



Business Plan for Combating Pollution of the Lower Litani River Basin

May 2020



Context

- Implementation of the roadmap for combating sources of pollution of the Litani River from its source to Lake Qaraoun
- Law No. 63/2016 on budgeting provisions for the execution of pollution-curbing projects in the Litani River Basin

Aims of the Assignment

- To assist the Government of Lebanon and the Council for Development and Reconstruction in identifying pollution sources of the Lower Litani River
- To recommend appropriate solutions in the form of a Business Plan to inform decision making

Contents

The Lower Litani River Catchment Area

Existing Pollution Pressures to Surface Water

Current State of Surface Water Quality and Sediments & Situation Analysis

Current, Planned and **Proposed** Measures

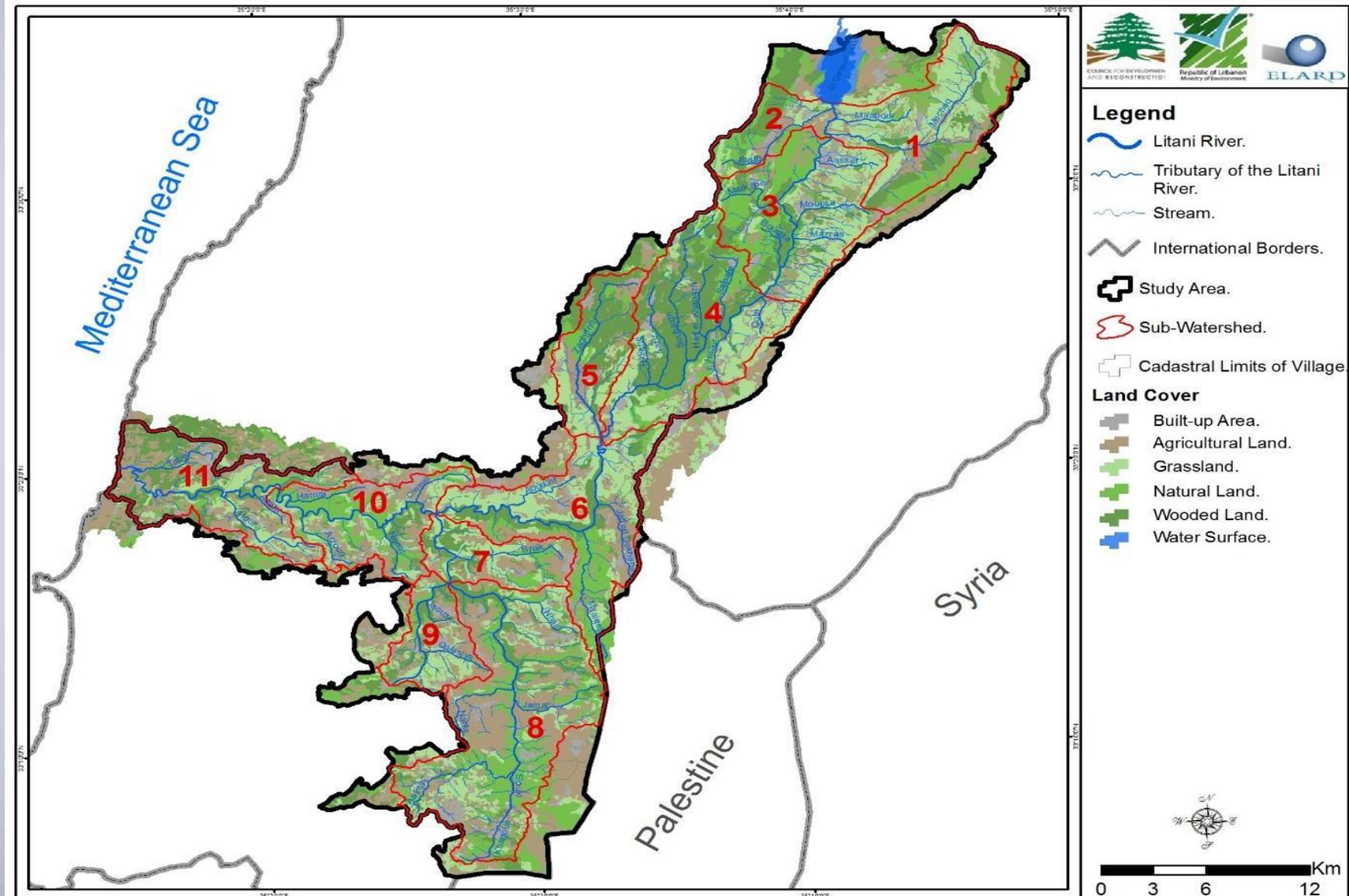
Costs and Prioritisation

Roadmap to the Implementation of the Business Plan

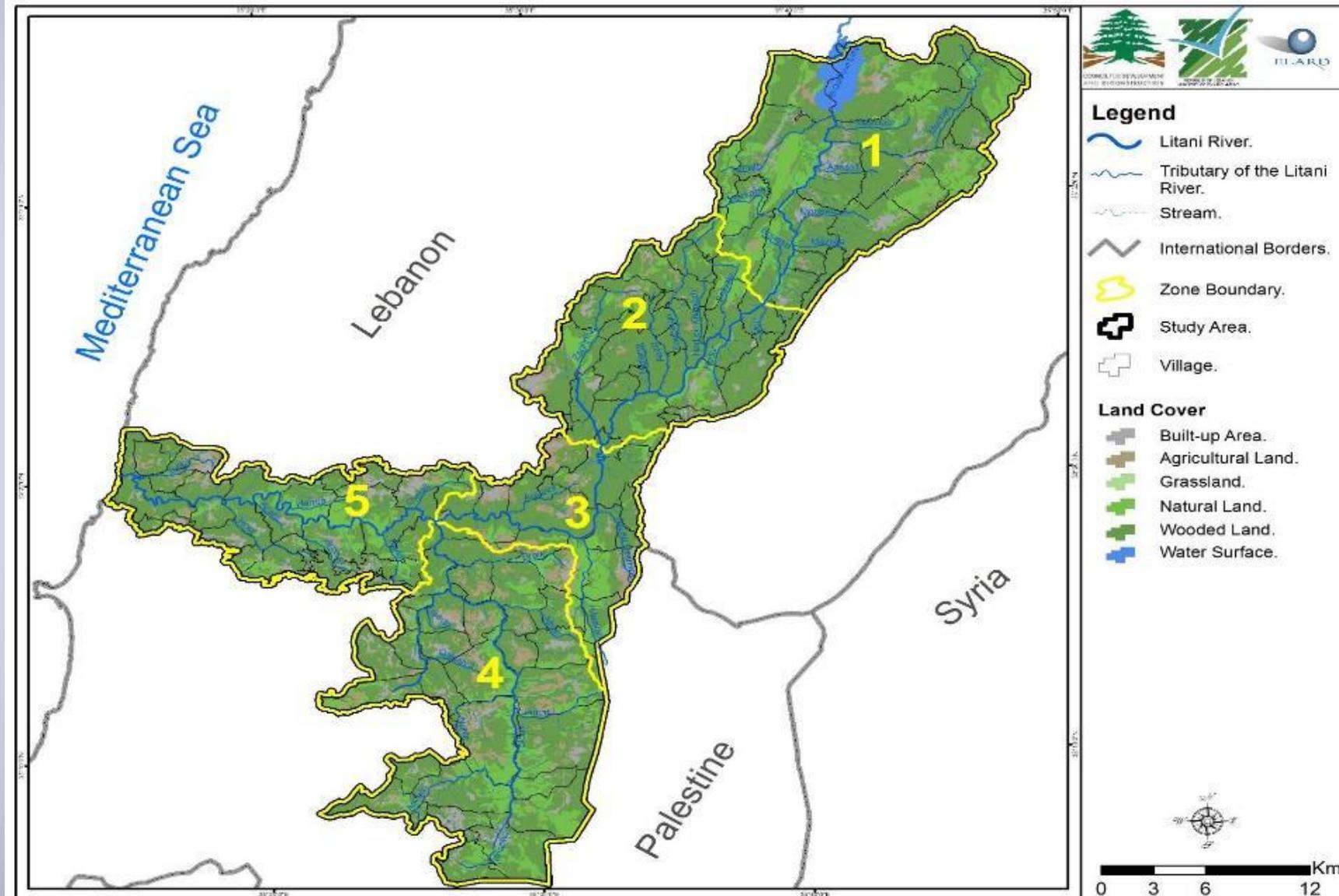
The Catchment Area

- The total area drained by the Lower Litani River from Qaraoun dam until it reaches the mouth at Qasmiyeh is 637 km²
- The catchment areas of the tributaries were considered to form the sub-catchments of the Lower Litani catchment area
- A total of 11 sub-catchments were identified
- The sub-catchments were merged to create five 'zones' that make up the Study Area of 792 km²
- 132 localities or villages in four governorates & 10 districts – 99 municipalities

