agro-industrial companies. The initial context changed dramatically after the 1990s, creating a mismatch between the initial design and the new land property, energy prices, agro-industrial actors, EU farm payment schemes, and household economies. The local labor force and agro-industrial actors adapted to this new reality, by physically changing the infrastructures, by land-grabbing, and new water extraction strategies.

The article has the following structure. In the first section, we review the literature on irrigation systems, and in the next we describe our methodology. Then, in the following section we analyze the initial hydro-economic logic of the irrigation project financed and designed by the World Bank during the 1970s. Then, we turn to describing the forces of change, which include the partial ruination, intermittent functioning, and material instability of the irrigation system in the 1990s-early 2000s, when water subsidies stopped and land was restituted. Then, in the last section, we describe the three hydro-economic logics that currently govern the territory of the irrigation system. In the concluding section, we return to the theoretical implications of this study for understanding temporal change of large-scale irrigation and infrastructural projects.

## Hydrosocial territories and hydro-economic logics in irrigation systems

"There are many ways of thinking about the relations between power, society, water, and technology," one study notes, but they all agree that "water and society co-constitute

each other" (Rogers and Crow-Miller 2017, 1). In this section we highlight four major themes in the studies of irrigation systems: their capacity to reorganize power in society; their political ecology, the possibility of contestation, and unequal benefits; the symbolic and utopian dimensions of irrigation systems; and the production of hydrosocial territories.

The intersection of irrigation systems, political power, and unequal water distribution is one perspective used to understand the hydrosocial territories of irrigation projects (Molle, Mollinga, and Wester 2009; Şerban 2020; Wheeler 2019). Through the reordering of technology, time, and space, irrigation systems often produce privileges and concentration of power through unequal water distribution, as documented in a study of a South Indian large-scale system (Mollinga 2014). In that irrigation project, the storage and diversion of water for agricultural production politicizes economic development by privileging a limited number of trajectories and transforming irrigation into an act of power. A similar unequal redistribution of power is documented in the case of Spain's irrigation projects of the 1950s – 1970s, where access to, and the distribution of, water are highly unequal. As Swyngedouw (2015, 229) describes, "the articulation of the use and techno-natural transformation of water with social and political processes in which actors take highly unequal positions." The original hydraulic dream of the early Spanish modernizers "was perverted to serve the particular interests of the oligarchic elites" (Swyngedouw 2015, 116).

Another analytical strategy for understanding irrigation systems is grounded in the political ecology of water. The intersection of large public investment in irrigation, the configuration of the agri-export sector, and neo-extractivism, bring to the fore water scarcity scenarios and territorial inequalities (Castillo, González, and Fernanda Ramírez 2023). The strengthening of the irrigation sector consolidated the territorial and monopolistic concentration of land and water resources, increasing the power of the state to selectively support export-oriented and water-demanding crops (Castillo, González, and Fernanda Ramírez 2023, 125). That, in turn, reconfigured the hydro-social territories and the environmental dynamics, sometimes with disastrous consequences. Reworking nature and water for modernization and economic development, irrigation projects may create serious, unanticipated problems, across previously separated spaces. One study mentions "the salinization of water and soils and desertification" (Obertreis 2017, 45) in Central Asian 1960s irrigation projects, but also in India, China, and Turkey. Unlike countries in western Europe, the study notes, such negative consequences did not generate ecological movements and contestation until much later and were rather "taboo subjects" (46).

Another analytic focus has been to foreground the utopian and symbolic dimension of irrigation systems (Duarte-Abadía 2023; Obertreis 2017). In her analysis of the historical shaping of hydrosocial territories through river planning in Spain and Colombia, Duarte-Abadía (2023) documents the dystopian effects of utopian political thought over the needs of populations inhabiting the territory close to the rivers. Through irrigation systems, states have constitutive powers in shaping the lives and subjectivities of farmers. One study shows how the production of modernist-capitalist hydrosocial territories in two river basins in Spain constructs farmer subjectivities (Bourguignon, Villamayor-Tomás, and Boelens 2024). While the Spanish state expected to generate ideal irrigation farmers' subjectivities, the legislation and policies often

clashed with the farmers' experience. Such state power is often based on Orientalist framings. A study of a Central Asian irrigation system shows a mixing of European civilizational superiority discourses with the cult of engineers, and notes that "not only was the term 'engineerial' frequently attached to the projects of modern dams or canals, but so was the word 'European.' 'European irrigation constructions' were accordingly juxtaposed to the indigenous ones that were already present" (Obertreis 2017, 74; also 187).

Finally, irrigation projects have often been examined as generators of "hydrosocial territories", that is:

> the contested imaginary and socio-environmental materialization of a spatially bound multi-scalar network in which humans, water flows, ecological relations, hydraulic infrastructure, financial means, legal-administrative arrangements and cultural institutions and practices are interactively defined, aligned and mobilized through epistemological belief systems, political hierarchies and naturalizing discourses. (Boelens et al. 2016, 2)

This concept was central to several studies of irrigation systems which explain how water flows, local people, technology, governments, and social movements interact to produce territoriality. The moral dimension of competing claims over hydraulic infrastructure emerges in a study of the Ilisu Dam, part of Turkey's 21st Century domestic and regional political plans, which unravels how the various social actors' claims are embedded in the political and geopolitical projects, and socio-environmental concerns (Hommes, Boelens, and Maat 2016). Older hydrological projects on the other hand, as they age, become naturalized, in the sense that it remains difficult to notice a separation between infrastructure and the environment, as large territories are ecologically modernized and hardly separable from the infrastructures that cross and transform them (Gandy 2003).

While we find inspiration in each such family of themes, we are particularly interested in those about production from the hydrosocial territory perspective. Such studies point to the world-making capacity of irrigation systems, but they are perhaps less prepared to understand the rapid processes of unanticipated, radical political change that may emerge throughout their life-span. Unlike some of that work, the fact that we follow the evolution of an irrigation system over 50 years allows us to highlight how such hydrosocial territories change, in addition to how they were produced through the initial plans. Our study highlights the fragmentation of the multiple logics that may emerge over time.

> We find inspiration in similar studies which have documented how hydrosocial irrigation territories may evolve in such a period, such as a study of irrigation in southern Ukraine, which shows that despite the continuity of some technology (center pivot irrigation), "a variegated and uneven geography has arisen from the shadow of Soviet multiplicity" (Kuns 2018, 867). That study uses the categories of the formal-informal sector, and the source of water (canal versus underground water). It finds that:
>
> if the water comes from the canal, and there is centre pivot irrigation, then farms are mostly large-scale and in the formal sector … [while] … if water comes from closer-to the surface underground sources … farms are, relatively speaking, more likely to be smaller scale and in the informal sector. (867)

While we also identified these two hydro-economic logics, which we label as "vertical irrigation" and "water grabbing", the particulars of our research site indicate the existence

of a third hydro-economic logic, namely the emergence of land-grabbing next to the canals. These are large landowners active in the formal economy, who do not use center pivot irrigation, but rather individually-owned pumps and plastic pipes to irrigate their land.

