Hussein Abdulmunim Amery*

The Litani as a Link: Toward a Better Reconstruction in Lebanon**

الليطاني نهرًا جامعًا: نحو إعادة بناء فضلى في لبنان

Abstract: This study addresses the vital importance of the Litani River in Lebanon and the environmental challenges resulting from its severe pollution. An estimated 40 million cubic metres of untreated sewage is dumped into the river annually, exacerbating its deterioration. The study argues that Lebanon's water crisis is deeply rooted in political fragility, inadequate governmental response, the sectarian political system, the aftermath of the civil war, and pervasive poverty. The study emphasizes the urgent need for sustainable development and balanced reconstruction in Lebanon, advocating for integrated solutions and effective water and land governance. The study highlights the importance of effective use of natural resources and the adoption of innovative technologies to bolster resilience against climate change. Proposed measures include remote sensing, improved rainwater collection, and enhanced soil humidity.

Keywords: Litani River; Lebanon; Pollution; Water Management; Governance.

الملخص: تتناول هذه الدراسة الأهمية الحيوية لنهر الليطاني في لبنان، وتعالج التحديات البيئية الناجمة عن التلوث الشديد في النهر، حيث يُلقى فيه سنويًا نحو 40 مليون متر مكعب من مياه الصرف الصحي غير المعالجة. وتحاجّ الدراسة في أنّ الهشاشة السياسية، والاستجابة الحكومية غير الكافية، والنظام السياسي الطائفي، والحرب الأهلية، والفقر المدقع، كلّها عوامل أسهمت في مفاقمة أزمة لبنان المائية. وتؤكد الدراسة أنه ثمّة حاجة ملحّة إلى تنمية مستدامة وإعادة إعمار متوازنة في لبنان، من خلال تطبيق حلول متكاملة وحوكمة ذات فاعلية بالنسبة إلى الماء والأرض. وتُبرز أهمية الاستخدام الفعّال للموارد الطبيعية وتبنّي تقنيات مبتكرة لبناء مرونة تجاه تغير المناخ؛ مثل خدمات الاستشعار عن بُعد، وتحسين جمع مياه الأمطار، وتعزيز رطوبة التربة.

كلمات مفتاحية: نهر الليطاني؛ لبنان؛ التلوث؛ إدارة المياه؛ الحوكمة.

* Professor of Water Politics and Policy, Department of Humanities, Arts & Social Sciences, Colorado School of Mines, US.
Email: hamery@mines.edu

** This study was originally published in Arabic in: Hussein Abdulmunim Amery, "al-Līṭānī Nahran Jāmiʿan Bayn al-Ṭawāʾif: Naḥw Iʿādat Bināʾ Fuḍlā fī Lubnān," *Siyasat Arabiya*, vol. 11, no. 62 (May 2023), pp. 103-112.

> It is no exaggeration to say that the Litani River has become a channel transporting poison between different villages and cities located in its basin. Along the river course there are tremendous accumulations of solid wastes, sewage and industrial outfalls, as well as an intolerable odour.[1]
>
> To rule a country, first rule its waters.[2]

Introduction : An Overview of Water Management Challenges

Lebanon has a Mediterranean climate, characterized by abundant rainfall along its coastal plains and moderate precipitation in the interior. On average, it receives 661 mm of precipitation per year, a figure significantly higher than that of most countries in the region.[3] However, economic and political mismanagement has depleted the country's relatively abundant water resources, degraded the natural environment, particularly rivers, including the Litani, and jeopardized human food and water security.

This study argues that sustainable recovery in Lebanon could begin with effective governance of water resources, implemented through community-centred schemes. These include reducing wastewater discharge into the Litani, promoting regenerative agriculture, and improving environmental education. Rebuilding social trust is also essential and can be achieved through cooperative and integrated water resource management. Ultimately, agreeing on goals such as clean water and an ecologically sound river system can bind people together as they pursue their intertwined interests.

The Litani is to Lebanon what the Nile is to Egypt: it is the country's largest river in terms of size, length, and basin extent. Its flow amounts to approximately 750 million cubic metres (m^3), with a basin covering 2,110 square kilometres (km^2), equivalent to one-fifth of Lebanon's total landmass of 10,452 km^2. The river feeds Lake Qaraoun, the country's largest lake, with a capacity of 220 million m^3. Spanning 174 km, the Litani passes through several climatic zones, and supplies water to nearly one million people.[4] Its basin is home to Muslims and Christians of all denominations, living in 246 cities, towns, and villages across four governorates.