Sub-catchments of the Catchment Area



Zones of the Study Area



Desk and Field Data Collection & Mapping

Collection & review of past documents

Meetings with key stakeholders

Preliminary site reconnaissance

Field data collection

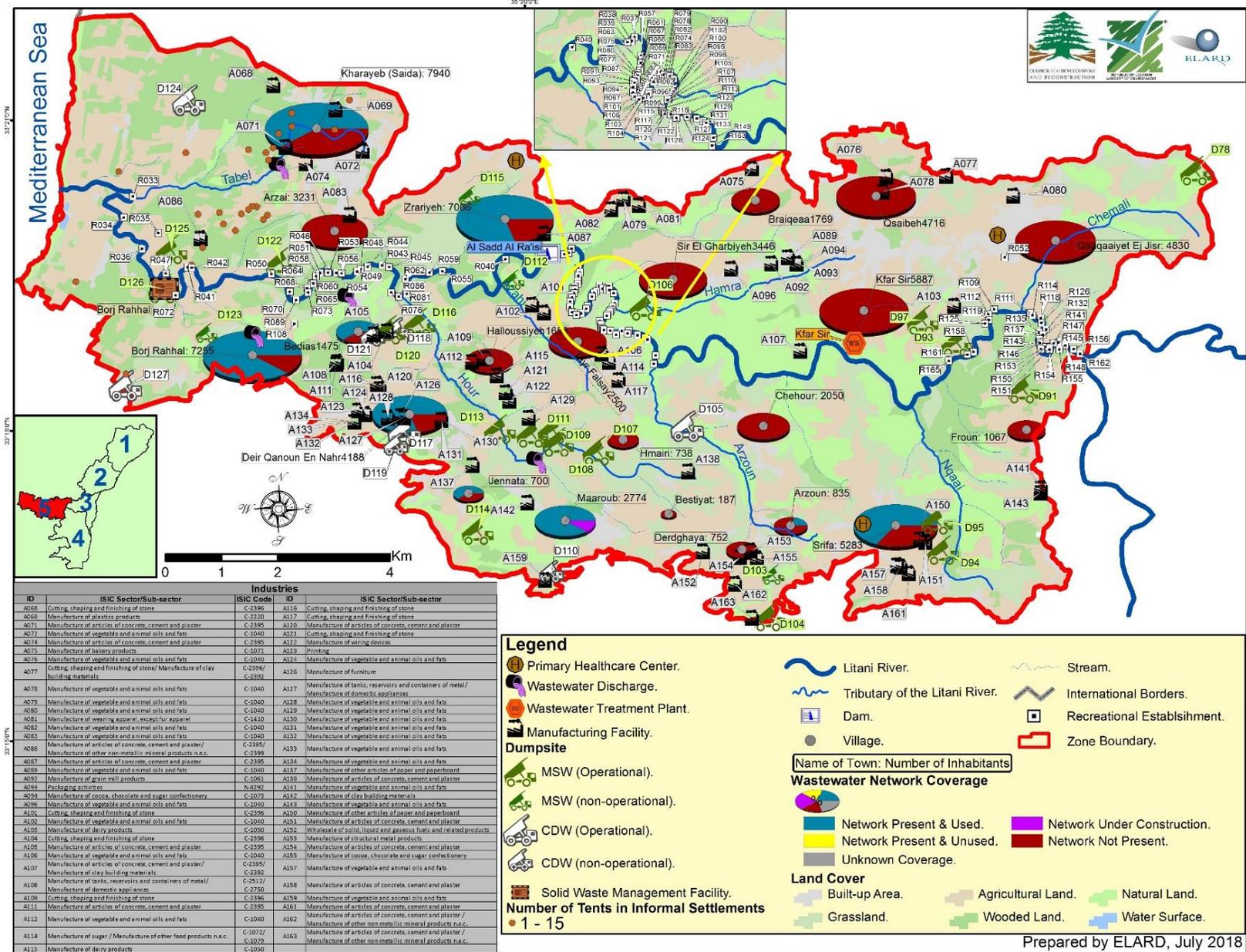
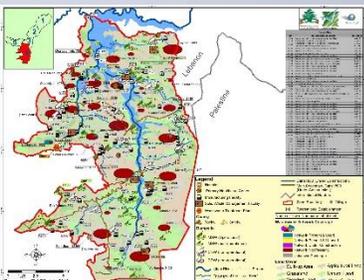
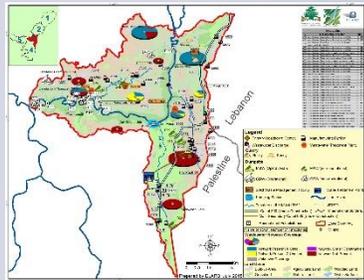
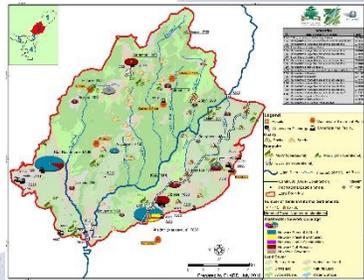
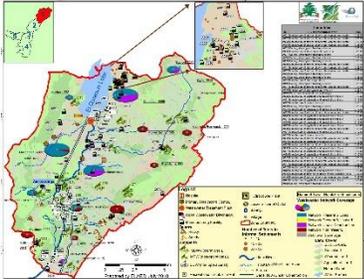
- Site walk-over
- Surveys with local authorities
- Surveys with farmers
- Surveys with agricultural input suppliers
- Desk & field survey of industries

Production of Pressure Profile Maps by Zone



Pressures

Pressures – Zone 5 (Example)





Pressures from Solid Waste Disposal Practices



Pressures from Solid Waste Disposal Practices

Solid waste types considered

Municipal Non-hazardous Waste

Industrial Hazardous Waste

Healthcare Hazardous Waste



Impact Pathway

River bank dumpsites: - Falling wastes
- Surface runoff of leachate

Littering from random dumping



Assessment of the susceptibility of surface water to be affected by the pressures based on

Pressure's distance to the surface water body

Size of the disposal site

Type of wastes disposed

Pressures from Solid Waste Disposal Practices

Dumpsites

- Zone 1: Ain El Tineh, Sohmor, Majdel Balhis
- Zone 2: Rihane – Jezzine
- Zone 3: Yohmor En Nabatieh
- Zone 4: Aadchit El Quassair, Bani Haiyane, Kounine, Deir Siriane, Houla, Rabb Et Tlatine
- Zone 5: Borj Rahhal, Bedias, Deir Qanoun El Nahr, Maaroub, Hmairi, Sir El Gharbiyeh, Srafa

Littering

- All Zones



Pressures from Municipal Wastewater Discharge Practices



Pressures from Municipal Wastewater Discharge Practices

The threat to surface water was primarily considered

The threat to groundwater contamination was considered as a secondary threat to the quality of the River surface water, which is the main target of this study