## Methodology

To understand these past and current hydro-economic logics, we used semi-structured interviewing, field observation, and archival research. Between 2018–23 we repeatedly visited the territory of the Sadova – Corabia Irrigation System (hereafter SCIS), located in the Oltenia region, in southwest Romania, close to the Danube. We returned to the site several times per year, primarily during summer and fall. This constituted a total of 110 days spent in the region, in 18 field site visits. Most of the time, we found accommodation in the household of one of our key interlocutors.

From the point of view of geographical coverage, we chose three categories of field sites, classified according to their position on the irrigation system, as well as according to the three hydro-economic logics that they illustrate: the town where the water from the main canal is pumped up onto the terraces above the Danube, two villages located in the proximity of secondary canals in the center of the system, and the Danube's floodplain where the water comes in and out of the irrigation system. We observed how the scale and type of irrigation shapes the use of water in order to explain how the differentiated access to water shapes privileges and inequalities. We also paid attention to droughts, because they typically catalyzed the pumping of water in the canal system. Unlike the operating regime during the socialist period, the canals remain empty except for two to three days each year when water is pumped into them, which transforms them into "infrastructural events" (Carse 2017), in the context of water scarcity.

We also conducted 20 sit-down and walking interviews along the irrigation system's canals with regular residents, local agricultural entrepreneurs, mayors, and past and present technicians. We anonymized all persons in this study, according to the ethics requirements of Department of Sociology in our institution, which granted us an exception, as it is noninterventionist research. In order to map the current physical state of the system's components and to capture the forms of continuity, maintenance, and ruination of the system, and how these forms became entangled in post-socialist dynamics, we conducted three categories of interviews. First, we discussed with technicians, former, and current employees of the irrigation system, as well as small-scale farmers, in a series of "go-along" and situated interviews with an oral history and life-course component. Second, we conducted four online interviews with British engineers who participated in or coordinated the construction and maintenance of the system. Thirdly, we interviewed a former cameraman who worked in the past for the Romanian state documentary film-making office and who produced documentaries about this irrigation system.

Finally, we conducted archival research, including an analysis of technical documents of the irrigation construction, which allowed us to consolidate our understanding of the social history of the system. We retrieved documents from the Archive of the Central Committee of the Romanian Communist Party and from the Archive of the Institution of Civil Engineers in London. We examined how the written press of the state-socialist media

institutions of the 1970s and 1980s, as well as the industrial documentary production of *Sahia* Studios, reflected the construction, use, and outcomes of the irrigation system.

## The socialist-era hydro-economic logic of the irrigation system

The 1970s and 1980s were the heydays of financing and construction of irrigation systems through loans and technical transfer by the World Bank, with an average of 26 projects per year worldwide, compared to a rate of four projects per year in the 1960s (Jones 1995). In the early 1980s, irrigation system loans represented about ten percent of all World Bank loans and 38% of agricultural loans, the largest subsector of the agricultural and rural development loans of the World Bank (Hotes 1983). SCIS was one such project, located in southeast Europe, more specifically in Oltenia, the southern region of Romania, along the left bank of the Danube River.

Construction of SCIS began in August 1969, and lasted five years. It employed 103 British and 250 Romanian engineers and technicians, as well as 1,830 Romanian workers. The project covered an area of 80,000 hectares. It included two main pumping stations, three main canals comprising 24 kilometers, and 370 kilometers of secondary canals. It used 1,785 kilometers of PVC pipes, 1,940 kilometers of aluminum pipes, 20,500 hydrants, and 57,500 sprinklers (Taylor Woodrow Irrigation Group 1973). The Director of the construction project, referring to the scale of the undertaking, mentioned that over 16,000 metric tons of plastic pipes were installed (Thomas 1972, 4). The system became functional in August 1974. From then until 1990, the main and secondary canals, as well as the hydrants in the crop fields, would receive water from the Danube between spring and early November.

The SCIS represents one of the dozens of water management and irrigation projects constructed by the Romanian state, alongside two major hydropower systems built together with the Federal People's Republic of Yugoslavia (Creţan and Vesalon 2017). "During the socialist period," one study notes, "Romania has invested constantly in the irrigation systems as a part of agricultural infrastructure. The area equipped for irrigation has expanded from 42,400 hectares in 1950 to 3.2 million hectares in 1989" (Rusu and Simion 2015, 91). Between 1974 and 1980, Romania secured loans from the World Bank for additional irrigation systems, most of which were larger in scale than the SCIS pilot project: Giurgiu – Razmiresti (100,800 ha.), Rasova – Vederoasa (65,400 ha.), Ialomita – Calmatui (148,500 ha.), Viisoara (115,340 ha.), Mostistea – Calmatui (158,540 ha.), and Covurlui (143,250 ha.). Among the socialist countries of eastern Europe, only the former Yugoslavia secured World Bank loans for agricultural development. On the south bank of the river, the neighboring country of Bulgaria also created a few irrigation systems, but fewer than in Romania, because of the hilly landscape. In 1968, the Romanian Government and the World Bank contracted the British company *Taylor Woodrow Irrigation Group* (currently a subsidiary of the construction and infrastructure giant *Vinci*), to design and manage the project, and supply the equipment.

Compared to the level of Romanian technology at the time, the British contractor brought state-of-the-art equipment and technological capacity. At the time, it was the world's largest automated irrigation scheme, according to the director in charge of the project (Thomas 1972). That technology transfer was part of the Cold War dynamics and political detente and 1970s economic rapprochement between the UK

and Romania (Percival 1995; see also Kuns (2018) on such transfers between the US and USSR). The project also overlapped with high modernist state power and the techno-nationalist ambitions of the mastery of the complex socio-ecological system of the Danube River (Şerban 2020). This project pleased the Romanian authorities' commercial interest in securing foreign currency through the selling of agricultural products and raw materials (Dragomir 2021). The cooperation with the UK company was described as "barter" by one of the British engineers, who, during his time spent on site, witnessed "long convoys of trucks bringing in motors, pumps and other technical components, and then returning to the UK filled with fruit, vegetables, and wine."

By World Bank standards, the SCIS was deemed a great success (World Bank 1982). As we learned during fieldwork, the residents of the area shared this evaluation. The twenty villages and towns in the area of the project were at the time home to about 120,000 residents (World Bank 1975). As it was one of the poorest areas in Romania at the time, unindustrialized and affected by water scarcity, the benefits of the irrigation system were considerable, and even today people remember fondly the positive transformation brought into their lives. Unlike most of the plains in the Oltenia region, the target area was terrain that resembled a desert, which is unusual for Romania, a country with a temperate climate.

Some thirty years before the project's inception, in the 1930s, "the core of the region, which was entirely formed of sandy dunes, was uninhabited, and villages were established only along the periphery, where soils were manageable" (World Bank 1975, 49). Despite the plantation of poplars, acacia, and conifers which to a certain extent stabilized the soil, the region could only be used for grazing, as it acquired a steppe-like ecology. Before the irrigation of the area, helped by fertilizers, some agricultural inroads were possible in the more stable land located between the sand dunes, including some profitable cash-crops such as maize, tobacco, watermelon, grapes, and fruit trees, although the yields were low (World Bank 1975).