The volume of water discharged from the Litani Basin constitutes 24% of Lebanon's net rainfall, representing more than 30% of all inland river runoff.[5] The ecological significance of the river's basin is heightened by its role in sustaining Lebanon's largest wetlands, located in the Kafr Zabad and Ammiq regions. The latter, near the river's source, is a remnant of a much larger network of marshes and lakes that spread across the Bekaa Valley. The late Kamal Salibi, a renowned historian and professor at the American University of Beirut,[6] said the name "Bekaa" [*biqā'*] refers to areas or "spots" of water in the valley through which the Litani flows. Although the Ammiq has greatly diminished in size, it remains Lebanon's last significant wetland and serves as a vital stopover for birds migrating between Europe and Africa.

Over the past five decades, Lebanon has endured a protracted civil war, several wars with and invasions by Israel, direct and indirect foreign intervention by various countries (most notably Syria, Iran, and Saudi

---

[1] Mouin Hamzé & Amin Shaban (eds.), *The Litani River, Lebanon: An Assessment and Current Challenges* (Cham, Switzerland: Springer International, 2018).

[2] A saying by Xi Jinping. See: "Taming the Waters: China's Grand Canal is Full for the First Time in Decades," *The Economist*, 14/5/2022, accessed on 6/12/2023, at: https://bit.ly/3uJ5tDA

[3] FAO, *The State of Land and Water Resources for Food and Agriculture in The Near East and North Africa Region*, Summary Report (Cairo: 2022), accessed on 4/4/2023, at: https://bit.ly/47tTw30

[4] Hussam Hussein et al., "Syrian Refugees, Water Scarcity, and Dynamic Policies: How Do the New Refugee Discourses Impact Water Governance Debates in Lebanon and Jordan?," *Water*, no. 12 (January 2020), p. 325; Talal Darwish et al., "Sustaining the Ecological Functions of the Litani River Basin, Lebanon," *International Journal of River Basin Management*, no. 21 (February 2021).

[5] Hussein et al., p. 41.

[6] Kamal Salibi, personal interview, American University of Beirut, 3/6/1998.

Arabia), domestic political deadlock, and a demographic shift since 2011 driven by the massive influx of refugees from the Syrian Civil War. Since 2019, Lebanon has also suffered a full-scale economic collapse. The local currency has lost 90% of its value and corruption has permeated every aspect of life. Compounding this crisis, a massive explosion of more than 2,500 tonnes of ammonium nitrate at the Beirut port in 2020 claimed hundreds of lives, caused severe damage to many homes and businesses, and completely destroyed the country's main grain silos.[7] In the fall of 2022, political bickering once again prevented parliamentarians from reaching consensus and electing a president, leaving the post vacant until January 2025 – an all-too-familiar situation in recent decades.[8] Over the decades, these challenges have gradually but dramatically undermined the role of Lebanon's central government and reduced its ability to provide basic services such as water and electricity, which remain erratic and irregular, particularly in rural areas.

Lebanon has long been wedged between complete anarchy and a façade of order. This political fragility is interconnected with the country's high degree of institutional and social vulnerability. According to the World Bank, the government's "inadequate" political responsiveness stems primarily from "a lack of political consensus over effective policy initiatives" and "political consensus in defence of a bankrupt economic system, which benefited a few for so long".[9] While institutions continue to function, the services they provide are diminished by severe budget cuts. Over time, sectarian leaders and the Lebanese public have devised coping methods and frameworks that have weakened government institutions, pushing them to the brink of collapse.

Some companies have exploited the country's economic and social collapse to maximize profits by evading the costs of safe waste disposal, instead dumping it into the natural environment, including the Litani. Sami Alawieh, director-general of the Litani River Authority, highlights that sewage and pollutants from factories, food processing plants, towns, villages, and hundreds of refugee camps all flow through the cities of Baalbek and Zahleh, as well as the villages of the western Bekaa Valley, ultimately contaminating Lake Qaraoun. Alawieh estimates that these pollutants amount to one million cubic metres per year.[10] Such blatant violations of environmental laws are facilitated by the protection extended to industrial pollutants by local or national political leaders. Meanwhile, many towns, villages, and unplanned refugee camps lack sewage systems. In other words, Lebanon's institutions have been hollowed out to the point that the state's functions are little more than an empty shell.

