

POLICY PAPER

**BREAKING POINT:
THE COLLAPSE
OF LEBANON'S WATER SECTOR**

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HOW MISPLACED AID, ELITE CAPTURE, AND A DEVALUED CURRENCY ARE CAUSING CRISIS IN THE WATER SECTOR





EXECUTIVE SUMMARY

Lebanon's worsening fuel shortage is not only bringing cars to a standstill; it is also reducing access to water for millions of Lebanese people. With the state only able to provide electricity for a few hours per day, and diesel for private generators increasingly scarce, water pumps across the country are grinding to a halt, causing shortages of this most basic necessity.

The ongoing economic crisis which lies at the heart of the current fuel shortages is exposing other frailties in Lebanon's fundamentally flawed hydrosocial cycle – a term for society's relationship with its water. Many can no longer pay their water bills. Those who can are paying in greatly devalued Lebanese Lira, an entirely inadequate revenue stream to maintain the already-faltering water administration bodies and their US dollar expenditures. While currency devaluation is a recent development, there are few signs of the Lebanese Lira returning to its old value in the immediate or medium term future.

A corrupt and mismanaged state which deliberately promotes private interests above the benefit of the people brought about this dismal state of affairs. Since the 1990s, water sector reconstruction policies designed by donors imposing neoliberal conditions and a vested ruling elite have pushed the sector towards privatisation and debt reliance. Comprehensive mismanagement at all levels of water policy and administration has imposed extra cost burdens on Lebanese citizens in order to access basic water services through the private sector.

Like other aspects of Lebanon's post-war development, the water sector was on dubious financial ground from the start. At its core, lay now-failed financial instruments,

a reliance on US dollar loans, subsidies to fund activity, and mechanisms to reclaim costs in Lebanese Lira.

Even before 2019, outflows of US dollars in the forms of large-scale infrastructure projects, fuel and electricity costs, private sector profits and debt repayments were not matched by revenue inflows to state water providers in Lebanese Lira. While the illusion of future sustainability could be maintained when rising interest and debt secured the currency peg, the failure of market and private sector-oriented approaches to water provision is now glaringly obvious.

The collapse of the Lebanese Lira and US Dollar shortages now mean the entire system is at breaking point, from the fuel inputs to run essential services to citizens' abilities to pay for public or private water.

The environment has been a major victim of this exploitative unregulated hydro-social cycle. Unmanaged waste dumping from households, agriculture and industry is leaching into ground water, river systems and the sea, killing fish stocks and destroying ecosystems and valuable community resources. Heavy metals and carcinogenic pollutants dumped into the water system now enter the food chain and are found in soil and common vegetables.

Despite 30 years of disastrous water sector mismanagement, the latest master plan – published after the onset of the 2019 financial crisis – promotes the same failed prescriptions. Propping up Lebanon's flawed water management system is guaranteed to end in disaster. Only people-oriented structural reform can bring about basic levels of social and environmental sustainability, achieving balance in Lebanon's hydrosocial cycle.



THE COST OF FAILURE

For decades, citizens and the environment alike have paid the price for the Lebanese state's widespread failings in the water sector. Although on paper a relatively high number of Lebanese households are connected to public water, distribution is deeply skewed, leaving many rural communities with little or no access for most of the year. Meanwhile, some half of the country's water infrastructure is in desperate need of modernisation.¹ Now, the consequences of a currency crisis – such as nationwide fuel shortages – are exacerbating an already fragile distribution and treatment network.

As is often the case in Lebanon, the price paid for the state's deficiencies has always been unevenly and inequitably distributed. Poorer, geographically remote communities spend more on accessing water than richer, urban segments of society. According to one study, 25 percent of low-income households in Beirut spent more than a \$100 a month on various sources of water in 2009 – the most recent report of its kind.² Those who lack political connections and patronage networks also tend to pay more for water.

The sector's failings are not only expensive for Lebanon's citizens; they also cost the government millions of US dollars every year. A 2009 public expenditure review, the latest of its kind, estimated that water mismanagement cost the state 2.8 percent of GDP.³ This expense is likely to be even greater today, as the economic crisis has hamstrung the most basic functioning of many state institutions. According to the latest available information, the state lost a further 1.3 percent of GDP from

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household spending on private sector water, and 0.5 percent from hidden government costs.⁴

International loans and grants – which provide the vast majority of investment in the water sector – also represent extra hidden costs to the system. Even when given at concessional rates, most loans must eventually be repaid with interest. In the case of grants, funds provided to pay for foreign expertise or material are often repatriated in the form of foreign contractors and consultants, meaning that the money never enters Lebanon's economy.

The environment also suffers from Lebanon's aquatic inadequacies. Unchecked pollution is degrading water systems to the point where they cannot sustain life,⁵ and water-borne disease cases associated to bad water quality, have nearly doubled since 2005.^{6,7} Heavy metals and carcinogenic pollutants dumped into the water system – by industry agriculture, and illegal household dumping – enter the food chain and are found in soil and common vegetables.⁸ Wastewater provision is also substandard with a staggering 90 percent of sewage running untreated into watercourses and the sea.⁹ In greater Beirut alone over three hundred thousand cubic metres of untreated



wastewater flows into coastal waters every day with disastrous effects on marine life and fish stocks.