In the 1970s and 1980s, the project transformed not only the local ecology but also led to local residents' access to paid work, and to the vertical integration of agricultural production, as well as lifting many families living in the villages and towns surrounding the sand dunes out of poverty. One benefit was the ecological reclamation and transformation of the area. As the area was primarily one of sandy dunes, the new irrigation, forestation, and cultivation of the soil stabilized the landscape (Stringer and Harris 2014). The project also brought about a substantial crop diversification, and much higher productivity, adding to wheat and corn production other new crops which included eggplants, peppers, tobacco, vineyards, watermelons (*Dăbuleni*, the main producer in the country, is located in this area), plums, apricots, apples, and tomatoes.

Another highly consequential effect was that the irrigation system created a diverse horizontal economy through the integration of crops, canned food production, and technical equipment production for maintaining the system. That horizontal economy created opportunities for paid labor. The SCIS was constructed in a period when World Bank irrigation system projects moved away from the "simple" construction of hardware components of dams and canals in the 1950s, to the inclusion of non-hardware complementary investments such as "on-farm works, input supplies, extensions, roads, processing and marketing, research, credit, coops, and training" (Jones 1995, 33–34). For the

residents, that meant the creation of roads along the canals, reforestation, the creation of one company for manufacturing pipes, and another one for producing pressed concrete interlocking slabs for the channels in a larger town in the area (see Figure 1).

Generally, the World Bank claims that the irrigation projects that it helped build tended to benefit the poor. In some cases, this is untenable; in the SCIS case, it seems accurate. The project's aim to help poorer families seemed to work out in part "because irrigation increases farming intensity, it greatly increases labor demand ... some of the additional labor is provided by farm-operating families, and some by hired labor" (Jones 1995, 3). For SCIS, that meant paid labor for a few thousand residents, of which the best paid were the irrigation system maintenance employees. The system also created other opportunities: the entire irrigation system had two large state-owned, intensive agriculture farms, 25 peasant cooperatives, and eight agricultural equipment stations (World Bank 1975). These production units supported six dairy farms, the irrigation of 61,407 ha. of corn and wheat cultures, 4,163 ha. of vineyards, 2,444 ha. of orchards, 891 ha. of mulberry, two cheese factories, two fruit processing plants, five wineries, two feed mills, and other vertically-integrated production facilities (World Bank 1975).

The irrigation system thus made possible two different types of paid labor: the technical personnel employed directly by the SCIS administration and technical personnel employed by the beneficiaries – collective farms and state farms. About 300 people made up the first category, which included engineers, electricians, mechanics, and maintenance and repair personnel. The second category, more sizable, consisted of farm workers whose task was to operate the peripheral parts of the system, especially to move the aluminum pipes across the agricultural fields. There were about 60 such employees for each collective farm, which added up to about 1,200 people. Their number was higher partially because of the redistributive ethos of the local state apparatus, which sought full employment, rather than pure financial efficiency. In order to boost the population's revenues and the employment figures, the

**Figure 1.** An irrigation canal, one year after the system began to function (© Eugeniu Lupu, 1975).

local Party leadership, together with the engineers of the system, decided to disconnect the automated components of the system implemented by the British engineers and technicians, as several mechanics who have worked there since the 1980s mentioned to us.

The "second economy" was another labor component of the irrigation system that was beneficial to the locals. Unlike the "informal" sector of the Global South, the second economy was an intrinsic part of the Soviet-style regime, consisting of those activities that were not directly run by the state, but only regulated, "in the form of legal constraints, of restriction on purchasing materials or hiring labor" (Sampson 1988, 137). The second economy in this area was centered on the household workforce and agricultural production. The best performing employees of collective farms were permitted to receive allotments (0.2 ha.) in irrigated areas of the system. This second economy was highly lucrative, as the land was highly productive and used for vegetable cash-crops that were then distributed to the nearby urban markets. That allowed the villagers to construct new houses, to encourage the educational mobility of their children, and even to purchase cars, which was a rare occurrence in socialist Romania (see Jderu 2020, 2023).

Aside from ecological reclamation, higher revenues, and social mobility, the new, human engineered landscape of the SCIS also produced a different form of personal experience and forms of environmental comfort. The canals allowed residents of the ex-sandy areas to inhabit a more "amphibious world" (Jensen 2017). The SCIS is located in the hottest area of Romania, with summer temperatures often exceeding 40°C. With the new canals and irrigation equipment, the area became much more pleasant in terms of thermal comfort. As several interviewees fondly remember, the presence of water between April and October, including in the dry summer months, allowed for cooler evenings. The leaks from the canals made the water table rise closer to the surface, which made the air more humid and thus more breathable. Children used to bathe in the irrigation canals during the heyday of the system, while the state organized canoe clubs for the residents. A history professor from a local school remembered how both children and adults used the canals for cooling during summer. The professor contrasted that experience with that of his current students, who cannot enjoy the same benefits. He now takes his own children by car for 35 km to the main channel of the Danube to swim. A reminder of the negative aspects of this past "amphibious world" are the existing funerary monuments of those who had drowned and died while bathing in the deeper canals.

Gogu and Mihaela, husband and wife, are a good illustration of those transformations. When we met Gogu in 2021, in his village, he was 75 years old, and struck us as a technology enthusiast. He mentioned that during his training to become a welder, he was so impressed by the British technicians that he dreamed a few times of seeing the welding flame through "a British welding mask". During our conversations, he often recounted technical stories and described the technology which composed the system. We discussed his experience while seated in his front yard, where one could see a vineyard, two immense walnut trees, a greenhouse for vegetables, and a few hens, and hear a couple of pigs. The main house, a four-bedroom dwelling, was completed in the mid-1980s, but construction began in the early 1970s. There was also another smaller and older house left unused and a "summer kitchen", which became the main living space for Gogu and Mihaela. In their yard, one may also notice several short segments of plastic

pipe retrieved from the irrigation system, which were used for different purposes, an aspect to which we will return to later.

After receiving training in the early 1970s at a huge metalworks company in Romania's capital city Bucharest, Gogu returned to his village and became a welder at the recently opened plant for large-diameter pipe production in the nearby town of Dăbuleni. Gogu spoke very fondly of that plant, recalling that the technology was up to date because of the imported British equipment that produced impressively large pipes (3.5 meters in diameter) which were not produced elsewhere in Romania. Moreover, he said, the architecture of the plant and the large volume of the production halls made a lasting impression on him.

While Gogu was the paid labor wage earner in his household, Mihaela worked on the collective farm in the same town. In the 1980s, she received a sizable allotment (about half a hectare), where the couple began to grow watermelons. The garden received free irrigation water and Mihaela worked the piece of land together with Gogu and her parents. Mihaela's mother was a regular collective farm member, while her father had a slightly higher status: a paid worker for the orchard and vineyard production farm. The second economy arrangement was helpful in another way too. In addition to free water, the collective farm also gave subcontractors fertilizers for watermelons. Moreover, the collective farm paid the trucks that transported the watermelons which families like those of Gogu and Mihaela produced. The collective farms distributed the watermelons to the farmers' markets in the large cities of Craiova, Sibiu, and Cluj, deducting the transportation costs. The family members would spend some three to four weeks in the peasant markets to sell their watermelons: "With the watermelon money and the good wage from the pipe plant, I was able to keep two children in college. Today, that would be impossible," explained Gogu. Indeed, their two children began high school in the late 1980s in Craiova, the regional capital of 300,000 inhabitants, and then moved on to college.