Since 2019, Lebanon's economy has deteriorated to the point that public utility firms can only intermittently supply water and fuel, forcing many residents to buy water by the tanker. The price of drinking water has surged rapidly and dramatically, increasing nearly sixfold by 2022 compared to 2019 levels. Most households now purchase bottled water for drinking, because of the dubious quality of tap water. For a family of five consuming a total of ten litres of water per day, this translates to an annual bill of around USD $261, a significant financial burden for many families. This figure does not include the cost of water needed for cooking and cleaning.[11] The World Bank estimates that, since 2020, the cost of tankered water has increased by around 35%, whilst the price of bottled water has nearly doubled.[12]

In parts of Lebanon, public utilities have nearly ceased to provide water and electricity, to the point that the country's only airport, Beirut-Rafic Hariri International Airport, has been plunged into darkness on

[7] Samar Al-Hajj et al., "Beirut Ammonium Nitrate Blast: Analysis, Review, and Recommendations," *Frontiers in Public Health*, vol. 9 (June 2021).

[8] "Chronology of Events: Lebanon," *Security Council Report* (New York: 2022), accessed on 5/4/2023, at: https://bit.ly/3Rdj4f4

[9] "Lebanon Economic Monitor: Lebanon Sinking (To the Top 3)," *World Bank* (Spring 2021), accessed on 5/4/2023, at: https://bit.ly/49TjluN

[10] Sarah Abdallah, "Why Lebanon's Largest Artificial Lake is Turning Green," *Al-Monitor*, 20/8/2019, accessed on 6/12/2023, at: https://bit.ly/40Rg2Ap

[11] UNICEF, "Lebanon's Water Infrastructure Struggles on, but Remains on the Brink," 21/7/2022, accessed on 6/12/2023, at: https://bit.ly/47sh9sx

[12] "Lebanon Economic Monitor."

several occasions, as have some traffic lights in the nearby capital Beirut. Meanwhile, civilian passenger planes have been struck by stray bullets,[13] and untreated municipal and industrial waste is routinely dumped into Lebanese rivers, including the Litani.

Historically, the government has largely neglected economic development in southern Lebanon, encouraging the rise of paramilitary groups and deepened political instability. Several factors have exacerbated this neglect.

First, Lebanon's sectarian power-sharing political system was for many years dominated by Sunni and Maronite political and economic elites, who often believed that the Shiites (mainly concentrated in the south) needed to prove their identity as Arabs and Lebanese[14] before the central government would invest in development projects in their areas.

Second, Palestinian militants based in the south and beyond engaged in a low-intensity war with Israel for two decades, discouraging the government from committing to development projects that could be easily destroyed in subsequent rounds of violence. Furthermore, when Palestinian militants left the area in the early 1980s, they were replaced by Hezbollah, an armed Shiite movement that has established a stronghold in the south and engaged in several destructive wars with Israel.

Third, the Lebanese Civil War (1975-1990) deepened social rifts, weakened national institutions, and marked the beginning of a steady erosion of the Lebanese state's presence and authority. At this stage, Israel created the Christian-led South Lebanon Army (SLA), which controlled a so-called "security belt" along the Lebanese-Israeli border. Israel's expansion northward and occupation of 20%-40% of Lebanon's territory between 1978 and 2000 exacerbated Lebanese fears about the motives of their occupiers regarding the country's water resources. The move appeared to reinforce claims that Israel viewed the Litani as its natural northern border.[15]

Moreover, the Israeli military imposed harsh restrictions on access to the Litani Basin and prevented investigative journalists and academics from conducting field visits, fuelling suspicions that Israel was concealing its activities in the area.[16] This iron curtain on information resulted in extensive media attention in Lebanon to Israel's perceived ambitions regarding the Litani. Reports included data and maps showing points where the river was being diverted, as well as reference to a United Nations report, academic testimony in the United States of House of Representatives, and comments by Lebanese MPs and government officials. Concern reached such a level that Lebanese officials and the Secretary-General of the Arab League have spoken of Israel's "greed" and ambitions to divert the waters of southern Lebanon.[17]

The environmental degradation of "Lebanon's Nile" is so severe that it seems the Litani has lost its strategic significance; it is now rare to encounter articles in the Lebanese press on the once-hot topic of Israel's "plans" for the Litani. Discussions of this issue, once frequent, have nearly disappeared, except for occasional mentions in politically charged opinion pieces published by Iranian-backed media outlets. At a 2016 academic conference on the Litani organized by the Beirut Arab University and attended by Lebanese officials, including then-Environment Minister Mohamad Machnouk, this author argued that the Litani has become so polluted that even if Lebanon offered it to Israel on a silver platter, Israel would reject it. These