Meanwhile, the country faces over-extraction which causes summer groundwater levels to recede and aquifers to be depleted, which in turn reduces well yields and increases pumping costs.¹⁰ Regional climate change exacerbates this pattern. River systems are so weak that they do not reach the sea for five to six months of the year. This increases pollutant concentration and threatens aquatic ecosystems when industrial and agricultural pollutants – which are also unregulated – discharge into the sea.¹¹

Although quantifying the economic impact of these devastating practices is difficult, the World Bank estimates that environmental degradation from water pollution costs the country 1 percent of GDP every year.¹² This cost, alongside multiple ruinous societal consequences, is especially dispiriting given that Lebanon boasts the fourth-highest water endowment in the MENA region.¹³ Unfortunately, the roots of this flawed and underperforming sector run deep. Now, Lebanon's economic crisis is exposing these systemic failings which have their origins in the reconstruction period following the Lebanese civil war (1975-1990).

WATER OR WASTA?

Sectarian power jostling in the post-war reconstruction period set the scene for Lebanon's water sector's current disarray and broken hydrosocial cycle. Much like other service provisions, water management quickly fell prey to political patronage networks which dominated the reconstruction era; powerful figures benefited from the sector by hiring personnel of their choosing and distributing contracts as they saw fit.^{14,15}

Besides creating an inefficient and contradictory water administration system (See Box I), sectarian bickering also interrupted the legislative process, stalling crucial legislative reform. For example, the 2005 draft Water Code – which would have fundamentally overhauled the water sector – were blocked by disputes over the leadership of the High Council for Water.¹⁶ The law's final iteration was ratified in 2018 under pressure to obtain some of the \$11 billion promised through the CEDRE donor conference. Yet by 2020, no implementation decrees – the legal text organizing the practical implementation of laws – had been articulated.¹⁷

BOX I: Overstaffed and underperforming

Lebanon's water management system suffers from an over-complicated set of administrative arrangements across state agencies, public corporations, and private companies. Eleven state administrative bodies – excluding municipalities – hold overlapping responsibilities and compete over managing water resources, from producing infrastructure to operating services such as water supply, irrigation, and wastewater treatment. The main bodies are the Ministry of Energy and Water (MoEW), Council for Development and Reconstruction (CDR), and four regional water establishments (RWEs) which are public corporations run by the MoEW. The RWEs are the Bekaa Water Establishment (BWE), Beirut Mount Lebanon Water Establishment (BMLWE), the North Lebanon Water Establishment (NLWE), the South Lebanon Water Establishment (SLWE). A fifth establishment, the Litani River Authority (LRA) is responsible for the management of the Litani River, specifically irrigation and power generation. Water use and demand is also shaped by broader sets of institutions, regulations and processes determining water and land use, import tariffs, and commodity prices.¹⁸ They include the Ministry of Agriculture



(MoA), Ministry of the Economy (MoE), Ministry of Public Health (MoPH) and Ministry of Environment (MoEn). Private actors are then heavily involved in construction and service contracting, and infrastructure management, bottling and trucking. Many of these bodies overlap. The CDR and the MoEW, for example, have similar responsibilities in planning and implementation. RWEs and municipalities also lack coordination; in fact, their relationship is often defined by competition over funds.^{19,20} Water can be used as a bargaining chip in this incoherent and competitive administrative network (See Figure I).

Frequent interruptions of the legislative process also stymied government budgets, essential for planning and allocating specific sums to ministries. No such budgets were ratified between 2005 and October 2017 meaning that the Ministry of Energy and Water's budget was not adjusted to meet changing needs for over a decade.²¹

In the absence of adequate finances and a strong, central water policy, and administration, the government looked to foreign funding to keep water in the taps. Since 1992, some \$3 billion of foreign funding has entered the water sector. The World Bank, the European Investment Bank, Agence Française de Développement, the Kuwait Fund for Arab Economic Development, and the Saudi Fund for Development number among the largest donors.

The main channel for receiving foreign funding is the Council for Development and Reconstruction (CDR), a body responsible for reconstruction and associated contract negotiations with donors (See Figure II). Since ministries did not have engineering and technical capabilities, the CDR came to dominate project implementation too. Coupled with donor priorities, this dominance has emphasised large-scale projects and top-down planning in

which grand visions overlook local water establishments' capacities and local communities' concerns.

MONEY DOWN THE DRAIN

Although foreign funding brought much-needed financing to water infrastructure projects, it did so at a price. Successive broadscale water plans and billions of US dollars in investment have failed to establish an equitable and efficient water system.

One major reason is that donors favoured large projects such as dams and centralised treatment facilities; by contrast, little attention was paid to the infrastructure connecting these eye-catching centrepieces. Irrigation networks, for example, are conspicuously lacking in donor-funded infrastructure projects. While approximately 60 percent of water is used for irrigation there has been general neglect of the agricultural sector, a key element of water policy. Since the civil war, the Ministry of Agriculture (MoA) has consistently received less than 0.5 percent of the government's annual budget.²²



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LEBANESE GOVERNMENT AND PARLIAMENT

Parliament and the government are responsible for passing draft laws, implementation decrees and budget allocations to ministries.



Policy Making, Master Planning and Implementation



Regulation and Enforcement

Ministries overseeing water use and water security policies are asked with setting and implementing regulations on licensing, water use and water quality.



Accountable to the prime minister, the CDR was intended to assess infrastructural needs arising from the civil war and allocate funding for reconstruction. It has been the primary channel for overseas funding of water investment.

MUNICIPALITIES

Municipalities manage individual water supply and wastewater schemes. They have the formal ability to approve or block any project via the granting of construction permits.