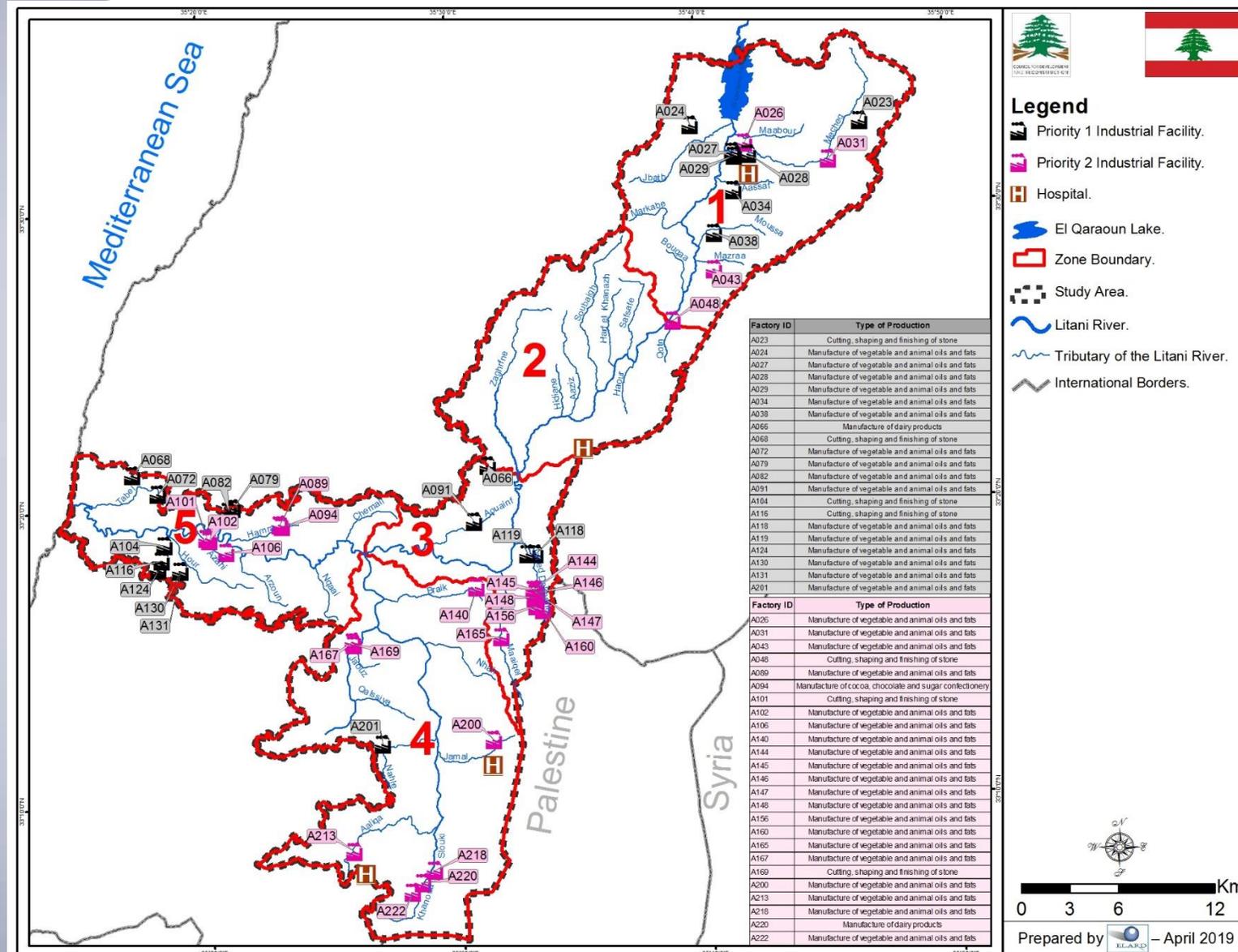
The determination of the overall level of susceptibility in each zone takes into account only the total daily estimated outflow into surface water from all the human settlements in a zone, and sensitivity of water sources in the zone

	Pressure Level
Zone 1	High
Zone 2	Low
Zone 3	Medium
Zone 4	High
Zone 5	High

Pressures from Industrial Wastewater Discharge Practices



Prioritisation of Industries



Prioritisation of Industries and pressures resulting from their wastewater discharges

Overall pressure from industrial wastewater discharge is determined based on:

- the number of priority industries in each zone
- estimated daily wastewater discharge from all priority industries in the relevant zone

Industrial pressure levels for each zone were assigned based on the industrial effluents discharge brackets, and persistence of effluents in the water environment

	Pressure Level
Zone 1	Medium
Zone 2	Low
Zone 3	Medium
Zone 4	Medium
Zone 5	High



Pressures from Agricultural Sources

Pressures: Agricultural Practices

Pesticides Issues

Weak knowledge about pesticides and alternative pest management techniques

No respect of pre- and post- harvest intervals

Low prices and different commercial names

Absence of proper handling and use

Lack of crop information and proper production practices

Pressures: Agricultural Practices

Fertilizers Issues

N and P-units added to crops averaged at least 1.5 times and reached up to 5 times the recommended fertilization dose in some instances

Potassium fertilization was mostly high in case of fruit trees where it reaches 4 times the recommended dose

Phosphorus fertilization ranged from 1.4 (olive trees) to 5.2 times (vegetables) the recommended doses

Farmers are over-fertilising their crops and doses are being applied without proper soil and water analysis and interpretation

Nutrient demands are being exceeded and crop yields are comparably low with respect to the input of fertilisers



Pressures from Recreational Establishments



Pressures from Recreational Establishments

Count of Establishments by Category and Type of Encroachment

	Camp Site			Hotel/Restaurant			Restaurant			Restaurant/Fishery			Public Garden			Recreational			Resort			Unspecified			Total
	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green	
Zone 1	-	-	-	-	-	-	13	-	8	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	25
Zone 2	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	6
Zone 3	1	1	1	-	-	-	3	1	-	-	-	-	1	-	-	2	-	-	2	-	-	5	-	-	17
Zone 4	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	11
Zone 5	2	1	1	-	2	-	31	24	18	-	-	-	-	-	-	3	5	2	9	3	3	13	4	1	122
Total	3	2	2	-	2	-	55	28	26	2	-	2	1	-	-	5	5	2	16	3	3	19	4	1	181