[13] "Middle East Airlines Plane Hit by Stray Bullet While Landing in Beirut, no Injuries," *Reuters*, 10/11/2022, accessed at: https://bit.ly/4a3LFL7

[14] Linda Sayed, "Sectarian Homes: The Making of Shiʿi Families and Citizens under the French Mandate, 1918-1943," PhD. Thesis, The Graduate School of Arts and Sciences, Columbia University, 2013.

[15] "The Current Situation in Israel," *Central Intelligence Agency* (US), ORE 68-49, 18/7/1949.

[16] Hussein Abdulmunim Amery, "A Popular Theory of Water Diversion from Lebanon: Towards Public Participation for Peace," in: Hussein Abdulmunim Amery & Aaron T. Wolf (eds.), *Water in the Middle East: A Geography of Peace* (Austin: University of Texas Press, 2000), pp. 121-149.

[17] Ibid.

views were based on field observations, both visual and olfactory, as well as academic research. Notably, no one at the conference challenged the comment.

Corruption and Excessive Pollution

Corruption is a major cause of insecurity and instability. When left unchecked and unpunished, it creates nationwide frustration and fuels public anger, undermining trust in government institutions and pushing people toward idealistic solutions – or even violence. They have little faith in the state institutions that have consistently failed to provide security or even the most basic services.

In response to state and institution failure, Lebanese in many communities and villages have raised funds both locally and from relatives abroad to buy generators, dig wells, acquire ambulances, and set up health clinics. Such socio-economic adaptations have fostered a greater sense of autonomy and changed the public's political ethos, further widening the gap between citizens and the central government. As institutions have crumbled, an atomized survival strategy has emerged, with individuals and communities each developing their own coping mechanisms to survive.

The long, gradual brain drain from Lebanon, due largely to corruption, insecurity, and state failure, has accelerated into a mass exodus.[18] This bodes ill for the Lebanese government's ability to recruit skilled professionals capable of leading its water and environmental institutions and formulate a vision for sustainable management of the country's rivers, particularly its largest, the Litani.

In 2021, the World Bank warned that "[t]he breakdown in sanitation services risks intensifying the spread of water-borne diseases, adversely impacting an already vulnerable public health".[19] A year later, in the autumn of 2022, Lebanon suffered an outbreak of cholera. While this was linked to the war and instability in neighbouring Syria, it was also the result of Lebanon's deteriorating infrastructure, poor water management, and economic collapse.

To prevent future outbreaks, the country needs well-maintained water pumping stations and wastewater treatment plants. This has been difficult to achieve, as the government lacks the funds to secure adequate fuel supplies. UNICEF's Representative in Lebanon said his office had "been warning for more than a year on the inevitable collapse of the water infrastructure as the electricity shortage is making it impossible to pump sufficient water and therefore putting the health of millions of people, particularly children, at risk".[20]

Today, the Litani is severely polluted due to lack of sanitation facilities in the villages along its banks. An estimated 40 million m3 of untreated sewage are dumped into the river annually.[21] Additionally, raw industrial wastewater from paper and battery factories in the town of Zahleh, as well as sugar factories along the Ghazayel River (a tributary of the Litani), further exacerbates the contamination. However, since farming remains the main economic activity for Litani Basin residents, the excessive use of agricultural chemicals has caused residues to seep into the soil, polluting both surface and groundwater resources.[22] Studies have shown that groundwater in the Bekaa Valley is heavily polluted with nitrogen-based fertilizers, of which Lebanon consumes about 1,816 tonnes annually, more than Syria, which consumes 1,422 tonnes annually.[23]

---

[18] Samia Nakhoul & Issam Abdallah, "Hundreds of Disillusioned Doctors Leave Lebanon, in Blow to Healthcare," *Reuters*, 12/11/2020, accessed at: https://bit.ly/3MYSkwl

[19] "Lebanon Economic Monitor."

[20] UNICEF, "UNICEF Is Actively Supporting the Lebanese Government Fighting the Cholera Outbreak," 26/10/2022, accessed on 6/4/2023, at: https://bit.ly/3T0t1xE

[21] Hamzé & Shaban (eds.).