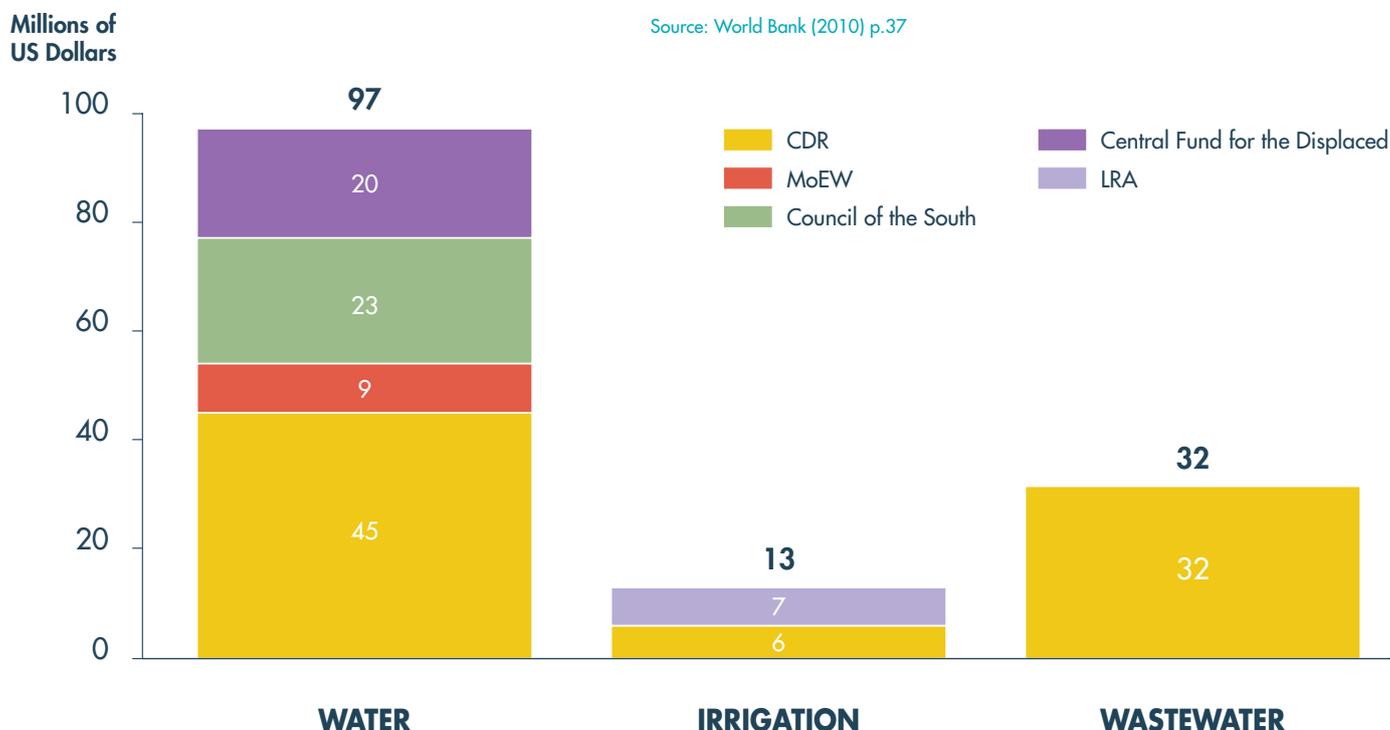


Regional Water Establishments are formally 'public corporations'. They are legally responsible for operation, maintenance and fee collection in water, wastewater and irrigation services.



Figure II: Capital Expenditure (2008) Prices by Agency and Sector

Source: World Bank (2010) p.37



BOX II: No lessons learnt

The most recent master plan – the 2020 National Water Sector Strategy Update – compiles multiple studies from international development actors. It includes a detailed analysis of administrative weakness at all levels. Like previous plans it fully embraced market environmentalist principles and identifies consumers as crucially responsible for the functioning of the service.²³ Yet why citizens would engage failed state institutions unable to provide reliable service at the weakest moment of citizen trust in the state is not explained. The plan identifies investment needs of about \$8 billion to 2035 but is unclear on the sources of funding. There is little discussion on how planning can react to the multiple crisis nor how the political and economic process share responsibility for the state of the water sector. Water sector management remains excluded from public political discussion, and planning and administrative reform are treated as technical issues.

Moreover, bodies charged with running and maintaining the water grid lack sufficient funding and training. Regional Water Establishments (RWEs) frequently lack the expertise and funding to properly operate donor-funded infrastructure, such as treatment plants. In some cases, plants are even constructed without considering the networks connecting them. As seen in figure II, the Ministry of Energy and Water (MoEW) provides little in capital investment and support to the RWEs for maintenance and operation, leaving them functioning on a shoestring.²⁴ One of the few exceptions to this rule is the US\$300 million Jannah Dam project implemented by the Beirut Mount Lebanon Water Establishment (BMLWE) in 2013. However, it is likely that this project only received the requisite investment because it benefited two local concrete suppliers.^{25,26}



Figure III: Regional Water Establishments' Estimated Fee Collection Rates

Source: National Water Sector Strategy Update (2020)



Short-sighted investment priorities have led to poor investment efficiency, illustrated by financial losses in the water sector. Only 50 percent of water used is paid for during production and consumption. RWEs often absorb this enormous financial loss in their budgets.²⁷ Meanwhile, only a fraction of investments and planned additional volumes of water service earmarked for the sector have in fact been spent.²⁸ Of the nearly \$2.5 billion planned to be spent on dams between 2010 and 2020 less than 15 percent was actually spent.