Completely in the 10m buffer zone

Partially within the 10m buffer zone

Out of the 10m buffer zone

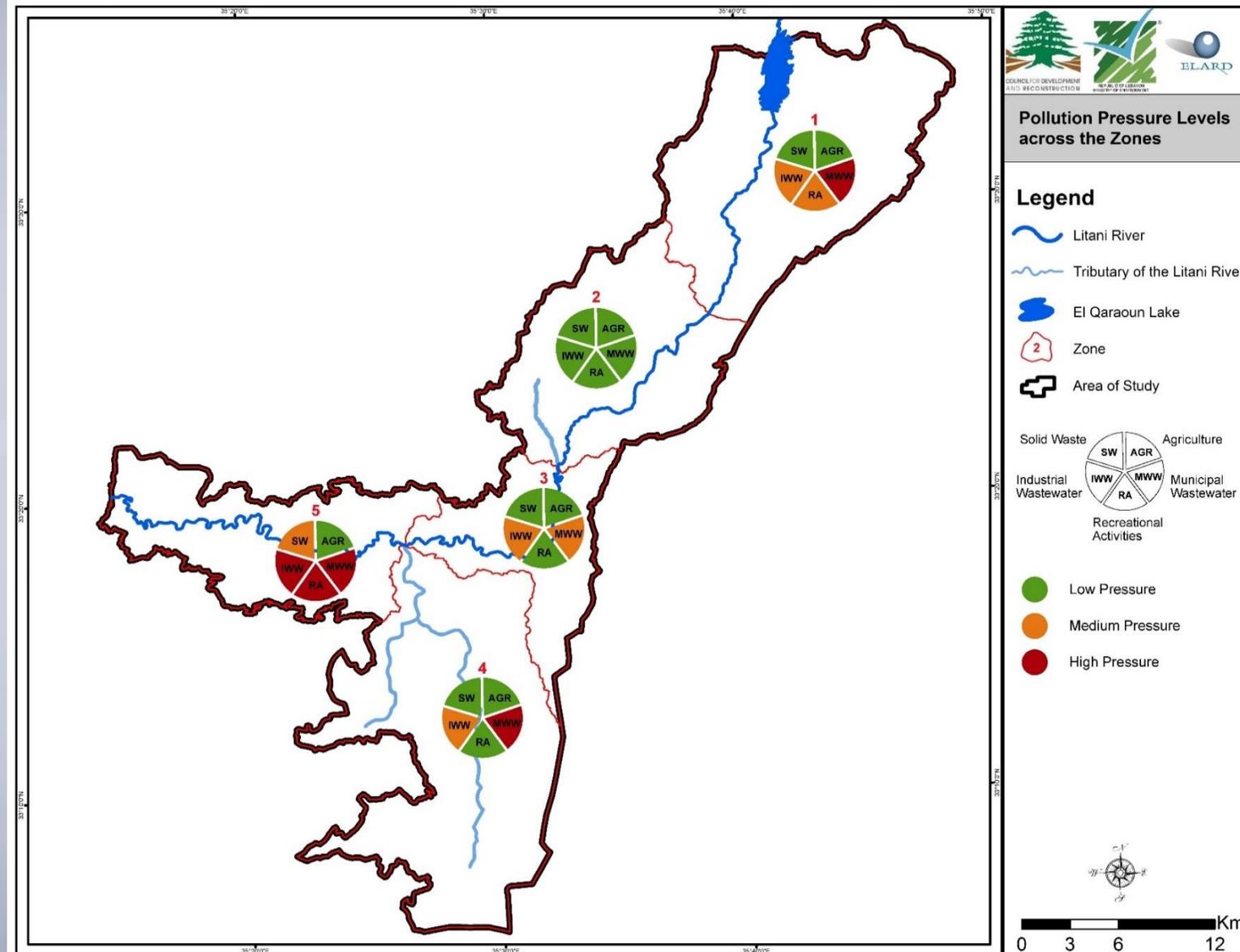


Pressures from Classified and
Non-classified Non-Industrial
Establishments

Pressures: Non-Industrial Establishments

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	TOTAL
Petrol Stations	22	16	22	45	41	146
Vehicle Repair Garages	72	45	20	53	127	317
Vehicle Wash Facilities	22	14	10	61	65	172
Poultry Farms	22	10	15	59	83	189
Cattle Farms	60	10	12	63	23	168
Sheep & Goat Farms	54	22	14	36	21	147
Slaughterhouses	3	0	1	5	8	17
Meat Butcheries:						
- Beef & Lamb	25	16	25	61	103	230
- Chicken	13	0	8	42	25	88