[22] Ibid.

[23] Ibid.; FAO.

Since the end of the civil war in 1990, residents in the western Bekaa district at the upper end of the Litani Basin (including towns such as Bar Elias and Qaraoun), have reported a marked increase in cancer cases, which they attribute to pollution in the river.[24] The constant, cumulative inflow of pollutants has rendered Litani's water highly toxic,[25] and the authorities responsible for enforcing environmental laws remain largely absent.

In 2016, the Bekaa branch of Beirut Arab University hosted a workshop addressing the environmental crisis afflicting the Litani. During the event, then-Environment Minister Mohamad Machnouk publicly stated that the perpetrators of most major environmental violations have "political cover" (i.e. de facto immunity) that prevents his ministry from stopping them. None of the Lebanese present batted an eyelid: the minister had merely confirmed something that is already widely known.

The Lebanese government and foreign aid agencies have launched and funded numerous programmes to tackle the pollution of the Litani and Lake Qaraoun. For example, the Ministry of Environment has led a multi-ministerial committee tasked with cleaning up the river, supported by the United Nations Development Programme and funded in 2016 with a USD $55 million loan from the World Bank.[26] However, I conducted field visits between 2019 and 2022, which revealed that little progress had been made to implement this plan.

To rebuild sustainability, Lebanon must prioritize the restoration of its water resources and social interconnectivity – beginning with its rivers, foremost the Litani. Ecological interdependence includes both "biotic and abiotic flows", with the latter encompassing "the spread of fire or sediment and nutrient transport in waterways", as well as tools, expertise and "flows of information and resources that enable active collaboration".[27]

The concept of socio-ecological connectivity reflects the "inherent interdependence and feedbacks" between humans and environmental resources "in a network across space and through time".[28] This notion applies to resources such as habitats, water flows, and shared social spaces, and can be approached at the hyperlocal level or more broadly, depending on the issue under analysis.

Lebanon's recovery must be grounded in a comprehensive plan and the formulation of a renewed social contract. Inter-communal cooperation can build interdependence and help restore social trust. Restoring the Litani could serve as a cornerstone for the socio-political reconstruction of a country devastated by wars and corruption, empowering a population that has long suffered from gross neglect by the central government.

The river system connects people, rural and urban, from various economic, ethnic, religious, social, and other groups. The "degree and nature of hydrological connectivity" fluctuates according to the form and extent of human activities, as well as the forces of nature. Human activities modify environmental interconnectedness on local, regional, and global levels. Though occurrences such as toxic pollution can disrupt such interconnections, actions such as removing physical obstructions from rivers can improve them.[29]

In the autumn of 2019, Lebanon was gripped by months of mass protests, which had at their heart "the request to establish a new social contract between the state and its citizens. As such, an important policy issue

[24] Hamzé & Shaban (eds.).

[25] Rodayna Raydan, "As Lebanon's Electricity Crisis Deepens, Water Becomes Scarcer," *Al-Monitor*, 12/6/2022, accessed on 6/4/2023, at: https://bit.ly/40Y3MxO

[26] Hamzé & Shaban (eds.).

[27] Clare E. Aslan et al. "Coupled Ecological and Management Connectivity Across Administrative Boundaries in Undeveloped Landscapes," *Ecosphere*, vol. 12, no. 1 (2021).

[28] Monika Egerer & Elsa Anderson, "Social-Ecological Connectivity to Understand Ecosystem Service Provision across Networks in Urban Landscapes," *Land*, vol. 9, no. 12 (December 2020), p. 530.

[29] Y. Zhang et al., "The Concept, Approach, and Future Research of Hydrological Connectivity and its Assessment at Multiscales," *Environmental Science Pollution Research*, no. 28 (August 2021), pp. 52724-52743.

facing Lebanon in this current moment is how to strengthen the national social contract, within a context of a fractured state and national identity, poor governance, and broken infrastructure."[30] The country's new social contract must be based on socio-religious coexistence, transparency and judicial independence, social protection for workers, environmental safeguards, and more. However, such an ambitious task will take time, and neither the Lebanese people nor their water systems can afford to wait for these complex political issues to be resolved. NGOs can play a vital role by engaging directly with local communities in the Litani Basin to facilitate cooperation around shared interests, a seed that could eventually grow into a cornerstone of national reconstruction.