Until the fall of state-socialism in 1990, however, such irrigation systems relied on three pillars: a particular property regime based on the ownership of land by the state, the vertical integration of production and processing, and the subsidized pumping of water (Dorondel and Posner 2022; Rusu and Simion 2015; Verdery 2004). Within a few years, during the 1990s, these three pillars of state-socialist irrigation systems either collapsed, or became unstable: state ownership over the territory of the irrigation system has fragmented through post-socialist land restitution and privatization, the vertical economic integration of the agricultural production, designed since the system's inception, imploded, and water and energy became a rare and unpredictable occurrence, which often left the irrigation canals dry.

## The unmaking of the socialist-era hydro-economic logic in the 1990s

In the few years after their sons began high school, Gogu and Mihaela's livelihood took a turn for the worse, following the change in property rights (which included the decollectivization of land) and the subsequent economic transformations in agriculture. In 1991, the pipe plant closed for good. The plant's machinery, buildings, and land were taken over by the large state farm from the nearby town, which used it as a repair shop for its equipment and as a silo for wheat. In the late 1990s, those parts were further sold (and

dismembered) to a buyer from out of town, who sold the machinery as scrap metal. The irrigation-thirsty collective farms, including the one where Mihaela worked, ceased to exist; instead, small land lots were restituted to the families who had owned land before collectivization. That abrupt ending of the irrigation world in the early 1990s left Gogu and Mihaela unemployed and with very small pensions. With the land they got back from the collective farm, they began practicing some more basic subsistence farming during the 1990s and 2000s. They stopped using water for their land in the mid-2000s, because the system functioned intermittently, and, besides, the water provision was much too expensive for them.

Gogu and Mihaela's changes in livelihood mirrored the transformation of the irrigation system. With the vanishing of the collective farms, the stability and fate of the irrigation system began to fluctuate. The system continued to function until the 2000s at variable capacity, but during the 2000s and, increasingly, during the 2010s, the new property and economic realities meant reduced volumes of water delivered, and reduced security of the irrigation components, which resulted in increased theft of the system's components, especially pipes.

The government continued to subsidize the irrigation system during the 1990s, even if the demand for water was greatly reduced by land fragmentation. Then, in 2005, the government discontinued the subsidies. Some (segments) of the canals (but not the majority) were abandoned and became overgrown with vegetation. On one occasion, we came across workers pruning some small-size mulberry trees which grew between the canal's concrete slabs after last year's water pumping episode. One worker told us in a half bitter, half joking tone: "Do you remember that last year, about this time, we delivered water on the canals? Well, all we achieved through this irrigation was to make it possible for these mulberry trees to grow!" The underutilization of the system allowed the emergence of a combination of human-made landscape and feral dynamics fueled by unintentional effects of what residents regard as the ruination of the system, made visible by the presence of weeds.

During six years of research, only once did we come across signs of significant investment in the rehabilitation of the system. Some missing concrete slabs were replaced during the last thirty years, but locals hold these interventions in contempt, describing the results as "patchwork", despite the earnest efforts of the maintenance teams. As the system was left unguarded, some of its components, especially the pipes feeding the land along the secondary channels and the pumps, weirs, but also the water insulation sheet deployed along the canals, began to be removed by the locals. Based on our personal estimation, about a third of the PVC pipes were stolen. In the early 2000s, residents began paying the marginalized Roma community to remove the PVC pipes either to their households, or to redeploy them vertically in order to extract water from the aquifers, as we will describe below. At the same time, they blamed the Roma for unearthing the pipes and thus wrecking the system.

In several backyards of the households that we visited during the interviews, we noticed plastic pipe fittings. Back in the day, such pieces were buried underground and linked the canals to the land they were meant to irrigate. Residents unearthed and transported them home and now use them in their yards as fencing to keep away domestic animals that may damage the grape and fruit trees that most of them cultivate. In one household, in addition to this form of protection, the family

**Figure 2.** A fragment of 1970s British pipe, unearthed from the canals and transported to a local family's yard (© authors, 2022).

turned a plastic pipe into a barrel for pickles (cucumbers, cabbage, and tomatoes). Although we have not seen it ourselves, when we asked that family about the barrel, they told us that some of their neighbors also use such barrels for wine-making and storage, because, apparently, they are easy to handle and wash. In other backyards, we also noticed that such fittings were stored on top of each other, awaiting future use (see Figure 2). Some concrete slabs were also displaced from the canals, and, occasionally, the initial water insulating sheets have been retrieved. The insulation sheets have been used for constructing ponds inside some yards, for covering and protecting the crops from the sun, and even for creating a sheepfold.

The ruination of the infrastructure was not only material, through the fragmentation of the entire system into smaller, disparate objects, but also the very territory for which it was designed disintegrated in the early 1990s. As political technologies, irrigation systems may be used for different political ends. For instance, the irrigation systems constructed during Franco's dictatorship in Spain (1939–75) were pushed forward by the landed elite and as a means to co-opt and keep their loyalty and to guarantee "the long-term stability of the latifundia system" (Swyngedouw 2007, 16). Yet in the process, the irrigation systems were also designed to co-opt the landless peasantry "to rationalize production, to serve as a wedge to permit structural land reform, and to facilitate access to land and water for the landless peasants" (11). In state-socialist Romania, the political rationality was different. The Romanian state had successfully transformed the property over land through the confiscation of the large equivalent latifundia in 1945 and through the collectivization of agriculture during the 1950s and 1960s (Kligman and Verdery 2011). The political rationality of the SCIS envisaged the consolidation of the socialist state's legitimacy and the generation of export crops to be sold by the socialist regime after the collectivization of the land. This construction of the project was possible because the state already controlled the territory and could use the entirety of the vast area of land amassed during the previous two decades of land confiscation and collectivization.

That irrigation sovereignty over huge swaths of agricultural land ended during the 1990s, through restitution of property rights over land (Verdery 2004). Land restitution and privatization led to the transformation of large state-run agricultural farms and large collective agricultural farms into small, fragmented household farms after 1990. Our repeated interviews with a former electrician working for a pumping station along the canals made us particularly aware of this and his arguments resonate with other studies (Theesfeld 2001) of post-restitution dynamics of irrigation systems in ex-socialist countries: "The [irrigation] system was designed for large surfaces of land; it was not created for private small-holders who may irrigate half a hectare or such," he told us. He complained about the role played by the land fragmentation in ruining the irrigation system and rendering it technically obsolete, but also about his additional burden of doing paperwork for a multitude of clients who occasionally use the water. Prior to land fragmentation, his work was relatively easy. The land was compact; instead of dealing with many clients, he would apply the pumping standards and once every ten days he would go to the field to move the water sprinklers. Now, he said, "after the [land] restitution, everyone contacts me. Everyone wants some irrigation and nothing is well organized any longer. I have to schedule them in a notebook, to give them invoices and receipts . . . It is really difficult!"