Investment in Lebanon's wastewater sector is also inefficient. Long-standing freezes on government hiring and a lack of adequate salaries to hire experts has meant the MoEW and their supplementary RWEs lack the technical and management expertise to fulfil their mandated responsibilities.

It is no surprise that the National Wastewater Sector Strategy remains ink on paper, despite ambitiously aiming to "increase the present wastewater collection (60%) and treatment (8%) to 80 percent collection and treatment by 2015, and 95 percent collection and treatment by 2020."²⁹ A recent water reuse study

showed that only around 30 percent of all wastewater receives any treatment while only about 10 percent receives secondary or tertiary treatment.³⁰

MARKET MEETS ENVIRONMENT

Donors such as the World Bank also insisted on de facto privatisation and consumer fee collection as the model for Lebanon's future water sector. This set of policies can be broadly described as "market environmentalism," since it seeks to apply market institutions to natural resource management as a means of reconciling goals of efficiency and environmental conservation. This model champions the private sector as a management solution and sees markets and pricing as an optimal distributive and demand control mechanism.

Most importantly, market environmentalism necessitates that RWEs recover all operating and maintenance cost from consumer fees. Successive water sector master plans, RWE by-laws, and more importantly the 2018 Water Law, have all been premised on supporting market environmentalist principles.³¹



Unfortunately, several factors have undermined the premise of cost recovery through fee collection.

RWEs' management capacities received little investment, rendering them chronically underfunded, understaffed, and unable to collect sufficient fees. The situation is much the same today, despite some 20 years of technical assistance projects by international donors and agencies.

Fee collection rates, therefore, have remained unsustainably low compared to RWEs' investment, operation, and maintenance needs, as seen in Figure III. This is true even in Beirut where revenues are considerable and collection rates are far above those of the other RWEs. RWEs even lack enough money to pay for electricity bills; even before the current financial crisis, the four establishments owed billions of Lebanese Lira to Electricite du Liban (EDL).³² Without subsidies from the MoEW and extremely generous grace periods on payments from EDL and other electricity suppliers, RWEs would be unable to operate. An imminent end to fuel subsidies will further undermine RWE's ability to pay for fuel necessary to pump water.

Now, Lebanon's currency crisis has exposed the full limitations of cost recovery through fee collection. Rapidly declining purchasing power has decimated RWE revenues. As early as February 2020 all water establishments directors reported reductions in fee collection.³³ On top of lower collection rates, whatever dwindling revenues that remain are now worth a fraction of their former value. Salaries and fees remain in Lebanese Lira, while material for maintenance and repairs or renewal and extension of networks are imported and priced in US dollars. As a result, the tariff structure proposed in the

National Water Sector Strategy Update from 2020 has become obsolete.

Redundancies and reduced hours have pushed the most qualified RWE employees to leave Lebanon for better paid jobs either with development agencies in Lebanon or abroad, further eroding RWE staff structure and capacities.

BOX III: Dearth of data

Effective and equitable water resource management requires comprehensive data and knowledge which Lebanon is completely lacking. While uncertainty exists regarding actual water availability, successive master plans have used lower estimates of 8.6 billion cubic metres to emphasise scarcity and justify supply side interventions – such as a reliance on building more dams – and higher prices under market-oriented policies. However, a range of studies put Lebanon's yearly average at closer to 9.3 or 10 billion cubic metres.³⁴ The latest master plan published by the Ministry of Energy and Water³⁵ (MEW) – the 2020 National Water Sector Security Strategy Update (NWSSU) relies on readings that expect no change in precipitation.³⁶ However more severe drought impacts have already been observed³⁷ and temperature rises³⁸ will lead to increases in water needs and demand, higher evaporation, and lower spring and river flows.^{39,40} There is also divergence in estimates of the population size that water policy should be serving. The NWSSU uses the highest population estimate of 6.5 million⁴¹ to guide its infrastructure needs and contract volume provisions. The Central Administration of Statistics however estimated there were 4.8 million people in Lebanon in 2019.⁴² Even knowing how much water is being extracted is near-impossible.⁴³ A combination of donor requirements and questionable administrative priorities have failed to prioritise knowledge production, resulting in this running-blind situation. The NWSSU outlines \$16 million is needed for data production projects and investments over the next 10 years.



PRIVATE GAINS

The private sector has stepped into many critical gaps left by state bodies failing to fulfil their designated functions. Local and international private companies – including multinationals such as Veolia, Nestle, and Pepsi – profit enormously from the dysfunctional sector. Lebanon's water bottling sector alone is worth \$160 million annually.⁴⁴ A 2009 World Bank report estimated yearly total revenues from water supply at around \$411 million – of which 75 percent were private sector revenues and 25 percent government revenues.⁴⁵ The majority of household expenditure goes to private contractors; these costs are predominantly spent on bottled water (51%) and trucking (21%).

Private water delivery services have replaced underfunded and mismanaged state water administrations across the country. In Beirut and Mount Lebanon, for example, public water rationing is severe and limited to only three hours per day in summer, compared to 13 hours winter.⁴⁶ This has led to the emergence of alternative service delivery options at various price ranges; a 2019 study priced per-litre water providers at 1 Lira for public water, 30 Lira for tanker water, and 345 Lira for bottled water.