In a recent article, Sami Zoughaib argued that

> the near total absence of the state on the social level led to a proliferation of informal channels of assistance aiming to cover the gaps. These informal channels are, by and large, community-based and lack a central policy design [… Rather, they are] localized interventions from political or religious actors using politically affiliated municipalities, religious institutions, and other organizations affiliated with these actors.[31]

Zoughaib argues that such efforts could be financed through donations from wealthy members of political parties and institutions, both in Lebanon and from the diaspora. He proposes an alternative approach involving "localized donor-led interventions implemented by international organizations or by domestic non-state actors". Zoughaib also proposes an approach that bypasses bankrupt and dysfunctional government institutions.[32]

Over the past three decades, the agricultural sector's share of the Lebanese job market has steadily declined, dropping to just 11% by 2019. Similarly, the share of the agricultural sector in the national economy had been in decline until 2019, when it suddenly jumped from 3.2% of GDP to 8.9% in 2020.[33] However, this dramatic reversal coincided with the onset of the country's economic collapse and an unprecedented banking crisis. Today, an estimated 31% of household income in the Litani Basin comes from agriculture, reflecting the widespread availability of agricultural products and services.

Building Back Better at the Community Level

Lebanon must transition toward environmentally and economically sustainable, socially viable development, as well as better reconstruction. This can be achieved through integrated solutions that embrace inclusive and sustainable water and land governance frameworks. Efficiently utilizing natural resources while minimizing their negative environmental impacts is crucial for building resilience to climate change. This could be supported by adoption of innovative technologies for better resource management, such as remote sensing, improved rainwater harvesting, and enhanced soil moisture.[34] As Egerer and Anderson argue, linkages between human actors are "a component of sustainability and resilience as connections between people decreases social isolation and fragmentation, which may contribute to communities' resilience to change and promotes positive environmental transformations.

---

[30] UNICEF & ILO, "Towards A Social Protection Floor for Lebanon, Policy Options and Costs for Core Life-Cycle Social Grants," *Policy Note* (Beirut: March 2021), accessed on 6/4/2023, at: https://bit.ly/3GfHOgf

[31] Sami Zoughaib, "Distorted Social Contract: The Dangerous Trajectory of Social Protection Systems in Lebanon," *The Policy Initiative*, 4/11/2022, accessed on 6/4/2023, at: https://bit.ly/3N1FQUz

[32] Ibid.

[33] The World Bank, "Agriculture, Forestry, and Fishing, Value Added (% of GDP) – Lebanon," *World Bank National Accounts Data and OECD National Accounts Data Files* (2022), accessed on 6/4/2023, at: https://bit.ly/46ATvJc

[34] FAO, "The State of the World's Land and Water Resources for Food and Agriculture - Systems at Breaking Point," *Synthesis Report* (Rome: 2021), accessed on 6/4/2023, at: https://bit.ly/47OVSJt

Much like ecological connectivity, increasing social connectivity requires balancing tensions with diversity and limiting trade-offs, and can be explicitly linked to the physical environmental structure, which determines how people move and interact across a landscape".[35]

NGOs could help Litani Basin residents from diverse religious and economic backgrounds by dedicating resources to fostering inter-communal collaborations, facilitating agenda-setting, and mediating productive meetings. Small-scale projects could be implemented to educate and inspire residents about the benefits of sound waste collection, sorting, and disposal practices. Some riparian villages have open-air tips close to the river or on its floodplain, highlighting the need to prioritize such measures to reduce pollution both in these areas and further downstream. NGOs could also engage farmers in dialogue about the efficient use of agrochemicals and introduce alternative methods such as organic, no-till, and regenerative agriculture. Educational extension programmes could also work with local individuals trusted by the community, such as religious clerics, *mukhtars* (community leaders) and scholars.

Furthermore, supporting water conservation and storage schemes could help bolster Lebanon's water and food resilience. Today, the country stores only 6% of its total water resources, far below the average of 85% in the MENA region.[36] Financing the construction of water reservoirs and rainwater harvesting facilities could help secure a more stable water supply, which would improve the lives of ordinary people, particularly farmers living in the Litani Basin.

Establishing the physical infrastructure and human capacity to collect and treat wastewater in areas of the Litani Basin currently lacking such facilities would greatly improve the river's water quality. This, in turn, would support the broader recovery of the waterway. As Anawar and Chowdhury argue, "polluted river water can be remediated by either in-situ water treatment or pollution control at the source point".[37]

Another key challenge is that developing countries with high external debt, such as Lebanon, often struggle to secure the financing needed to place their economies on a sustainable path.[38] In 2022, Lebanon's sovereign debt was equivalent to a staggering 179.2% of GDP,[39] a figure exceeded by only three other countries.