Summary of Pressures

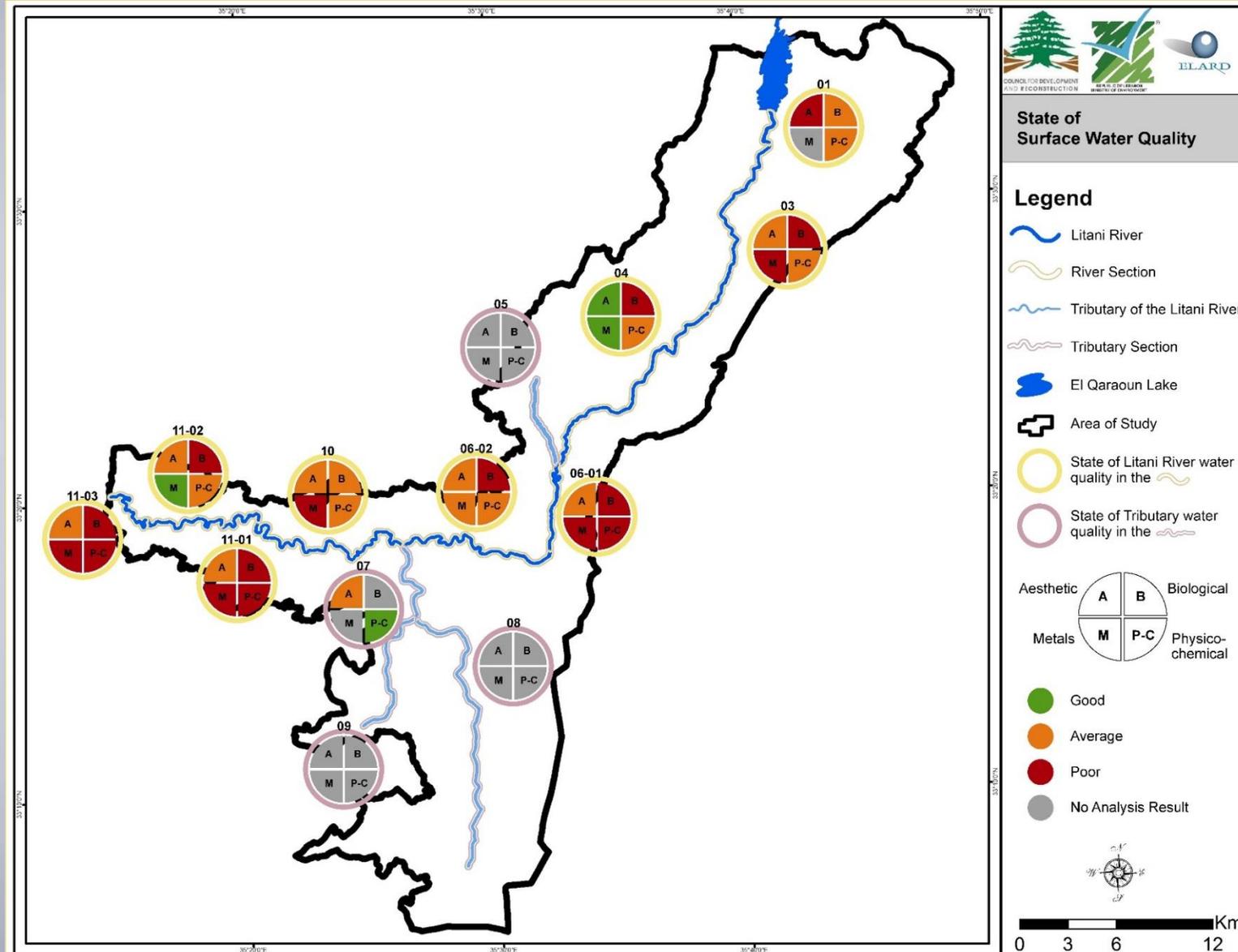




State



State of Surface Water Quality



Links between Pressure Sources & State

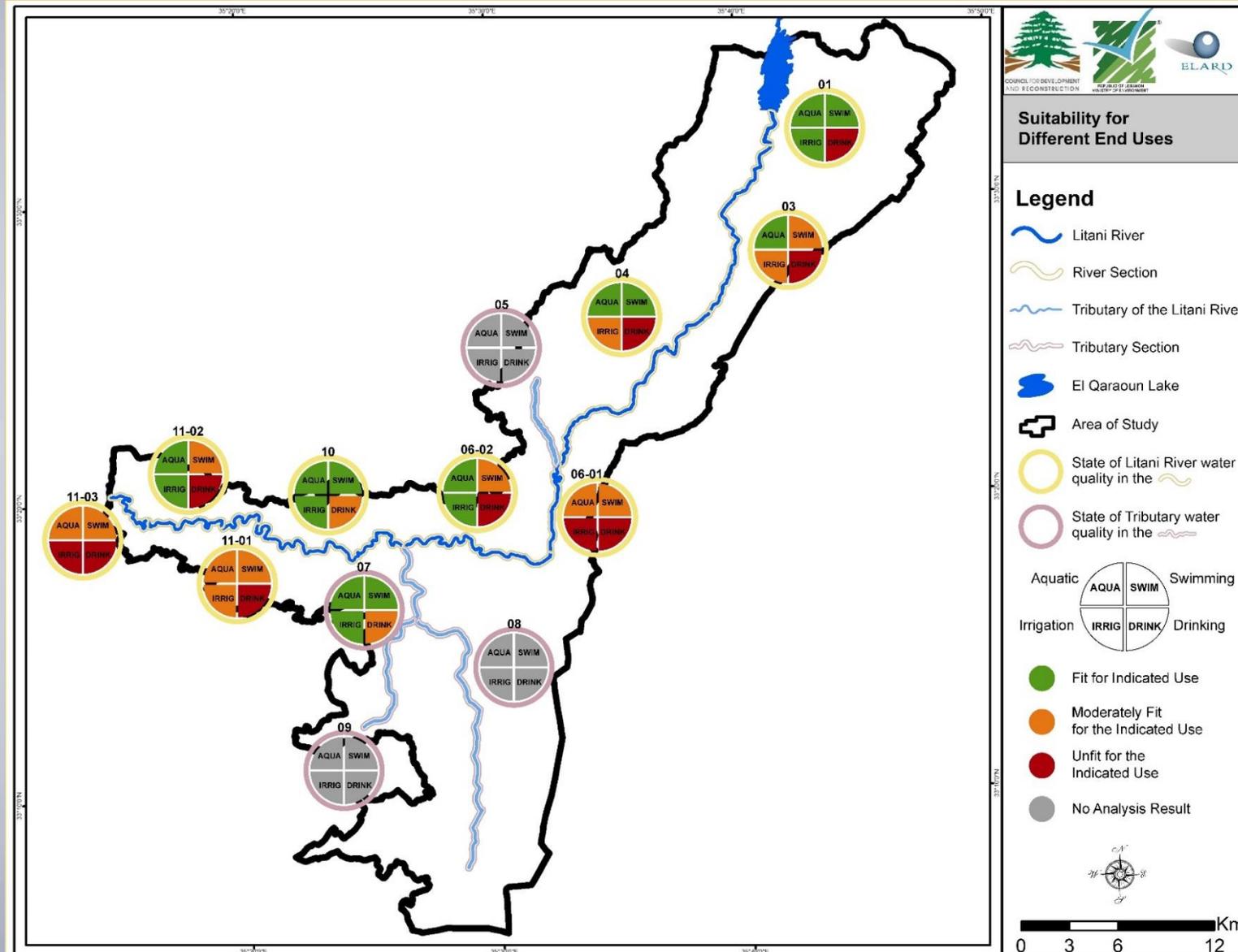
High concentrations of ammonia, nitrites and fecal coliforms indicative of the continuous discharge of municipal wastewater.

Although the Lower Litani Study Area is not as heavily industrialized like the Upper Litani region, the exceedance in BOD, TSS, and the high turbidity is indicative of industrial and municipal discharges.

Repeated exceedances in ammonia and phosphates, especially in the coastal region of the Lower Litani are indicative of a strongly dependent economy on agriculture in the region, and a runoff of pollutants that have travelled along the river course.

Heavy metals in the sediments, especially Cadmium, which is a common trace element in pesticides, are also indicative of agricultural pollution. Other possible sources of heavy metals comprise industrial discharge, municipal waste dumps and open burning, and possibly the July 2006 War. The occurrence of phenols in sediments and water indicate the presence of olive mills effluent accumulating throughout time in the river sediments.

Suitability of River Water for Different End Uses



Suitability of River Water for Different End Uses

Swimming in the Litani River in some stretches or drinking directly from the River's waters is not recommended due to bacteriological contamination.

The possibility of having a 'healthy' aquatic life that is able to survive uncompromised in the waters of the Litani is average, however a word of caution is warranted here since very few aquatic health parameters were measured.

From a physico-chemical point of view the water is generally fit for irrigation with slight to moderate restrictions.

Irrigation from the Litani River waters and those of the tributaries is commonly practiced, however some restrictions need to be applied on the crops that can be watered using these sources due to presence of faecal coliforms.



Current, Planned and Proposed Measures



Solid Waste

Solid Waste Measures: Zones 1 and 2

Current	Planned	Proposed
Construction of the solid waste management facility and landfill in Joub Jannine (Sorting and Composting Facility - capacity 100 t/d; landfill – capacity 50 t/d)		Operation and maintenance of the Joub Jannine SWM complex (Estimated at US\$1.2 Million for annual O&M)
Implementing a sorting at source programme for five municipalities in West Bekaa and building a storage facility for recyclables in Qaraoun		Stop waste dumping at Majdel Balhis, Sohmor, Ain Et-Tineh and Rihane Jezzine dumps. Transfer of the waste to the Joub Jannine sanitary landfill (Estimated at US\$71,500)
		Or close the above-mentioned dumps: excavate, line, cap and close (Estimated at US\$34,000)
		Direct dumping and disposal of waste in the river to be completely banned through the enforcement and application of legislation and penalties where applicable. Training, awareness, and monitoring activities are suggested at the local level.

Solid Waste Measures: Zones 3 and 4

Current	Planned	Proposed
The operation of the Qlaiaa sorting and composting facility (capacity 6t/d)	Construction of a sanitary landfill in Nabatiye (capacity 75 t/d)	Construction of a sanitary landfill for Nabatiye district (capacity 75 t/d) to complement the Kfour sorting and composting facility
Operation of the post 2006 war rehabilitated Aaytaroun sorting and composting facility (capacity 12t/d)	Construction of a sorting and composting facility for Bent Jbayl and Marjaayoun (capacity 250 t/d)	Construction of an integrated solid waste management complex for Bent Jbayl and Marjaayoun including a sorting and composting facility (capacity of 250 t/d) and a sanitary landfill of 100 t/d capacity.
Khirbet Selem sorting and composting facility (capacity 10 t/d) operation assisted with OMSAR funding sustaining operation of constructed SWM facilities	Construction of a sanitary landfill for Bent Jbayl and Marjaayoun (capacity 100 t/d)	Stop waste dumping at Yohmor (Nabatiye), Aadchit el Qoussair, Bani Haiyane, Kounine, Deir Siriane, Houla, and Rabb Et-Talatine dumps and transfer the waste to Nabatiye or Bent Jbayl/Marjaayoun sanitary landfills once implemented (Estimated at US\$133,500)
Operation of Mays El Jabal sorting and composting facility (capacity 10t/d)		Close the above-mentioned dumps: excavate, line, cap and close (Estimated at US\$76,500)
OMSAR assisted the capacity increase and remodeling of the Qabrikha sorting and composting facility from 10 t/d to 20 t/d.		Direct dumping and disposal of waste in the river to be completely banned through the enforcement and application of legislation and penalties where applicable. Training, awareness, and monitoring activities are suggested at the local level.
Non Operational Taybeh Marjaayoun sorting and composting facility (capacity 10t/d)		

