RE-TOOLING RELEASED TERRITORIES

PRODUCTIVE DESIGNED ECOLOGIES IN THE DEMINED LITANI WATERSHED

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While most hostilities end at ceasefire, post-military landscapes contaminated with cluster munitions and unexploded ordinances maintain the status of war for years later. They incapacitate the impacted land and community through depriving the right to land, particularly in countries like Lebanon where the cost of cleaning mines and UXOs is inhibitive. There are 2000 types of mines around the world today, existing in more than 58 countries (ICBL-CMC, 2017). Being denied access to once-agricultural land plots leads to soil erosion and degradation, deforestation, as well as a loss of biodiversity. This causes a reduction in land value and productivity, and a change in ecosystems, landscapes and ecological services, which can translate into adverse socioeconomic impacts affecting local livelihoods as well as the national economy. By the end of the 2006 34-day hostilities, the Lebanese territory was left with around 34 million m2 of land infested with over one million unexploded cluster munitions, 62% of the impacted land being primarily agricultural (Alpaslan and Roberts, 2016); and 545 cultivated fields being inaccessible due to the presence of UXO (in the form of artillery shells, cluster bombs, landmines, and rockets) (Darwish, 2009). By the end of 2016, according to the Lebanese Mine Action Center[1], two million m2 of cluster bomb fields and over 550 thousand m2 of landmine fields (LMAC, 2017: 32) were cleared in the same year and released to their respective landlords as 'safe territory'. The question raised is: what then becomes of these territories?

Though subject to a follow-up survey by demining agencies three months post-release, as per the National Mine Action Standards (LMAC, 2016:33), these plots of land are not provided with any further action plan, neither individually nor collectively. What remains is a fragmented patchwork of released private land lots, with exposed soils, eventually overtaken by an emergent ecology, awaiting intervention, investment, or ecological regeneration. The places that therefore remain are those of a terrain vague, characterized by a memory of loss and degeneration, a future of indeterminacy, yet a present strong in its potential as a socioeconomic generator.

This design research project takes as its test grounds the Litani River Basin, one of the heavily mine-impacted agricultural territories, environmentally and socioeconomically. The Litani River is the largest river in Lebanon; its basin area is equivalent to 20% of Lebanon's area.[2] The basin is the largest national producer of potato, and a major producer of apples for export, besides cherries, tomato, and cereals, all of which are vulnerable to climate change (MoE, UNDP, and GEF). The watershed's population, mostly agrarian, spans three administrative governorates and a total of around 240 urban agglomerations (Khawlie, 2007). The valley floor is a carpet of cultivation grounds interwoven with encroaching patterns of expanding regulated, unregulated and informal tented settlements.[3] The Litani River valley is not only debilitated by the repercussions of war, but also by its day-to-day intensive mono-cultural industrial agricultural practices that threaten its long-term longevity. According to the Litani River Authority, the valley suffers from the anarchic exploitation of its groundwater sources in the form of unregulated wells and pumping stations,[4] resulting in stressed aquifers. Its waters are polluted by direct wastewater dumping, factory effluents, and agriculture chemical runoff.[5] Its soils are exhausted, and its topsoils are prone to further erosion and desertification. The urban invasion is expanding, shrinking forest covers, depleting riparian ecosystems, decreasing soil organic carbon (SOC) and organic matter, whilst disrupting carbon and hydrologic cycles.