Water management projects that require significant financial investment could be addressed through a "debt-for-nature swap". This mechanism involves forgiving a portion of a developing nation's foreign debt, such as Lebanon's, in exchange for local investments in environmental conservation measures.[40] Such an approach not only alleviates the burden of public debt but also encourages investment in "projects linked to nature protection within the debtor country."[41] Debt-for-nature swaps have been successfully implemented in the Seychelles, the Philippines, Costa Rica, and elsewhere.

Such deals can also be reconceptualized as "debt-for-climate swaps". While conventional agriculture is a major source of carbon emissions, regenerative agriculture can sequester carbon, which helps mitigate

---

[35] Egerer & Anderson.

[36] The World Bank, *Lebanon Economic Monitor: The Deliberate Depression*, Document of the World Bank (Fall 2020), accessed at: https://bit.ly/40RR97L

[37] Hossain MD Anawar & Rezaul Chowdhury, "Remediation of Polluted River Water by Biological, Chemical, Ecological and Engineering Processes," *Sustainability*, vol. 12, no. 17 (August 2020).

[38] Igor Lukšić et al., "Innovative Financing of the Sustainable Development Goals in The Countries of the Western Balkans," *Energy, Sustainability and Society*, vol. 12 (February 2022).

[39] Marc Jones, "Foreign Creditors Urge Lebanon to begin Debt Restructuring Talks," *Reuters*, 21/9/2021, accessed on 4/4/2023, at: https://bit.ly/46vEOay

[40] Organisation for Economic Co-operation and Development, "OECD Stat," 2001, accessed on 6/4/2023, at: https://bit.ly/3SWqe8C

[41] Lukšić et al.

climate change while enhancing the productivity and resilience of cropland in a warming world.[42] This arrangement could benefit both creditor and debtor (Lebanon), and the international community.

Collaborative water management among stakeholders from different religious and economic backgrounds, coupled with good governance of the Litani, could promote economic growth, reduce poverty, tackle inequalities in water distribution, and protect the environment. Cooperation on better management of the Litani could also build stronger cultural and social bonds of trust among communities, united by their shared dependence on and the tragedy of its degradation.

Historically, Lebanon's small size has posed a challenge in supporting its population, making it a major exporter of human capital. Economic crises (since 2019, for instance) have further accelerated emigration rates. For example, data from 2021 showed a population decline of 0.8%.[43] The sheer size of the Lebanese diaspora indicates an overseas resource that could finance the rehabilitation of the Litani Basin.

Emigration from Lebanon is so prevalent that between 30% and 50% of the population now resides outside the country.[44] Generous remittances from migrants have long helped their relatives survive a decade and a half of civil war, economic downturns, and, more recently, the near-total collapse of the economy.[45] In 2022, remittances accounted for 38% of the country's GDP, or about USD $6.8 billion.[46] Well-coordinated plans to develop the agricultural sector and population centres in the Litani Basin would likely attract foreign investment, particularly from the Lebanese diaspora.

Tangible progress in rehabilitating the Litani could inspire a shift in public perception toward supporting change in the region, although positive reforms will take time to be accepted and embraced. Lebanon's natural environment, above all the Litani, has paid the price for decades of political and security crises that eroded the country's national institutions. Restoring the health of the Litani requires the initiation and support of a small, community-based projects that foster unity and collaboration, and a gradual process of reconstruction through regenerative agriculture.

References

Al-Hajj, Samar et al. "Beirut Ammonium Nitrate Blast: Analysis, Review, and Recommendations." *Frontiers in Public Health*. vol. 9 (June 2021).

Amery, Hussein Abdulmunim & Aaron T. Wolf (eds.). *Water in the Middle East: A Geography of Peace*. Austin: University of Texas Press, 2000.

Amery, Hussein Abdulmunim & William P. Anderson. "International Migration and Remittances to A Lebanese Village." *The Canadian Geographer*. vol. 39, no. 1 (1995).

Anawar, Hossain MD & Rezaul Chowdhury. "Remediation of Polluted River Water by Biological, Chemical, Ecological and Engineering Processes." *Sustainability*. vol. 12, no. 17 (August 2020).