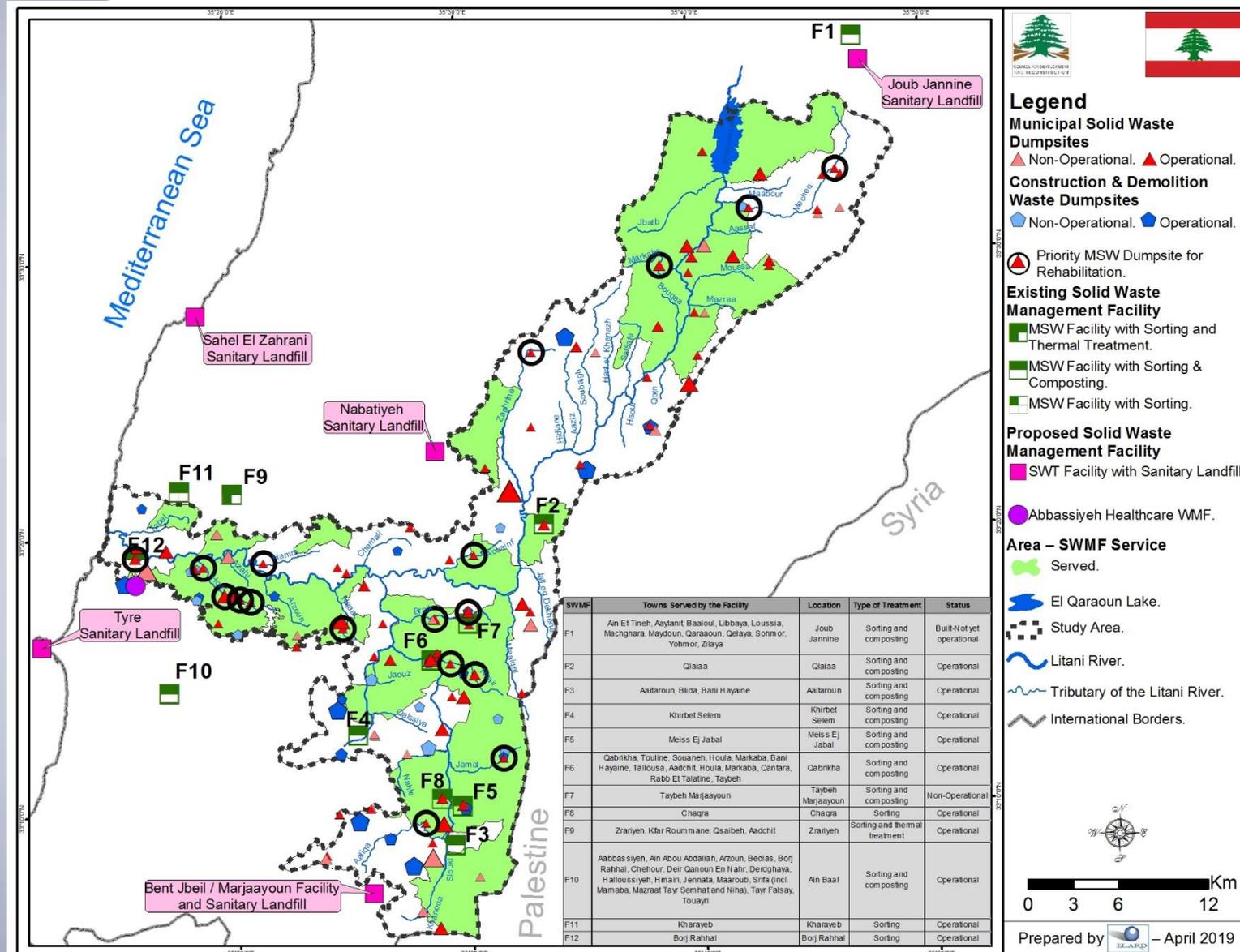
Solid Waste Measures: Zones 3 and 4 – Cnt'd

Current	Planned	Proposed
Chaqra sorting facility		
Bint Jbeil sorting and composting facility (50 t/d)		

Solid Waste Measures: Zone 5

Current	Planned	Proposed
Zrariyeh Green Ecotech facility, built by a private investor in 2014, serving Zrariyeh, Kfarroumane, Kousaibeh and Aadchit (10 t/d) – NON OPERATIONAL	Rehabilitation of Ras el Ain dump in Tyre	Construction of a sanitary landfill in Tyre caza and construction of a new integrated solid waste management complex for Sahel El Zahrani including a sorting and composting facility (capacity of 150 t/d) and a sanitary landfill (capacity of 75 t/d). (Estimated at US\$14.6 Million)
Operation of Ain Baal sorting and composting facility (capacity 100-150 t/d) funded by OMSAR	Construction of a sorting and composting facility (150 t/d) and a sanitary landfill in Sahel El Zahrani (75 t/d)	Stop waste dumping at Borj Rahhal, Bedias, Deir Qanoun En-Nahr, Maaroub, Hmairi, Sir El Gharbiyeh and Srafa dumps and transfer the waste to Ras El Ain or Sahel el Zahrani sanitary landfills once implemented (Estimated at US\$139,000)
Kharayeb sorting facility		Or close the above mentioned dumps: excavate, line, cap and close (Estimated at US\$102,500)
Borj Rahal sorting facility		Proper segregation of medical waste to reduce the volume of infectious waste; sending segregated infectious waste for disposal at the Aabbassiyeh sterilization centre
Saida facility for sorting, composting and RDF production		Direct dumping and disposal of waste in the river to be completely banned through the enforcement and application of legislation and penalties where applicable. Training, awareness, and monitoring activities are suggested at the local level.

Planned & Proposed SW Dumpsites' Rehabilitation & Treatment



Legend
Municipal Solid Waste Dumpsites
 ▲ Non-Operational. ▲ Operational.
Construction & Demolition Waste Dumpsites
 ◐ Non-Operational. ◑ Operational.

⊙ Priority MSW Dumpsite for Rehabilitation.

Existing Solid Waste Management Facility
 ◑ MSW Facility with Sorting and Thermal Treatment.
 ◐ MSW Facility with Sorting & Composting.
 ◒ MSW Facility with Sorting.

Proposed Solid Waste Management Facility
 ◑ SWT Facility with Sanitary Landfill.

⊙ Abbasiyeh Healthcare WMF.

Area – SWMF Service
 ◑ Served.

◑ El Qaraoun Lake.

◑ Study Area.

◑ Litani River.

◑ Tributary of the Litani River.

◑ International Borders.