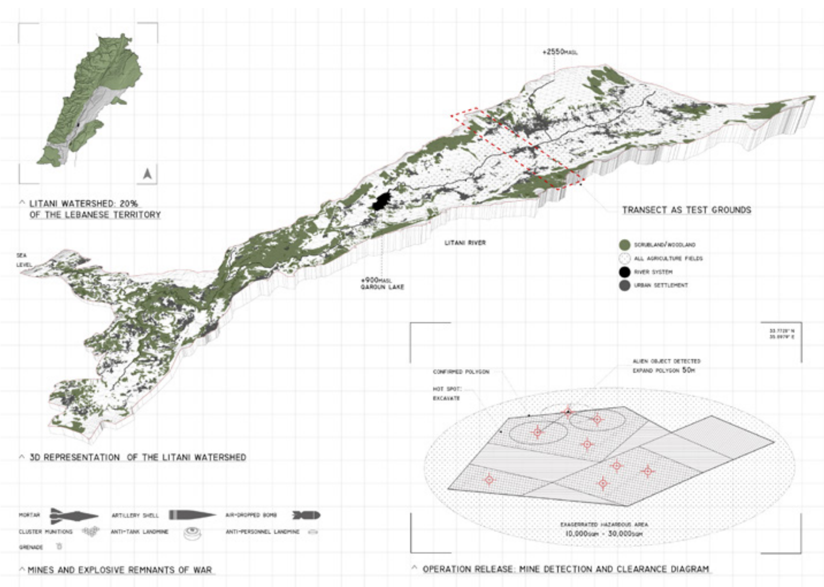

Figure 1

This design research project sees an opportunity in the demined territories in the Litani-basin, as grounds on which to transform the watershed into a ***regeneration machine landscape***, as a comprehensive agro-ecological system. It curates a ***productive restoration*** agenda using landscape planning as an agent for reconciliation with the land. Driven by landscape parameters as design guidelines, this project proposes proactive multi-scalar agro-ecological strategies and a series of contextual designed ecologies[6] as resilient infrastructure. The proposed strategies focus on the regeneration of disturbed topsoil in released land plots and the watershed at large, as well as the reclamation of ecosystem-services critical in the era of climate change. This project accordingly negotiates the role of the landscape architect as the mediator between socio-ecological agendas and organizational structures, and design as a tool for communication with various stakeholders.

The agenda is achieved through the following series of proposed operations that build on the existing operation of land clearance and release.

OPERATION RELEASE

LMAC-teams define large and exaggerated suspected hazardous areas based on combined non-technical surveys and technical surveys in suspected areas. Manual scanners and mine detection dogs direct technical assets to detect hot spots, those with the highest probability of contamination within the hazardous area.[7] The result is a confirmed polygon, a confirmed hazardous area, ranging between 10,000 and 30,000 m2. Manual soil excavation is conducted. The discovery of every new landmine extends the area of investigation by a radius of 10m and that of a cluster bomb by 50m, subject to the same

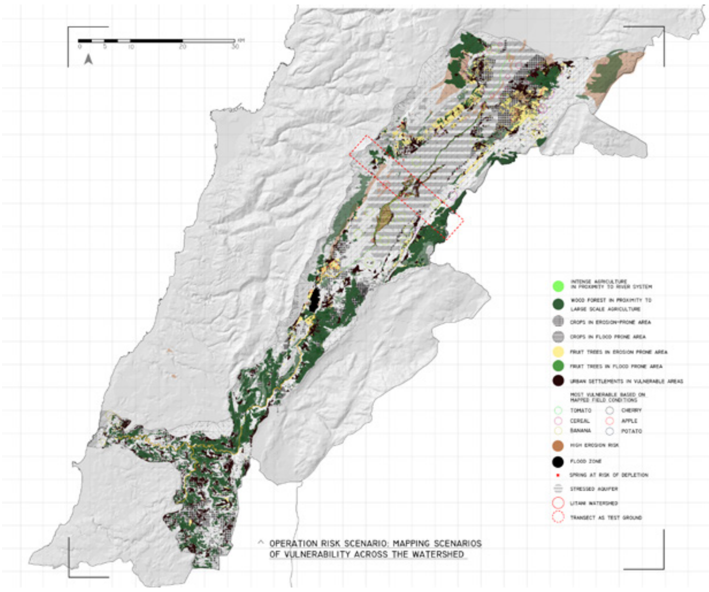

Figure 2

sequence of field operations. The process of clearance for landmines and cluster munitions through manual excavation disturbs no less than 20cm of topsoil (per national standards, with 13cm being the international standard).[8]

OPERATION RISK SCENARIO

Operation Risk Scenario uses Geographic Information System (GIS) to analyze available remotely-sensed geospatial data[9], aiming at spatially defining scenarios of vulnerability across the watershed. This operation is focused on spatializing data from a literature review (national reports on the vulnerability of Lebanon to climate change, on mitigation and recommendations, projections of regional models for climate change, etc.) overlaid with current geospatial data on terrain, surface and subsurface conditions (example: surface and subsurface water, soils, erosion, desertification index, flooding). The current spatial distribution of agricultural fields and the associated practices are closely studied in relation to projected climate changes over time, with a focus on the most vulnerable watershed crops (cherry, apple, potato, tomato, cereal, and banana). The result is a spatialized catalogue of scenarios. It emphasizes the need for site-specific mitigation measures.

OPERATION REGENERATE

Operation Regenerate responds to each of the identified scenarios by deploying a toolkit of agro-ecological strategies that change over time. These strategies are mostly focused on terrain geometries and vegetal processesas active agents of topsoil regeneration and ecosystem services reclamation.