Land fragmentation led not only to the increased instability of the system, but also to decreased agricultural productivity. Small-holders were, during the 1990s and 2000s, primarily elderly households, lacking extensive agricultural knowledge, money, distribution channels, and money for agricultural inputs, as well as access to credit for purchasing mechanized agricultural equipment (Cazacu et al. 2006; Rusu and Simion 2015; Stringer and Harris 2014). Land restitution transformed a hyperproductive agricultural territory into a territory of subsistence and social dumping during the 1990s and 2000s. Land and small-holder agricultural production during the 1990s and 2000s served primarily as a safety net for the workers laid-off in industry, families who became too poor to stay in large cities where industrial production closed, and the elderly (Stringer and Harris 2014). Faced with land fragmentation, the irrigation system became increasingly unstable during the 1990s, depending primarily on subsidies from the central government. Legal, institutional, technical, and economic problems led to the steady shrinking of irrigated land in the region (Rusu and Simion 2015).

## The new hydro-economic logics: vertical irrigation, land-grabbing, and water grabbing

Since the 2010s, one may witness the emergence of three hydro-social logics that reassemble the components of the irrigation system. One is vertical and relies on the extraction of components from the former system and their independent use as artisanal sources (Bakker 2003) for the creation of wells on small land parcels. The second one is land grabbing, based on the appropriation of premium land lots in the vicinity of irrigation canals. The third one is water-grabbing by industrial agriculture for the export of commodity crops, based on the use of underground streams and rainwater that flows through the return canals, thanks to gravity, based on the legal framing of that water as free water. We will discuss each below, before turning to the conclusions of this study.

*Vertical irrigation* emerged when the irrigation system stopped functioning (or functioned intermittently) during the late 1990s and the early 2000s, depending on

the occasional allocation of the central government subsidies. Some residents began to decouple the underground pipes from the canals and extract them from their horizontal position whose function was to transport water from the canals to the hydrants scattered across the neighboring fields. Then, through the payment of household money to professional water companies, some residents began digging wells and using the unearthed pipes for stabilizing their wells (see Figure 3). The appropriation and recycling of irrigation system pipes was grounded on the locals' perception that pipes were freely available, since the pipes were located on their land, and that pipes were resistant and good quality. Such reuse of the irrigation system pipes may be seen as "reappropriation through ruination" (Greven 2023).

On one occasion, a resident whom we befriended took one of us along to see the "English pipes" of Virgil, a friend of his. Virgil has two hectares of land cultivated with watermelons. Nominally, the land belongs to his parents, which they regained during the de-collectivization of the 1990s, but this has little value, since they could not afford the water that the irrigation system was intermittently delivering. Lacking water, Virgil could not plan long term and did not see much hope in the near future, so in 2005, he was pushed into agricultural farm work abroad. He traveled in spring, summer, and fall to Spain and then returned with some plans for his parents' plot. He dug a 30-meter-deep well on the land, inserted the "English pipes", and began irrigating his watermelon garden. The water is now pumped using a Honda engine and then distributed into the garden through a drip-irrigation system. Virgil told us that he prefers the water from SCIS because underground water delivered by his well is much colder than the water from Danube and could stress the plants. However, the large irrigation system was both unreliable and expensive; the well is cheaper and delivers water when it is needed (see Figure 4).


**Figure 3.** Each village and town in the area of the SCIS has posters that advertise services for digging wells (authors, 2021).

**Figure 4.** A well dug for irrigating a nearby greenhouse for tomatoes (© authors, 2022).

"We cannot wait for the [irrigation] system. Water might come today, but it might stop tomorrow. Watermelons need water around the clock," he explained. The arrangement, although splintering the integrated irrigation system, worked for Virgil. Three years after he had begun his vertical irrigation, he was seeking to rent additional land, for digging another well and expanding his watermelon garden. Part of this effort to expand to another parcel is related to the intricacies of watermelon cultivation. Apparently, after three years, watermelon cultivation depletes nitrogen from the soil. When seeking to water his watermelon garden, he would also have to dig another well, thus fueling the spiral of the horizontal disintegration of the smaller components of the irrigation system. This new vertical irrigation micro-arrangement has two negative ecological effects. One is that the water table has dropped significantly, which is a process also observed by Kuns (2018) in southern Ukraine. We have heard estimates ranging from a drop of ten to 20 meters. The second negative effect is that the plastic pipes used for dripping irrigation are not retrieved before a new agricultural cycle begins. That means that the tractor wheels break them down and then they are plowed over, thus producing significant quantities of microplastics that will be released into the air and underground water. In Virgil's land lot (100m × 50m) that meant about 2,500 meters of 16 mm-diameter soft plastic pipes.

Virgil's case illustrates the transition from a horizontal integration of the irrigation system to a vertical system and is typical of the new wave of agricultural producers. Like our interlocutor, the residents who engaged in this unearthing and reburial of "British" pipes are primarily residents of the area who, during the early post-socialist economic involution of the 1990s and early 2000s, left to work as agricultural workers in Spain, France, and the UK. Faced with the landscape of successful, EU-subsidized, viable industrial agriculture, some of the immigrants returned to their region after Romania joined the EU in 2007, when agricultural activities began receiving some subsidies. To be productive, they needed water to irrigate their land. While the irrigation system, when it worked, was a possibility, there were no water subsidies in the 2000s and the price of water was prohibitive. Therefore, they began to dig medium-depth wells (30-70m deep) and to use the pipes salvaged from the irrigation system. Such pipes had connected the canals to the

irrigated land in the past. As the water transported by the ex-horizontal pipes turned vertical, such agricultural workers began creating water-intensive, productive small land lots, capable of supporting their livelihoods by cultivating cucumbers. Other such farmers cultivated red pepper, eggplants, and very often tomatoes, which are purchased by large hypermarket chains. Vertical irrigation was non-existent in the late 2000s, but became relatively widespread by the time that we conducted our fieldwork post-2020. This created a sense of autonomy among agricultural producers such as Virgil.

The second hydro-economic logic splintered from the SCIS is *land grabbing*. Land-grabbers seek agricultural land next to the canals, primarily because the original pump stations and the hydrants have disappeared. Due to these circumstances, landlords have to pump water from the canals using their personal pumping devices. The pumps in use in the area can carry water no further than 250–300m away from the canals. That creates a premium on the land next to the canals, leaving the people who own or lease land further inland from the canals to extract water vertically, as is the case with Virgil.

In one village in the area which hosts 2,022 residents, the irrigation association established in 2007has only five members, who hold between 175 and 390 hectares of land. Below we present two illustrations of this phenomenon: Emil details a positive experience, while Ema's story shows the tensions that arise from this new irrigation configuration.