Prepared by ELAND – April 2019

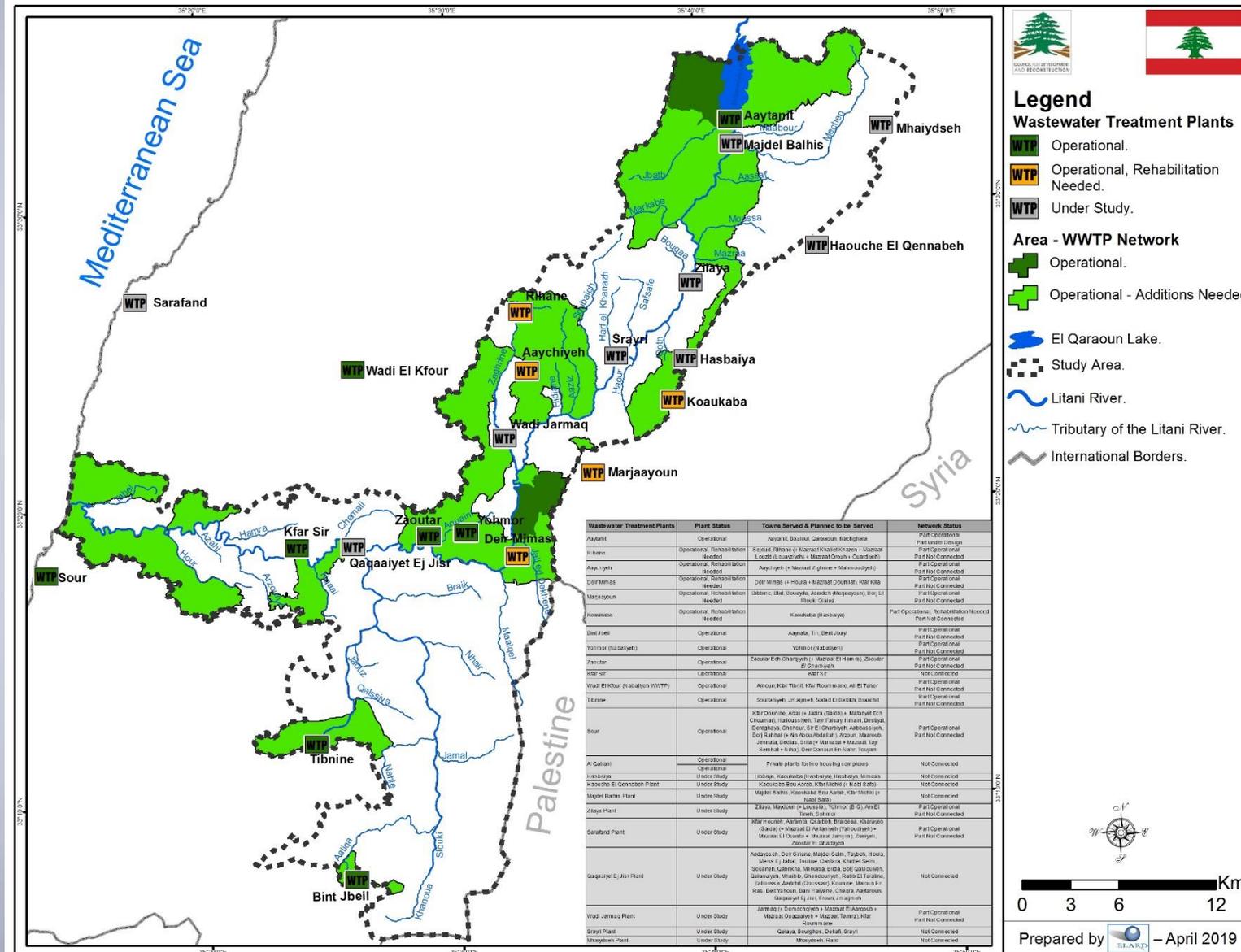


Municipal Wastewater

Current Measures: Municipal Wastewater – All Zones

- Inadequate wastewater infrastructure to safely handle the quantities generated and reduce the threat
- Currently only 2 out of 95 localities have complete sewer network coverage, and 27 have partial coverage, ranging from 10% to 95%
- Communities having partial or complete collection coverage represent 45% of the total estimated load. The remainder have no wastewater collection networks and therefore rely on cesspools.
- LLB is served by the following wastewater treatment plants:
 - Aaytanit
 - Rihane
 - Aaychiyeh
 - Deir Mimas
 - Marjaayoun
 - Kaoukaba
 - Yohmor (Nabatiyeh)
 - Zaoutar Ech Charqiyeh
 - Kfar Sir
 - Wadi El Kfour (Nabatiyeh)
 - Tibnine
 - Sour
 - Qatrani (two private plants)
- An assessment is needed to accurately reflect gaps and needed upgrades in order to tie in with, complement or restructure coverage in line with the existing master plans and Law No. 63/2016 programming

Current WWTP Coverage & Gaps to be Addressed



Legend

Wastewater Treatment Plants

- Operational.
- Operational, Rehabilitation Needed.
- Under Study.

Area - WWTP Network

- Operational.
- Operational - Additions Needed.

- El Qaraoun Lake.
- Study Area.
- Litani River.
- Tributary of the Litani River.
- International Borders.



Proposed Measures: Municipal Wastewater

Proposed Measures	Villages and localities concerned
<ul style="list-style-type: none">• Prepare the feasibility study, preliminary design, detailed design and construction documents for the wastewater treatment system and collection networks• Construct, operate and maintain the wastewater treatment and collection system• Design and implement innovative means to finance and sustain the operation and maintenance• Assess the coverage, operational status and treatment effectiveness of wastewater treatment systems• Establish networks in unserved areas and connect to existing WWTPs• Expand the network coverage of wastewater treatment systems	<ul style="list-style-type: none">• Zilaya• Majdel Balhis• Rihane-Aaychiyeh, incl. Sejoud• Chbail, Mazraat Daraya and Qatrani• Marjaayoun• Kawkaba• Aaramta & Kfar Houneh (Sarafand system)• Wadi El Jarmaq• Srayri, Dellafi, Borghous and Qelaya• Kfar Roummane, Kfar Tibnit and Arnoun (Nabatiyeh)• Deir Mimas• Zaoutar El Gharbiyeh (Sarafand)• Qaqaaiyet Ej Jisr• Tiri and Aaynata• Sultaniyeh and Jmajmeh (Tibnine)• Sour• Zrariyeh and Kharayeb• Kfar Sir

Proposed Measures: Municipal Wastewater

Notes

In Law 63/2016:

- *No budget is clearly allocated to the Majdel Balhis treatment system and associated networks*
- *The programming allocated funds for the Rihane-Aaychiyeh wastewater treatment and collection systems*
- *Chbail, Mazraat Daraya and Qatrani are not programmed for*
- *The Marjaayoun system is not programmed for*
- *The treatment and collection systems in Kaoukaba are not allocated for*
- *Wadi El Jarmaq system does not have allocated funding*
- *Srayri system does not have allocated funding*
- *Establishing the networks in Kfar Roummane & Kfar Tibnit as part of the Nabatiyeh wastewater treatment system is programmed. While Arnoun is not covered, it will be served by the Nabatiyeh system.*
- *The Deir Mimas treatment and collection system has allocated funding*
- *Servicing the locality of Zaoutar El Gharbiyeh is not earmarked for funding, however Zaoutar El Gharbiyeh could be serviced by the Sarafand system*
- *Action in Tiri and Aynata, and in Soultaniyeh and Jmajmeh is not allocated funding*
- *Expansion of the network in Sour is allocated funding*
- *Funding for Kfar Sir is not allocated .*



Industrial and
Healthcare
Wastewater

Proposed Measures: Industrial Wastewater



Industries are required to (pre-)treat their industrial effluents to reduce the pollution load to an acceptable level so that the wastewater can be further treated in a biological treatment plant.



The degree of (pre-)treatment needed varies from one industry to the other.



After pre-treatment, industries can discharge their diluted wastewater effluents in the sewer network.



The effluent is proposed to be treated in the municipal wastewater treatment plants that are planned for the region.

Proposed Measures: Healthcare Wastewater

Hospitals should separate the hazardous liquid waste from domestic-like wastewater, similar to the practice in solid waste management.

Establishing the quality of healthcare wastewater from each hospital will aid in the decision whether pre-treatment of wastewater is required prior to draining the wastewater to the municipal sewer.

The presence of sewer networks does not reduce the threat from hazardous healthcare wastewater discharges to surface water since there are no operational wastewater treatment plants that treat the collected wastewater, where hospitals are currently located.



Classified and Non-classified Non-Industrial Establishments

Proposed Measures: Non-Industrial Establishments

Environmental guidelines for non-classified establishments are available, however, poor enforcement and supervision have led to widespread infringements, non-compliance and negligence.



Local authorities to ensure environmental compliance and supervision of establishments' operational activities.



Capacity building training for local officials and police on environmental regulations.



Trade-focused media events and targeted technical assistance in order to raise awareness on simple public hygiene and resource conservation measures.

Proposed Measures: Quarries

Numerous measures and legal action were taken to circumvent the damages of quarrying activities and sand washing



The activation of environmental prosecutors has spurred the litigation of cases related to environmental damages, and working by the polluter pays principle.



In the matter of quarrying, the only proposed measure is the application of the law, to ensure quarrying activities do not cause undue harm to third parties, and to the river ecology.



Recreational Establishments

Proposed Measures: Recreational Establishments

Recreation along the river banks is a key activity in the Lower Litani, yet, it is the poor regulation of recreational establishments, that can create pressure on the quality and flow regime of the river water.

Establish guidelines and operational parameters for recreational establishments of various sizes and activities

Facilities are to contract waste and wastewater collection services to transport their waste and wastewater to the nearest processing facilities, with records maintained and compliance enforced by municipalities

Implement a strict no discharge policy of solid waste, anti-littering and wastewater into river course, and apply a penalty system

The public domain on river embankments be defined through topographic surveying and correct interpretation of legal texts on a case-by-case basis

Application of rules for setback distances by requesting and then enforcing demolition of built structures that are encroaching on the public domain and river/tributary courses



Informal Tented Settlements

Proposed Measures: Informal Tented Settlements

Although the pressure level from ITS in the LLB Study Area is considered low, it is necessary to...

Ensure that waste and wastewater discharges are properly directed to the formal and existing collection and treatment systems

Ensure that relief agencies abide by the national and local legislation and coordinate efforts with local authorities and governmental agencies to avoid creating a burden of waste cleanup and property rights infringements



Agriculture

Proposed Measures: Agriculture

Proposed Measures

1. Development of IPM curricula of important crops in the region
2. Collection of preliminary baseline information on current practices for the selected crops
3. Introduction of new varieties/cultivars that are resistant to diseases and pathogens
4. Surveying of present pests and natural enemies of selected crops
5. Training on proper agrochemical handling, application and storage
6. Creation of farmer discussion groups through equipping demonstration plots in 3-4 regions to solve their problems individually and collectively whenever applicable based on their experience and expert consultation
7. Establishment of liaisons between farmers, extension service agents and experts in research stations and universities for the identification of proper IPM techniques and their dissemination
8. Familiarization of farmers with the different techniques and tools used in IPM
9. Mandating and enforcing the use of buffer zones for maximum pesticide trapping efficiency
10. Create incentives in favour of IPM and organic products through removal of direct or indirect subsidies for pesticide use, and tax exemption for environmentally friendly pesticides
11. Promotion of produce cultivated using IPM techniques
12. Training sessions on traceability and certification
13. Training sessions on labelling, packaging, storage, current safety standards and quality, crop specific quarantine requirements in the targeted markets