Bottled water – used by 80 percent of households for drinking⁴⁷ – spring water, trucking for household use, and pumping from wells can consume considerable portions

of household income for low-income households.⁴⁸ On the other end of the spectrum, the wealthiest in Lebanon have access to technical solutions such as reverse osmosis plants as standard features of luxury housing and regular groundwater trucking. If the hydrosocial cycle is maintained in its current form, bottled water will always enjoy a bright future. Before the economic crisis, some even predicted growth rates for this essential good of 15 percent.⁴⁹

Water injustice also extends to the agricultural sector where export-orientated farming has encouraged production of relatively water intensive crops. Unequal distribution of water is reflected in land distribution. The agricultural census of 2012 shows irrigated land ownership is more highly concentrated than overall land ownership. The top 1.8 percent largest landholders with holdings larger than 10ha hold 33 percent of all arable and land and 42.6 percent of all irrigated land. In contrast the bottom 70 percent of land holders with holdings on 1ha or smaller hold only 15.2 percent of irrigated arable land.⁵⁰

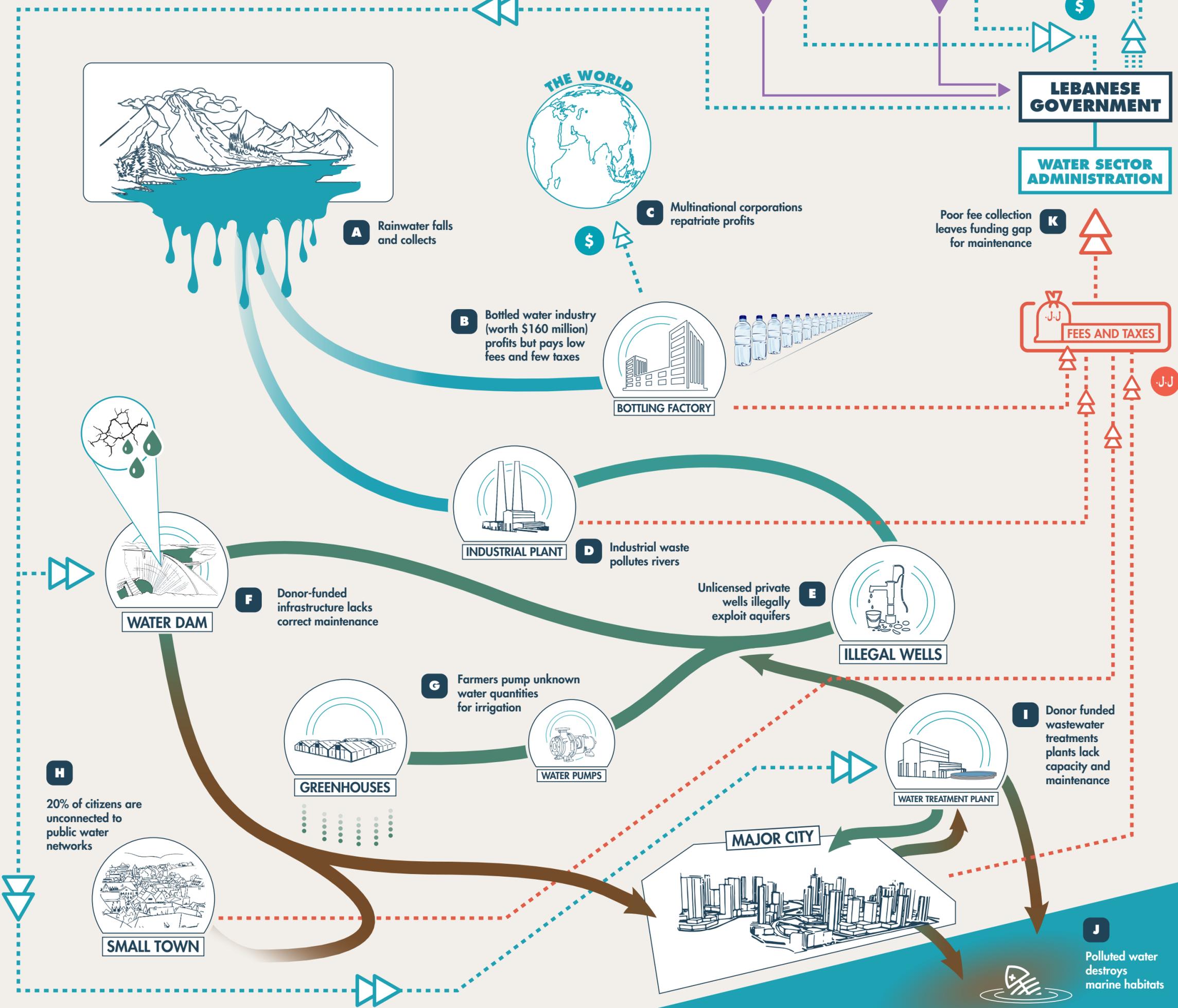
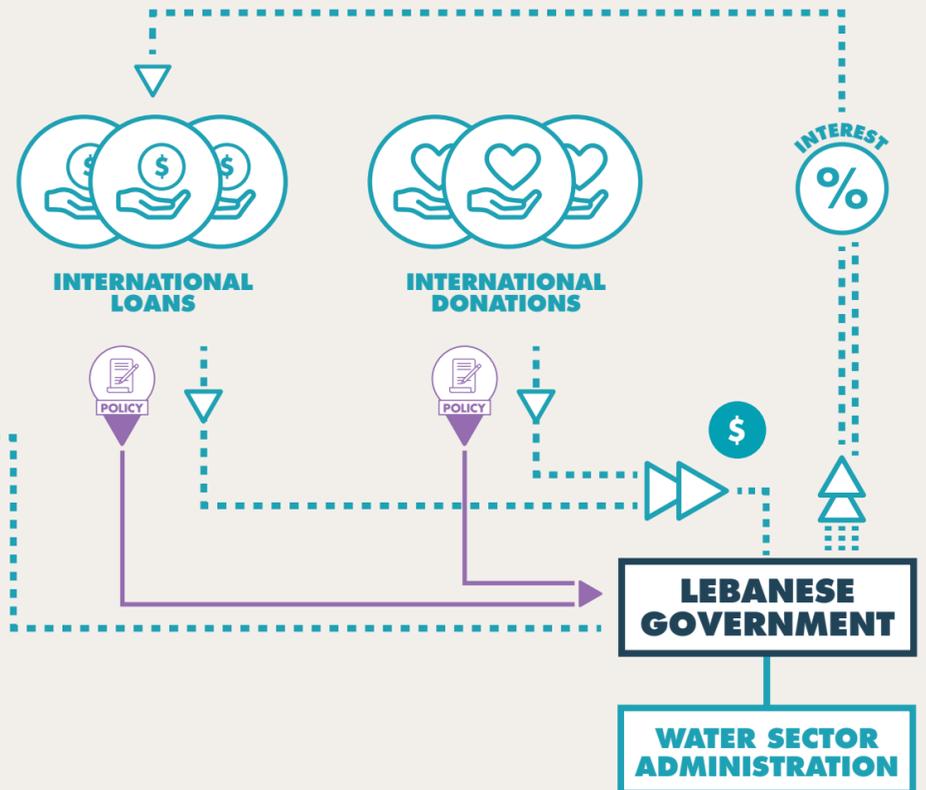
It is estimated that more than 50 percent of all water used in agriculture is drawn from groundwater. Of an estimated 100,000 wells throughout Lebanon fewer than 30,000 are licensed. This reflects the Ministry of Energy and Water's inability to regulate and enforce well drilling regulation and poor irrigation management capabilities in RWEs.