Emil is an entrepreneur with a long experience of working in agriculture, who managed in the last 20 years to accumulate about 500 hectares of land, a sizable area by local standards. Most of the land belongs to him and another part is leased from locals who, for one reason or another – including old age or lack of access to the means of production – have given up working the land. Most of the land owned or leased by Emil can be found in the vicinity of the main irrigation canals. People in his village envy him for the premium locations that he has amassed. When he places water requests to the control center of the irrigation system, Emil and his few employees connect the main canals to the secondary canals and then irrigate through hose irrigation reels at distances no greater than 280m from field canals, which are the smallest ones. In order to irrigate the rest of the cultivated crops, Emil leaves the hoses on the ground to send water by gravity to the seedlings between the rows of corn (see Figure 5). That way, he managed to obtain an impressive corn production of about ten tons per hectare in 2023. The rest of the land-owning locals (including Ema's case, to be discussed next) rarely have access to irrigation and can yield a maximum of two tons of corn per hectare on their plots; accordingly, they resent Emil and his land grabbing success.

Emil and other land-grabbers were energized by a post-2017 political engagement of the state for subsidizing energy to transport water. Unlike the early 2000s, when the land was fragmented and the state shifted the financial responsibility of the irrigation costs to the landlords, since 2017 the state decided to deliver water freely to agricultural producers. The canals still belong to the state. The post-2017 arrangement is based on the state paying for the transportation of water through the canals, while the agricultural users only pay for the transportation of water from the canals to their lands. This post-2017 subsidy policy increased the value of the land lots situated closest to the canals, making the costs of transporting water from the canals to the nearby land lower.

Conversely, Ema's experience shows the tensions between the land-grabbers bordering the canals in the irrigation system territory (large producers relying on subsidized

**Figure 5.** An irrigation pump next to a secondary canal used by a land grabber who now controls the agricultural lands next to several canals (© authors, 2022).

water and close to the surface water), and the vertical irrigation farmers whose land is situated further away from the canals (small producers relying on wells). Aged in her mid-30s, Ema is a farmer who has seven years of seasonal work experience in Spain, where she worked picking strawberries for about five months of the year. She had also worked for three years in France, in the Nantes area, packing chestnuts and almonds with her husband, especially in the winter months. Back in the 1980s, Ema's father was a tractor driver in a local state agricultural enterprise, which was a prestigious position. Ema saved money together with her husband and, between episodes of seasonal mobility, set up her own agricultural holding of about three hectares. One lot was cultivated with strawberries, one with raspberries, and another with melons. She ended her seasonal work abroad in 2021, after a herniated disc caused by picking strawberries in unsuitable conditions. A surgical intervention to her spine followed in March 2022 and, two months later, she returned to hard work. She gave up the watermelon plantation because now, due to medical problems, she can no longer lift heavy weights.

Ema's land needs intensive irrigation during the summer. Because she does not have access to water from the irrigation system, she relies on the service of two wells. One is 34m and the other 54m deep. Her lots are far away from the canals and it is cheaper to get water from underground sources. The local water irrigators' association invited her to join the association when they needed a wider membership to apply for the rehabilitation of two pumping stations, but she refused. The problem, for her and others, was that the repair plans only focused on repairing the canals, but not the pipes and sprinklers transporting water from the canals to the producers' land plots. "My lands are far from them [the canals]. I had hydrants on my land, but they were stolen in the 2000s and since then I have no way to irrigate [my crops] with water

from the system," she explained. Mentioning the farmer whose land separates hers from the canals, Ema went on to say that "these days, only farmers with tens and hundreds of hectares are irrigated next to the canal. Whoever was smart and got land next to the canals is doing great."

The third logic is *water-grabbing*. While many pipes extracting water from the canals became vertical wells on small parcels, the canals themselves continued to exist and remained pretty much intact. Through the ironies and contingencies of agricultural policies, national water policies, global markets for agricultural commodities, and the power of large-scale industrial agriculture, the largest economic actor in the entire irrigation system came to enjoy canal water for free. A large Spanish agricultural investor (*Losan Group*, from Galicia, Spain) came to acquire a large swath of land in 2010. The company is now called *Agronova*. Since 2006, the land had been left idle, primarily because of the erratic pumping of water in the irrigation system. Then, in 2007, Romania joined the EU, which meant that agricultural companies, but also individual households, began receiving subsidies from the EU's Common Agricultural Policy. That meant that Romania became attractive for large agriculture business interests, and international investment funds from the EU and outside the EU. Land was very cheap by European standards. Moreover, the government and the EU began offering subsidies and tax exemptions. Any area of agricultural land larger than ⅓ hectare became eligible for subsidies, as long as the owner or tenant cultivated it. At the local level, another factor that increased the value of land and agriculture was a 2007–11 project to repair some of the canals.

In this context, the country as a whole, and the SCIS region in particular, became a target for large-scale agricultural investments. The largest agricultural farm in the entire EU is located in Romania (*Insula Mare a Brăilei*, also situated on the Danube, sold in 2018 to a company from the UAE, with no less than 57,000 ha.). *Agronova*, in the SCIS area, with 14,000 hectares, is the second largest agricultural company in Romania. It produces primarily water-intensive Lucerne, which it exports to the EU and the Middle East.

The land was leased from the Romanian state, with an initial lease of 7,000 ha. in the mid-2000s. They changed the destination of the land from grazing pasture to "Kansas style" irrigation for growing Lucerne (see Figure 6). The land is the reworked bottom of a meadow lake situated next to the River Danube. During the late 1960s, the state drained the meadow and turned it into grazing pasture. It was run not as a collective farm, but as an intensive, state-owned agricultural business. As the water table is high and there are underground springs near the surface, in order to keep the land dry in the 1970s, the British engineers drained the springs to some canals, which then flowed downstream to the Danube.

Unlike the previous land use (primarily grazing for cows and sheep, as well as pig farms), the Spanish company began using the land for growing Lucerne, which is harvested four times a year, and exported to Middle Eastern countries. That led to increased demand for water. The previous technical component of transferring water back to the Danube became obsolete. Instead, the company began to capture the downstream water flowing from the former meadow and transported it to the irrigation system and then back up to the company's land for center pivot irrigation. It began doing so through irrigation subsidies from the EU funds, which allowed it to purchase digitally controlled, center pivot irrigation systems.


**Figure 6.** The land of a large agri-business company in the area; one may notice green dots created by center pivot irrigation circles (© Google Maps, 2023).

Through a techno-legal artifice, the company received water for free, through a favorable interpretation of a new policy of subsidizing water for agricultural producers. This hydrological privilege, as in the case of land-grabbers next to the canals, has created resentment among the smaller agricultural producers in the area. They perceive *Agronova* as favored both by the state and nature, and they place the company outside the moral geography of the irrigation system, framing it in discourses that combine frustration regarding the water injustice, with admiration for the company's financial and technological might. This is amplified by the *Agronova* investment into a Lucerne pellets factory at the edge of their land, next to the main road in the area. The subsidized water deepens the inequalities and creates resentment, as well as a patchy landscape of agricultural land use and productivity. One smallholder explained to us that:

> the Romanian state offers them [Agronova] water for free, transported by gravitation, and finances their pumping station, but they do not give anything back to us, because they have few employees. They use these new technologies, which do not require employees.