With access to accurate locations of the released polygons denied (because of the sensitive nature of the data itself), the study assumes a transect of 5km by 20km as test ground. The selected transect falls in a previously heavily contaminated area, that also covers a range of the above risk scenarios.

Vegetal agents selected for root performance such as perennial grasses and species are deployed for phytoremediation in scenarios where fertilizer-intensive agriculture (for example potato) drains its agriculture runoff in the river system. The terrain is engineered as a constructed wetland (30m width) to allow for bio-filtration, a diverse vegetal structure, and to mitigate flooding. The introduction of vegetal cover by the river edge (150m buffer) potentially brings back the lost riparian ecosystem and improves the water quality. In scenarios where land in proximity to the river is prone to erosion, the same approach can be applied. In scenarios where agriculture fields are at a high risk of erosion and dust storms are possible, trees such as the Tamarix-species (resistant to drought and poor soils) perform as dust collector. Trees can be combined with cover crops inter-planted with the agricultural crops. Cover crops retain soil moisture, increase organic matter and stabilize soils. Similarly, nitrogen-fixing species such as legumes contribute to regenerating soils while also providing nitrogen. Furthermore, in scenarios of exhausted, poor, and saline soils, halophytic species, massively seeded in intensive crop areas, help extract excessive salts and reduce the fertilization pressure on the soils for a period of five years. Meanwhile, production in controlled environments, and soilless practices like hydroponics and aquaponics[10] could be erected temporarily on the same stressed lots. By the fifth year, remediated soils can be replanted following the same intercropping, cover crop, no-till guidelines. In scenarios additionally facing a depleted water table, densification with trees helps preserve the water level. No-till, dry-land farming and integrated cropping like permaculture combine fruit trees with low-growing shrubs to further reduce stress on soil as well as water resources. Cherry trees, except drought-resistant cherry cultivars, currently planted below 1300 meters above sea level, are relocated to higher elevations. Apple trees are combined with pest-deterring, soil-enriching productive grasses such as lemongrass and dill. Land-forming and micro-terracing on higher elevations control erosion on the one hand, and on the other hand help create micro-climate conditions favorable to tomato. Vermiculture at a household and industrial scale produces an alternative organic soil amendment. Apiculture deploys bee-feeding vegetation masses as continuous corridors. Sentient agriculture (like smart irrigation systems and drone-mapping) allows for the optimized production and allocation of limited resources in areas with large-scale stressed soils. In scenarios where the soil suitable for agriculture is located in proximity to nature reserves and fragmented woodland patches, densification with trees in the form of agroforestry is highly recommended. Agroforestry maintains agriculture production while simultaneously contributing to a larger scale national mass forestation project.[11] Agroforestry maintains a flow between habitats across the territory. As for the areas evaluated as less suitable for long-term agriculture, future typologies of medium-rise high-density urban settlement could be tested along with ag-production in controlled environments.

OPERATION EXPAND

As the operations above expand at the watershed scale, a further nuanced understanding of the terrain and water resources is necessary. Given the accelerated advent of climate change and the indeterminacy of our landscape, it becomes more critical to address the role of landscape as a guide to land management, structuring urban growth in association with questions of food security (Belanger, 2011) in a paradigm shift away from the traditional zoning approach. Could the urgency to simultaneously sequester carbon, reduce the heat effect, replenish the ground table, and feed the nation finally become the guiding parameter of our urban and spatial decisions at a territorial scale?

With ecological agents such as resilient infrastructure, this design research project provokes a speculative spatial model to begin rethinking our agriculture. It capitalizes on the role of the landscape architect as the converging element, connecting spatial data analysis and local stakeholders in an agenda that is in line with