“Private water delivery services have replaced underfunded and mismanaged state water administrations across the country.”

LEBANON'S UNSUSTAINABLE HYDROSOCIAL CYCLE



Source: Eid-Sabbagh, Karim-Philipp (2015) A political economy of water in Lebanon: water resource management, infrastructure production, and the International Development Complex. PhD thesis. SOAS, University of London.





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“The market environmentalist approach to water management must be replaced by a commons-based approach to water as a common good comprising one element of a social protection floor.”

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Unfortunately, the government has struggled to catch any of the windfalls brought by the lucrative private water sector. Large brands such as Pepsi, Nestle, Rim, and Tannourine account for some 30 percent (\$60 million prior to 2019) of the market before the financial crisis.⁵¹ The rest of the market is shared between approximately 1000 localised bottlers – of which only 42 are licensed by the Ministry of Public Health. Most do not pay the already cheap government fees of 600 Lira per cubic meter as mandated by law.⁵² The trucking sector is also lucrative with estimated revenue of \$80 million per year before 2019.⁵³

Other beneficiaries of Lebanon's dysfunctional hydrosocial cycle are private contractors and the donors themselves. A considerable proportion of loans provided to the water sector ends up in the pockets of local and international contractors. These companies, which include multinational corporations, provide high-value technical components as well as multi-year operations contracts with quasi-guaranteed profits. Meanwhile, donors themselves are set to receive their money back with interest, albeit at preferential terms typically below 2 percent interest.

RECOMMENDATIONS

Without a radical transformation of political structures and coherent planning, water sector reform will remain elusive, hampered by the excesses of self-interested governance and reliance on international

donors. Effective water resource management policy presupposes that a state is able to plan, implement, regulate, and enforce regulations – a context completely lacking Lebanon at the time of writing.

Sustainable planning efforts will need to be rooted in the financial capacities of a functioning and capable state. Full cost recovery is an unrealistic scenario for the coming decade, at the very least. Given this reality, there will be no choice but to increase water revenues through better-regulated and equitable pricing and taxation.

The market environmentalist approach to water management must be replaced by a commons-based approach to the hydrosocial cycle, in which water is a common good comprising one element of a social protection floor.⁵⁴ Foreign examples of such policy reversals toward re-municipalisation of water services provide case studies to learn from.⁵⁵ In the Lebanese context, re-municipalisation of water services could rapidly transform currently disparate popular actions into a movement for just, equitable, and environmentally sustainable water management.

Lebanese municipalities already enjoy a central role within water related issues, acting as important interlocutors between local communities and regional water establishments. These decentralised authorities have proved themselves capable of operating water supply systems, contributing to their improvements, mediating, and resolving conflicts around water, and



successfully running wastewater treatment plants.⁵⁶ Municipalities are also key negotiators, with the power to approve or prevent projects being implemented on their territories.⁵⁷ Working with these municipalities to help them articulate their own discourse and priorities would influence policy debates towards participatory water ownership and management within a commons-based framework.

Rather than appealing to the state for the enforcement of rights, a commons-based approach also centres on people's co-production of their water. In the face of state and market failure, the management of resources by end users most affected in health and ecological outcomes is necessary.

This perspective promotes collective management of water systems by communities and means claiming substantive popular participation along all stages of the development process – even at the master planning level. This must not be confused with the decentralisation and devolution of responsibilities of advocated by proponents of market environmentalism.

Rather than shifting and diluting responsibilities, such a process would seek to keep the responsibility within the state, answerable and sanctionable to a movement of communities. It will be up to those groups and individuals who take up this struggle to develop the strategies and language to anchor such a conception in the practice of organising.⁵⁸

One possible starting point for action would be in municipalities involved in discussions with the central administration over water and wastewater projects and their implementation. Municipalities are in a strong position to demand water administrations engage

in a more adaptive and participatory approach to planning and implementation.