Aslan, Clare E. et al. "Coupled Ecological and Management Connectivity Across Administrative Boundaries in Undeveloped Landscapes." *Ecosphere*. vol. 12, no. 1 (2021).

[42] Nuna Teal & Karl Burkart, "Regenerative Agriculture Can Play a Key Role in Combating Climate Change," *One Earth* (June 2023), accessed on 6/6/2023, at: https://bit.ly/47NyY57

[43] The World Bank, "Agriculture, Forestry, and Fishing, Value Added (% of GDP) – Lebanon."

[44] Fawwaz Traboulsi, *A History of Modern Lebanon* (London: Pluto Press, 2007).

[45] "Demand Lifts Lebanese Real-Estate Prices," *The Daily Star*, 25/11/2010, accessed on 6/4/2023, at: https://bit.ly/40V4Rqd; Hussein Abdulmunim Amery & William P. Anderson, "International Migration and Remittances to A Lebanese Village," *The Canadian Geographer*, vol. 39, no. 1 (1995), pp. 46-58.

[46] Kareem Chehayeb, "Lebanon's Financial Pains Eased by Remittances Over Holidays," *Associated Press*, 22/12/2022, accessed on 6/4/2023, at: https://bit.ly/4aaEwJg; "Remittances Grow 5% in 2022, Despite Global Headwinds," *Press Release*, The World Bank, 30/11/2022, accessed on 6/4/2023, at: https://bit.ly/3Gj9UaK

Chayes, Sarah. *Thieves of State: Why Corruption Threatens Global Security*. New York: W.W. Norton & Company, 2015.

Darwish, Talal et al. "Sustaining the Ecological Functions of the Litani River Basin, Lebanon." *International Journal of River Basin Management*. no. 21 (February 2021).

Egerer, Monika & Elsa Anderson. "Social-Ecological Connectivity to Understand Ecosystem Service Provision across Networks in Urban Landscapes." *Land*. vol. 9, no. 12 (December 2020).

FAO. "The State of the World's Land and Water Resources for Food and Agriculture - Systems at Breaking Point." *Synthesis Report* (Rome: 2021). Accessed on 6/4/2023, at: https://bit.ly/47OVSJt

_____. *The State of Land and Water Resources for Food and Agriculture in The Near East and North Africa Region*. Summary Report (Cairo: 2022). Accessed on 4/4/2023, at: https://bit.ly/47tTw30

Hamzé, Mouin & Amin Shaban (eds.). *The Litani River, Lebanon: An Assessment and Current Challenges*. Cham, Switzerland: Springer International, 2018.

Hussein, Hussam et al., "Syrian Refugees, Water Scarcity, and Dynamic Policies: How Do the New Refugee Discourses Impact Water Governance Debates in Lebanon and Jordan?." *Water*. no. 12 (January 2020).

Lukšić, Igor et al. "Innovative Financing of the Sustainable Development Goals in The Countries of the Western Balkans." *Energy, Sustainability and Society*. vol. 12 (February 2022).

Sayed, Linda. "Sectarian Homes: The Making of Shiʿi Families and Citizens under the French Mandate, 1918-1943." PhD. Thesis. The Graduate School of Arts and Sciences. Columbia University. 2013.

Teal, Nuna & Karl Burkart. "Regenerative Agriculture Can Play a Key Role in Combating Climate Change." *One Earth* (June 2023). Accessed on 6/6/2023, at: https://bit.ly/47NyY57

The World Bank. "Agriculture, Forestry, and Fishing, Value Added (% of GDP) – Lebanon." *World Bank National Accounts Data and OECD National Accounts Data Files* (2022). Accessed on 6/4/2023, at: https://bit.ly/46ATvJc

_____. *Lebanon Economic Monitor: The Deliberate Depression*. Document of the World Bank (Fall 2020). Accessed at: https://bit.ly/40RR97L

Traboulsi, Fawwaz. *A History of Modern Lebanon*. London: Pluto Press, 2007.

UNICEF & ILO. "Towards A Social Protection Floor for Lebanon, Policy Options and Costs for Core Life-Cycle Social Grants." *Policy Note* (Beirut: March 2021). Accessed on 6/4/2023, at: https://bit.ly/3GfHOgf

Zhang, Y. et al. "The Concept, Approach, and Future Research of Hydrological Connectivity and its Assessment at Multiscales." *Environmental Science Pollution Research*. no. 28 (August 2021).