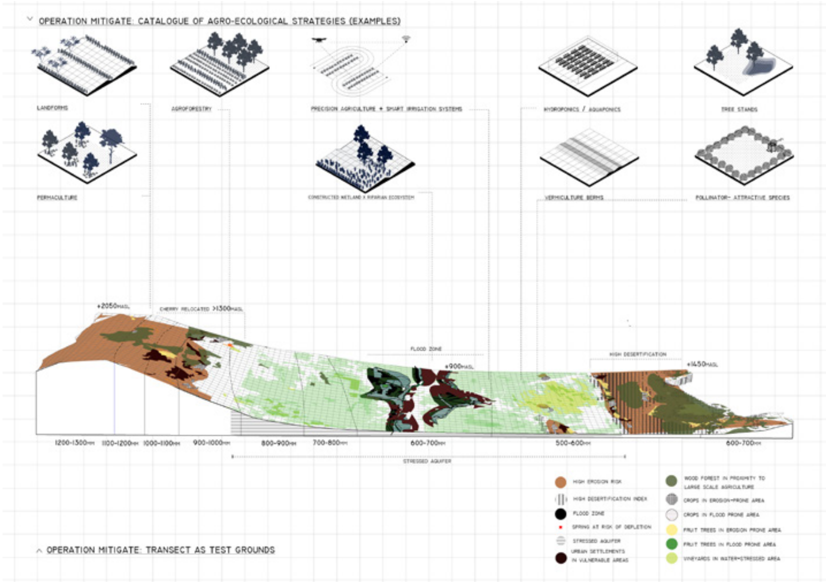

Figure 3

the mission of the concerned authorities to maintain a safe and resilient land and community. Determining the fate of reclaimed cleared territories for the purpose of adaptive reuse is not confined to a polygon-to-polygon programming. The place that remains therefore is a strategic network of productive terrains capable of performing collectively towards a resilient contemporary constructed ecosystem.

FOOTNOTES

1. The Lebanese Mine Action Center (LMAC) was founded in 1998 and falls under the Engineering Regiment of the Lebanese Army Forces (LAF).

2. Litany River Authority, 2018, http://www.litani.gov.lb/en/?page_id=71 (accessed 15 February 2018).

3. The current population includes a minimum of 350,000 registered Syrian refugees, according to UNHCR.

4. Litany River Authority, 2018, http://www.litani.gov.lb/en/?page_id=71 (accessed 15 February 2018).

5. Litany River Authority, 2018, http://www.litani.gov.lb/en/?page_id=71 (accessed 15 February 2018).

6. Designed Ecologies, as described by Christof Girot (2016), corresponds to a universal language, detached from local cultural or historical contexts, and a new approach to the curation of nature for the purpose of performance in restoration ecology in particular, to reverse environmental deterioration.

7. Land Release in Humanitarian Mine Action, Norwegian People's Aid Humanitarian Disarmament, Published on April 19, 2016, https://www.youtube.com/watch?v=NSfEbAlvHCM.

8. Makki, Major A. interviewed by Dima Rachid, 2017-2018, Lebanese Mine Action Center, Chukri Ghanem Military School, Fayadieh, Lebanon.

9. Raw geospatial data obtained from the National Center for Remote Sensing (NCRS); other data digitized from reports, for example the National Physical Master Plan of the Lebanese Territory, Final Report, Lebanon, 2005.

10. Agriculture technology like hydroponics and smart irrigation is starting to grow locally in the form of ag-tech startups.

11. The Lebanese Reforestation Initiative (www.lri-lb.org) works with local communities to support native tree planting across Lebanon, mainly foresting public lands, religious-endowment land, and abandoned lots.

FIGURES

Figure 1. Operation Release: Mine Detection and Clearance

Figure 2. Operation Risk Scenario: Mapping Scenarios of Vulnerability Across the Watershed)

Figure 2. Operation Regenerate: Transect as Test Grounds

BIBLIOGRAPHY

Alpaslan, O. and Roberts, R. (2016). *Challenging Post-Conflict Environments: Sustainable Agriculture*. London Routledge.

Belanger, P. and Roth, C. (2011). *The Agronomic Landscape*.

Darwish, M. et al. (2009). The 2006 war and its inter-temporal economic impact on agriculture in Lebanon. *Disasters 33*(4): 629–644.

Girot, C. (2016). Designed ecologies. FS 2018 V02. *Landscape Architecture*. Theory Lab Lecture Series, Zurich: Institute of Landscape Architecture.

ICBL-CMC (International Campaign to Ban Landmines-Cluster Munition Coalition) (2017). *Landmine Monitor 2017*. Available at: http://www.the-monitor.org/en-gb/reports/2017/landmine-monitor-2017 (accessed 10 March 2018).

Khawlie, M. et al. (2007). Towards an ecosystem approach to the sustainable management of the Litani Watershed- Lebanon: Final technical Report to IDRC. Lebanon.

LMAC (Lebanese Mine Action Center) (2017). *Annual Report 2016*. Lebanon.

MoE, UNDP, and GEF (2016). Lebanon's third national communication to the UNFCCC. Lebanon.

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