Water resource management approaches will have to shift away from large infrastructure projects wherever possible. The risks of funding shortfall to large technical systems that require considerable amounts of capital to remain operational are tremendous. Funding shortfalls, along with RWEs inability to maintain infrastructural assets priced in US dollars will continue to pose a major risk if unaddressed.

Low cost and low maintenance technologies suited to the state's endogenous investment capacities are the primary alternative. An important aspect of such planning and reorientation will be knowledge about the Lebanese hydro-social reality. Measurement of produced volumes and extractions, reduction of system water losses and optimisation of infrastructure efficiency will be important in maximising the potential for low-cost alternative technologies.

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Allès, C. (2019). La dimension spatiale de l'État au Liban. Une analyse à partir des politiques publiques de l'eau potable et de l'assainissement (Doctoral dissertation, Université de Nantes).
Eid-Sabbagh, K. P. (2015). A political economy of water in Lebanon: water resource management, infrastructure production, and the International Development Complex (Doctoral dissertation, SOAS, University of London).
- 25 The project is strongly related to Bassil Gebran and represents the sectarian balancing to the Bisri dam project. In both cases the two local concrete producers were to benefit.
- 26 Roland Riachi (2013), Karim Eid-Sabbagh (2015), Christelle Alles (2019) make these arguments in in-depth studies of the sector.
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- Eid-Sabbagh, K. P. (2015). A political economy of water in Lebanon: water resource management, infrastructure production, and the International Development Complex (Doctoral dissertation, SOAS, University of London).
- 27 The Janneh Dam (90 MCM/year) has been under construction since 2014, the Bisri dam project (with an estimated volume of 120 MCM/year) has been effectively cancelled. The Msaileh dam is empty. Similarly, the South Lebanon Irrigation Project (known as Canal 800) remains incomplete, and construction suspended due to the current crisis. Institutional, and organizational reform has not produced substantial results, the tariff structure remains inadequate nor other financial and operational benchmarks of the 2012 plan being met.
- 28 The Janneh Dam (90 MCM/year) has been under construction since 2014, the Bisri dam project (with an estimated volume of 120 MCM/year) has been effectively cancelled. Msaileh is empty. Similarly, the South Lebanon Irrigation Project (known as Canal 800) remains incomplete, and construction suspended due to the current crisis. Institutional, and organizational reform has not produced substantial results, the tariff structure remains inadequate nor other financial and operational benchmarks of the 2012 plan being met.
- 29 That a separate wastewater strategy was produced highlights the ongoing inter-administrative competition. The director of a bilateral development agency interpreted this fact as being related only to politics of appearance and competition between different factions in the ministry and judged as unnecessary: "If cooperation in the ministry would have been better, then this wastewater strategy would not have been necessary. But it was about egos. One advisor wanted to do the same as the other advisor and the World Bank also wanted to participate somewhere with something. Support for the wastewater part of the national water strategy could have been better." (GIZ Lebanon Director quoted in Eid-Sabbagh 2015, p. 120).
- 30 Eid-Sabbagh, K. Et al. 2021.
- 31 See Eid-Sabbagh, K., 2015. p.141-142. Also Catafago, S. and Jaber. B., 2001. Monographies de l'eau au Liban. Sophia Antipolis, France: Plan Bleu.
- 32 By early 2020 the North Lebanon Water Establishment (NLWE) owed 80 billion Lira in unpaid electricity bills, the Beirut Mount Lebanon Water Establishment (BMLWE) owed 60 billion Lira over three years, and the Bekaa Water Establishment owed \$5.6 million in 2017, while the South Lebanon Water Establishment (SLWE) owed nearly US\$6 million to EDL The bills of the SLWE is highest on a per capita basis because in the south water has to be pumped from deeper aquifers, incurring high energy cost. See Water Governance in Times of Crisis - Issam Fares Institute for Public Policy and International Affairs (IFI), https://www.facebook.com/watch/live/?v=569065650359961&ref=watch_permalink
- 33 The BMLWE recorded a 25% reduction in late 2019, in the Bekaa collection rates dropped from 35% to 12%. The SLWE reported a drop of 50% and the NLWE also expected to see large contractions.
- 34 Shaban, A. (2020). Water resources of Lebanon. Springer International Publishing. and MEW and UNDP, 2014. Assessment of Groundwater Resources of Lebanon. Beirut, Lebanon.
- 35 MEW, 2020. National Water Sector Strategy Update. V - III A 3 - .
- 36 Ad dangerously optimistic strategy given the uncertainties regarding climate change modelling, specifically regarding positive feedback mechanism and the potential qualitative transformation of the climate system this might entail. The precautionary principle as posited in the NWS-SU would suggest that at least and assessment of worst-case scenarios should be considered at least for discussion.
- 37 For example: Tyrllis, E., Škerlak, B., Sprenger, M., Wernli, H., Zittis, G., and Lelieveld, J. (2014), On the linkage between the Asian summer monsoon and tropopause fold activity over the eastern Mediterranean and the Middle East, *J. Geophys. Res. Atmos.*, 119, 3202– 3221, doi:10.1002/2013JD021113.
- 38 Lelieveld et al 2016 Lelieveld, J., Proestos, Y., Hadjinicolaou, P. et al. Strongly increasing heat extremes in the Middle East and North Africa (MENA) in the 21st century. *Climatic Change* 137, 245–260 (2016). <https://doi.org/10.1007/s10584-016-1665-6>