The fragmentation into the patchy irrigation of vertical wells and the Spanish company, he went on to explain, creates a situation where "on their [the company's] land everything is green and new, but on ours [the upland level], everything is dry, the water seldom comes, and the canals are in disrepair."

Besides the transformation to vertical irrigation through the creation of wells, land grabbing, and the subsidies of large agribusiness, the former irrigation system acts as a potential habitat for animals and alternative political projects and competing economic visions, as was the case for a 2008 World Bank/USAID project to repair some parts damaged by theft (Dorondel and Posner 2022; Rusu and Simion 2015). The project explored the limits of agricultural producers' willingness to associate into producers' associations, in order to create more reliable demand and predictable use of the canals and pipes. Despite the efforts of the World Bank and the Romanian authorities to stimulate the organization of irrigators'

associations, the small-scale and young farmers proved skeptical and went on drilling wells, as this was perceived as a site of autonomous, unlimited, and almost free access to a source of water. Thus, the political prospect of association did not succeed in overcoming the atomization produced by decollectivization, land restitution, and land privatization.

## Conclusion

The vanished original script of the irrigation system allows us to understand the various projects that emerge from the material and political transformations of integrated infrastructural projects constructed during the heyday of financing such mega-projects, in particular in ex-socialist countries. Oltenia's SCIS was part of a group of socially-focused World Bank irrigation projects, but the rapid political changes following the collapse of state-socialism in the 1990s have transformed the overall purpose of the initial project, the initial technological design, forms of accumulation, material stability, water flows, and the labor of the residents in the area.

Constructed as part of the (socialist) high modernist political rationality of mastery over water, nature, and private property, this irrigation system is interesting because one can understand the changes of a hydrosocial territory over time, through the substantial remaking of property relations, and the general economic organization of society. It is also interesting because, aside from the reworking of water and society into new hydrosocial territories, the reorganization of power and symbolic dimensions escapes the predominantly vertical understandings of power inside irrigation systems (Swyngedouw 2015). While other cases (such as Swyngedouw 2015) found that the irrigated hydrosocial territory favored the powerful actors in agriculture in Spain, our case study suggested, based on the accounts of our interviewees, that such systems may substantially have benefited the poor as well.

Projects like the one we analyzed had a highly inclusive horizontal power dimension. We described how the construction, partial ruination, and especially the fragmentation of the integrated hydro-social system resulted, since the early 1990s, in three distinct economic logics. These three logics are autonomous vertical irrigation, independent of the irrigation system; land grabbing next to the canals since the reintroduction of water transportation subsidies in 2017; and water grabbing for export crops by large agro-industrial companies that combine free delivery of water and a favorable legal interpretation of the drainage flows. As the empirical material suggests, the emerging hydro-economic logics intersected with powerful processes such as the labor migration of Romanians to the rest of the EU, and capital and commodity circulation at the EU and global scale, which far exceed the confined territory of the irrigation system itself.

The vertical irrigation logic results in almost complete autonomy from the irrigation canals, as they use groundwater, imagined by users as a never-ending resource and site of hydraulic autonomy. The other two fragmentation logics recombine existing materialities of the original irrigation system – primarily the canals – with state subsidies, EU agricultural subsidies, and the global financial and agricultural commodities markets. Accordingly, the master hydro-economic logic of the socialist era led to a constellation of individual projects which included seasonal labor migration to agricultural regions outside Romania, aspirations of household autonomy, as is the case with vertical irrigation

farmers, and the appropriation of national and EU subsidies diverted toward world markets, rather than used for wage labor and local household economy, as is the case with land grabbers and water grabbing actors.

Both its positive social outcomes, as perceived by our informants, but also the ecological dimension make our research site interesting for future efforts to assess the "dark legacy" of the "Soviet inefficiency of and mismanagement in relation to irrigation" (Kuns 2018, 867). Unlike the case described by Obertreis (2017), where the development of large-scale irrigation schemes for cotton near the Aral Sea – through the excessive use of water from the Amu Darya and Syr Darya river basins – had a disastrous ecological impact, SCIS has been and continues to be perceived by locals as a provider of comprehensive ecological services. Instead, the partial ruination and intermittent functionality of the system in the post-socialist period is framed by locals as ecologically problematic. Unlike the case described by Kuns (2018) in neighboring Ukraine, where continuity with Soviet era was driven by the technological stability formed around center pivot irrigation, our analysis indicates that the fragmentation of SCIS led to new articulations of property relations, state subsidies, and the adoption of different, more decentralized technologies used for irrigation.

## Acknowledgements

An earlier version of this article was presented at the conference *EASA 2024: Doing and Undoing with Anthropology*, in the panel "Infrastructural space and the politics of un/making", held in Barcelona in July 2024. We are grateful to the two anonymous reviewers for their insightful comments, and to Colin Nelson, Smaranda Schiopu, and Eugeniu Lupu for their valuable feedback and suggestions.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## References

Babadjanov, Jakhongir, and Martin Petrick. 2025. "Uzbekistan's Cotton Clusters in the Context of the Industrial Policy Debate." *Eurasian Geography and Economics* 66 (3): 354–383. https://doi.org/10.1080/15387216.2023.2267093.

Bakker, Karen. 2003. "Archipelagos and Networks: Urbanization and Water Privatization in the South." *The Geographical Journal* 169 (4): 328–341. https://doi.org/10.1111/j.0016-7398.2003.00097.x.

Boelens, Rutgerd, Jaime Hoogesteger, Erik Swyngedouw, Jeroen Vos, and Philippus Wester. 2016. "Hydrosocial Territories: A Political Ecology Perspective." *Water International* 41 (1): 1–14. https://doi.org/10.1080/02508060.2016.1134898.

Bourguignon, Nicholas, Sergio Villamayor-Tomás, and Rutgerd Boelens. 2024. "Fabricating Irrigators: Contested Hydrosocial Territories and Subject-Making in Spain's Tagus–Segura Interbasin Transfer Arena." *Water* 16 (2): 192. https://doi.org/10.3390/w16020192.

Brite, Elizabeth Baker. 2018. "The Hydrosocial Empire: The Karakum River and the Soviet Conquest of Central Asia in the 20th Century." *Journal of Anthropological Archaeology* 52:123–136. https://doi.org/10.1016/j.jaa.2018.08.003.

Carse, Ashley. 2017. "An Infrastructural Event: Making Sense of Panama's Drought." *Water Alternatives* 10 (3): 888–909.

Castillo, Mayarí, Pablo González, and María Fernanda Ramírez. 2023. "Neoextractivism, Agribusiness and Water Scarcity in Contemporary Chile." In *Neoextractivism and Territorial Disputes in Latin America*, edited by Penelope Anthias and Pabel C. López Flores, 125–146. London: Routledge.

Cazacu, Constantin, Elena Constantin, Elena Cazacu, and Florin Mărăcineanu. 2006. *Dezvoltarea rurală durabilă prin exploatarea amenajărilor de irigații în judetul Olt* (*Sustainable Rural Development through the Exploitation of Irrigation Facilities in Olt County*). Craiova: Alma.

Creţan, Remus, and Lucian Vesalon. 2017. "The Political Economy of Hydropower in the Communist Space: Iron Gates Revisited." *Tijdschrift voor Economische en Sociale Geografie* 108 (5): 688–701. https://doi.org/10.1111/tesg.12247.

Dorondel, Ştefan, and Cristina Posner. 2022. "Infrastructure, Feral Waters and Power Relations in Rural Romania." *Critique of Anthropology* 42 (2): 172–190. https://doi.org/10.1177/0308275X221095935.

Dragomir, Elena. 2021. "Romania Turns West: National and International Rationales." In *European Socialist Regimes' Fateful Engagement with the West: National Strategies in the Long 1970s*, edited by Angela Romano and Frederico Romero, 190–211. New York: Routledge.

Duarte-Abadía, Bibiana. 2023. "Utopian River Planning and Hydrosocial Territory Transformations in Colombia and Spain." *Water* 15 (14): 2545. https://doi.org/10.3390/w15142545.

Gandy, Matthew. 2003. *Concrete and Clay: Reworking Nature in New York City*. Cambridge, Massachusetts: MIT Press.

Greven, David. 2023. "Bursting Pipes and Broken Dreams: On Ruination and Reappropriation of Large-Scale Water Infrastructure in Baringo County, Kenya." *Journal of Eastern African Studies* 17 (1–2): 241–261. https://doi.org/10.1080/17531055.2023.2231790.

Hommes, Lena, Rutgerd Boelens, and Harro Maat. 2016. "Contested Hydrosocial Territories and Disputed Water Governance: Struggles and Competing Claims Over the Ilisu Dam Development in Southeastern Turkey." *Geoforum* 71:9–20. https://doi.org/10.1016/j.geoforum.2016.02.015.

Hotes, Frederick. 1983. "World Bank Irrigation Experience." *International Journal of Water Resources Development* 1 (1): 65–75. https://doi.org/10.1080/07900628308722275.

Jderu, Gabriel. 2020. "Motorcycling in a Repair Society: A Maintenance and Repair–Centered Approach to Automobility." *East European Politics and Societies* 36 (2): 604–625. https://doi.org/10.1177/0888325420950802.

Jderu, Gabriel. 2023. *Fixing Motorcycles in Post-Repair Societies: Technology, Aesthetics and Gender*. New York: Berghahn Books.

Jensen, Casper Bruun. 2017. "Amphibious Worlds: Environments, Infrastructures, Ontologies." *Engaging Science, Technology, and Society* 3:224–234. https://doi.org/10.17351/ests2017.56.

Jones, William. 1995. *The World Bank and Irrigation*. Washington, DC: The World Bank.

Kligman, Gail, and Katherine Verdery. 2011. *Peasants Under Siege: The Collectivization of Romanian Agriculture, 1949–1962*. Princeton: Princeton University Press.

Kuns, Brian. 2018. "'In These Complicated Times': An Environmental History of Irrigated Agriculture in Post-Communist Ukraine." *Water Alternatives* 11 (3): 866–892.

Molle, François, Peter P. Mollinga, and Philippus Wester. 2009. "Hydraulic Bureaucracies and the Hydraulic Mission: Flows of Water, Flows of Power." *Water Alternatives* 2 (3): 328–349.

Mollinga, Peter. 2014. "Canal Irrigation and the Hydrosocial Cycle: The Morphogenesis of Contested Water Control in the Tungabhadra Left Bank Canal, South India." *Geoforum* 57:192–204. https://doi.org/10.1016/j.geoforum.2013.05.011.

Mollinga, Peter. 2019. "Cultural Political Economy and Critical Water Studies: An Introduction to the Special Themed Section." *Water Alternatives* 12 (3): 788–801.

Obertreis, Julia. 2017. *Imperial Desert Dreams: Cotton Growing and Irrigation in Central Asia, 1860–1991*. Göttingen: Vandenhoeck & Ruprecht.

Percival, Mark. 1995. "Britain's 'Political Romance' With Romania in the 1970s." *Contemporary European History* 4 (1): 67–87. https://doi.org/10.1017/S096077730000326X.

Rogers, Sarah, and Britt Crow-Miller. 2017. "The Politics of Water: A Review of Hydropolitical Frameworks and Their Application in China." *Wiley Interdisciplinary Reviews: Water* 4 (6): 1–12. https://doi.org/10.1002/wat2.1239.

Rusu, Marioara, and Gabriel Simion. 2015. "Farm Structure Adjustment Under the Irrigation System Rehabilitation in the Southern Plain of Romania: A First Step Towards Sustainable Development." *Carpathian Journal of Earth and Environmental Sciences* 10 (3): 91–100.

Sampson, Steven. 1988. "'May You Live Only by Your Salary!': The Unplanned Economy in Eastern Europe." *Social Justice* 15 (3–4): 135–159.

Scott, James. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven: Yale University Press.

Şerban, Stelu. 2020. "Techno-Nationalizing the Levees on the Danube: Romania and Bulgaria After World War II." *Nationalities Papers* 48 (2): 373–387. https://doi.org/10.1017/nps.2018.77.

Stringer, Lindsay, and Angela Harris. 2014. "Land Degradation in Dolj County, Southern Romania: Environmental Changes, Impacts and Responses." *Land Degradation and Development* 25 (1): 17–28. https://doi.org/10.1002/ldr.2260.

Swyngedouw, Erik. 2007. "Technonatural Revolutions - the Scalar Politics of Franco's Hydro-Social Dream for Spain 1939–1975." *Transactions of the Institute of British Geographers* 32 (1): 9–28. https://doi.org/10.1111/j.1475-5661.2007.00233.x.

Swyngedouw, Erik. 2015. *Liquid Power: Contested Hydro-Modernities in Twentieth-Century Spain*. Cambridge, MA: MIT Press.

Taylor Woodrow Irrigation Group. 1973. *Sadova-Corabia Irrigation Project Romania*. Surrey: Kadek Press.

Theesfeld, Insa 2001. "Constraints for Collective Action in Bulgaria's Irrigation Sector." *CEESA Discussion Paper, 5*, Berlin: Humboldt–Universität zuBerlin.

Thomas, J. M. 1972. "Application of upvc Pipe in a Large Irrigation Project." Paper presented at The Plastic Pipes Conference Association (PPCA), Southampton, UK.

Verdery, Katherine. 2004. *The Vanishing Hectare: Property and Value in Postsocialist Transylvania*. Ithaca: Cornell University Press.

Wheeler, William. 2019. "The USSR as a Hydraulic Society: Wittfogel, the Aral Sea and the (Post-) Soviet State." *Environment & Planning C Politics & Space* 37 (7): 1217–1234. https://doi.org/10.1177/2399654418816700.

World Bank. 1975. *Report No. 582a-Ro FILE COPY Appraisal of Sadova-Corabia Agricultural Credit Project*. Agricultural Credit and Agro industries Projects Department Europe, Middle East and North Africa.

World Bank. 1982. *Project Performance Audit Report Romania - Sadova-Corabia*. Agricultural Credit Project (Loan 1083–Ro).