- 39 Peak river flow is expected to occur "15 days to a month earlier" so extending the summer drought period, see Hreiche et al 2007. Modelling further predicts that by 2034 to 2040 spring flows will start receding a month earlier and total flow volumes will decrease. see Doumar et al (2018). Hreiche, Antoine, Wajdi Najem, and Claude Bocquillon. "Hydrological impact simulations of climate change on Lebanese coastal rivers/Simulations des impacts hydrologiques du changement climatique sur les fleuves côtiers Libanais." *Hydrological Sciences Journal/Journal des Sciences Hydrologiques* 52.6 (2007): 1119-1133. Doummar, Joanna, Assaad Hassan Kassem, and Jason J. Gurdak. "Impact of historic and future climate on spring recharge and discharge based on an integrated numerical modelling approach: Application on a snow-governed semi-arid karst catchment area." *Journal of Hydrology* 565 (2018): 636-649. Doummar, Joanna, Assaad Kassem, and Jason J. Gurdak. "Impact of future climatic scenarios on spring discharge signals based on an integrated numerical modelling approach: Application on a snow-governed semi-arid karst catchment area." EGU General Assembly Conference Abstracts. 2018.
- 40 Waha, K., Krummenauer, L., Adams, S. et al. Climate change impacts in the Middle East and Northern Africa (MENA) region and their implications for vulnerable population groups. *Reg Environ Change* 17, 1623–1638 (2017). <https://doi.org/10.1007/s10113-017-1144-2>
- 41 MoEW (2020) 'NWSU', p. 1 – 18.
- 42 This includes Palestinian and Syrian populations. CAS, 2019. Labour Force and Household Living Conditions Survey. Beirut Lebanon.
- 43 Of 1449 public wells only, about two thirds are operational. 270 million m3 year is drawn from groundwater according to estimates in the NWS-SU. In 2010 the NWSU claimed 44 000 wells existed at least and 100 000 existing wells were estimated in 2017 by research on groundwater governance. Private wells are estimated to produce 430 million m3 per year. This totals 200 MCM more than currently suggested in available in the water budget. Water usage levels are equally uncertain. Estimates vary wildly between 150 l per capita per day to 300-400 per capita per day domestic use. NWSU estimates place irrigation requirements at around 880 million m3 per year – expected to rise to 930 million m3 by 2035 but present daily use is unknown but estimated to be lower.
- 44 The market value of bottled water is 160 million USD or about 20% lower than the WB estimate. Cochrane, P. 28.07.2017. The big Lebanese thirst, Executive magazine. <https://www.executive-magazine.com/economics-policy/the-big-lebanese-thirst>
- 45 M. Sarraf, B. Larsen and M. Owaygen. 2004. Cost of environmental degradation – The case of Lebanon and Tunisia, Paper No. 97, Environmental economics series, Washington DC: World Bank
- 46 World Bank, 2010 Republic of Lebanon – Water sector: public expenditure review, Report No. 52024-LB, Social and Economic Development Group, Middle East and Africa Region
- 47 Central Administrations of Statistics, International Labor Organisation (2020), Labour Force and Household Living conditions Survey 2018-2019 Lebanon, Beirut.
- 48 According to one study 25% of low-income households spent more than a US\$100 a month on various sources of water in 2009. Depending on the different cost sharing agreements, types of service connections and consumption patterns, the study found that water costs per household in Beirut's Hamra area could exceed US\$150 a week (especially in summer). In rural areas public water rationing can be as severe for two or three times per week for limited hours. See Eid-Sabbagh, Karim-Philipp (2015) A political economy of water in Lebanon : water resource management, infrastructure production, and the International Development Complex. PhD thesis. SOAS, University of London. p. 202-204 DOI: <https://doi.org/10.25501/SOAS.00020365>
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- 51 Molle, F., et al. (2017). Groundwater Governance in Lebanon, The Case of Central Beqaa- A Policy White Paper. IWMI, Columboi, Sri Lanka. p.9
- 52 Chardon, L. august 2011. Les Busines de cammion citerne. Le Commerce du Levant. Beirut.
- 53 In this sense it is also sensible to question the utility of contracting a multinational company to produce water for sale when it repatriates profits derived from the exploitation of Lebanese resources.
- 54 McDonald, D. A. (2018). Remunicipalization: The future of water services?. *Geoforum*, 91, 47-56. Special McDonald, David A., and Erik Swyngedouw. "The new water wars: Struggles for remunicipalisation." *Water Alternatives* 12.2 (2019): 322-333. *Water Alternatives*, 2019. Themed Section: Remunicipalization: The future of water services? Guest Editors: David A. McDonald and Erik Swyngedouw. Volume 12 | Issue 2 <https://www.water-alternatives.org/index.php/tp1-2/1906-vol12/338-issue12-2>
- 55 Satoko Kishimoto, Emanuele Lobina, Olivier Petitjean, 2014. Here to stay Water remunicipalisation as a global trend. <https://www.tni.org/en/publication/here-to-stay-water-remunicipalisation-as-a-global-trend>
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- 56 Examples of municipalities' important and diverse roles can be found in case studies referenced in this paper including the towns Ali Nahri, Addaisseh, Zghorta, Ablah, Forzol, Hamana, and Aitanit.
- 57 Protests in Hamana, Bisri, Jannah (against the Blue gold project) are examples of municipalities' negotiating power in the water sector.
- 58 For an in-depth discussion of notions of the commons see for example: Bakker, K. (2007). The "commons" versus the "commodity": Alter-globalization, anti-privatization and the human right to water in the global south. *Antipode*, 39(3), 430-455.
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