Proposed Measures: Agriculture – Cont'd

Proposed Measures

14. Performance of regular pesticide residue tests on certified IPM products throughout the production season
15. Training Sessions on water quality for irrigation, water analysis for irrigation, agricultural soil pollutants, soil sampling and analysis for pollutant accumulation
16. Estimation of pollution loads by frequent sampling of water to determine if the irrigation water quality standards are met for fertilizers and pesticides
17. Setting up a pilot project for "Empty Pesticide Containers and Obsolete Stocks Management System"
18. Field training on drip irrigation: Existing and new equipment features and benefits
19. Field training on water management, water budgeting and scheduling, and use of agro-meteorological data
20. Field training on methods to enhance the use of filtration techniques (improve water quality, impact on irrigation systems, use of sand, screen, disc, etc.)
21. Educate farmers on the use of soil organic matter and appropriate mechanical and conservation tillage practices
22. Field training on methods in field drainage (planning of drainage improvements, operation & maintenance of drainage system)
23. Awareness raising on the negative environmental impacts of traditional fertilization
24. Restricting farms within an NVZ regarding how much nitrogen fertilizer can be applied to the land
25. Training to improve understanding of basic plant nutrient requirements
26. Training on proper fertilization and fertigation
27. Identification of potentially susceptible areas known as Nitrate Vulnerable Zones (NVZs)

Proposed Measures: Agriculture – Cont'd

Proposed Measures

28. Estimation of land use – land cover changes between two base maps or satellite images (e.g., 2005 and 2020); net primary productivity (NPP) and soil organic Carbon (SOC), and ecological corridors delineation
29. Ecological assessment to identify species for ecological restoration
30. Land degradation assessment including establishment of a corridor
31. Topographic surveys of quarries and engineering studies to determine rehabilitation requirements of quarries using construction and demolition waste, and related Environmental Impact Assessments (EIAs)
32. Development of rehabilitation plans covering forest management planning, reforestation, rangeland rehabilitation, rangeland management planning, rehabilitation of abandoned terraces and other agricultural land that are publicly owned, simultaneous rehabilitation of construction – demolition waste dumps and quarries with the ultimate creation of vegetated terraces/ public gardens or other depending on each case.



Cross-sectoral and Governance

Proposed Measures: Cross-sectoral and Governance

1. Strengthening the governance and law enforcement procedures to ensure that technical measures are effectively carried out.
2. Systemizing and standardizing data management to measure, document and understand how and where mitigation actions are leading to improvements.
3. Improvement of public administration management and inter-agency coordination to carry out the proposed measures.
4. Physical and chemical monitoring systems for water quality, water balance, and river ecology baseline; in-depth assessment of pollution levels, sources and costs of response measures needed of a section of the river.
5. Master plan for the LL Basin and creation/updating of land zoning that will determine river and tributary course boundaries, and permissible land uses (all economic activities) that can ensure river course integrity (setback distances) and protection from encroachments.
6. Monitoring and evaluation of proposed sectoral interventions of the Upper Litani basin to build on lessons learned.



Summary Costs of Proposed Measures

Summary Costs of Proposed Measures

Solid Waste	• US\$ 24.2 Million
Municipal Wastewater	• US\$ 34.3 Million
Industrial Wastewater	• US\$ 2.6 Million
Agriculture	• US\$ 2.6 Million
Cross-sectoral / Governance	• US\$ 12.3 Million
TOTAL	US\$ 76 Million

Implementation Timeframe: 5-7 years



Prioritisation of Measures

Prioritisation of Measures

Solid Waste

The priority for solid waste is to address the largest dumping sites which are located in Zone 5.

Municipal Wastewater

The largest wastewater pressures are identified by crossing the population pressure with the presence of water supply sources, whether for drinking, irrigation or recreational purposes. The top priority for response is indeed the municipal wastewater.

Industrial Wastewater

Industrial WW pressures are seasonal, yet not to be underestimated in their acute and long-term impact, especially that olive mill wastewater contains high levels of COD and phenols that can be detrimental to aquatic fauna, and to water supply structures downstream of the points of discharge.

Prioritisation of Measures – *Cont'd*

Recreational Establishments

The recreational establishments priority is to examine the area with the largest concentration of recreational activities which is Zone 5, where Tayr Filsay, Sir El Gharbiyeh, Qaqaaiyet Ej Jsir, Bedias and Jazire are the priority areas to be looked into to determine encroachment and regulate river use at these recreational establishments in order to allow for sustainable operations.

Agriculture

Agriculture does not constitute a major pressure on the River pollution in the LLB. The overuse of pesticides and fertilizers was noted for all crops and eventually agricultural return flows will contribute to the river pollution as well as groundwater and soil pollution. Ecological and land rehabilitation (forests, rangeland, quarries, dumps, agricultural land) is needed to reduce soil erosion and surface runoff, which would indirectly reduce contamination of surface water with contaminated runoff.



Roadmap to Implementation

Roadmap to Implementation

Municipal Solid Waste



- Operation of the Joub Jannine MSW facility
- Construction of the various MSW facilities (landfills, composting/sorting plants) and procurement of needed equipment
- Closure and rehabilitation of illegal dumpsites
- Procurement of needed equipment for solid waste collection services
- Training and capacity building for local authorities
- Public awareness campaigns
- Enforce anti-littering penalties

Municipal Wastewater



- Construction of the wastewater treatment plants in the identified localities
- Completion of wastewater networks and construction of new ones in the identified localities
- Assess the operation and efficiency of the existing wastewater systems
- Carry out feasibility studies for the construction of new wastewater projects

Industrial Discharges



- Establish a regional pre-treatment facility for olive mills wastewater treatment
- Support priority stone cutting facilities (7), and licensed quarry and sand washing sites, to establish their own pre-treatment units
- Support two dairy industries, and one chocolate industry to install pre-treatment systems

Roadmap to Implementation – Cont'd



Healthcare Wastewater Discharges

- Support healthcare establishments in establishing separate waste and wastewater collection systems.
- Advise healthcare establishments on pre-treatment systems if not connected to municipal wastewater network.
- Establish routine effluent monitoring programs at healthcare establishments.



Recreational Establishments

- Establish guidelines and operational parameters for their management of wastewater and solid waste
- Observe implementation of these measures through a discharge custody process
- Implement a strict no discharge policy into river water, and apply a penalty system
- The public domain on river embankments to be defined through topographic surveying
- Application of rules for setback distances where these apply



Quarries

- Enforce environmental legislation through Environmental Prosecutors



Informal Tented Settlements

- Inspection of sanitation and waste management conditions of ITS

Roadmap to Implementation – Cont'd



Classified and Non-Classified Non-Industrial Establishments

- Training of local government bodies on environmental requirements for various establishments
- Awareness raising on environmental measures
- Inspection spotchecks



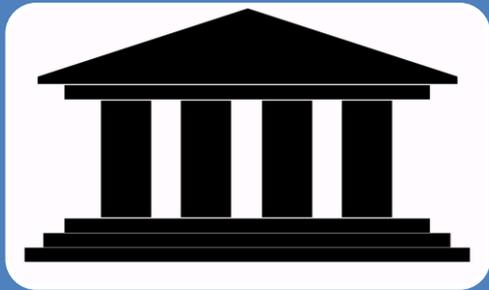
Agriculture

- Build and strengthen capacity on IPM
- Identification of technical problems and constraints of production and export of selected crops
- Monitoring of Water and Soil Quality
- Supporting the installation and use of efficient irrigation methods and technologies
- Support integrated Plant nutrition systems and soil conservation at farming community level
- Creation of Nitrate Vulnerable Zones (NVZs)
- Setting up a collection and disposal system for empty containers and obsolete/unused pesticide stocks, and training of farmers
- Ecological and Land Rehabilitation: estimation of land use-land cover changes, ecological assessment, land degradation assessment including establishment of a corridor, topographic surveys of quarries and engineering studies to determine rehabilitation requirements of quarries using construction and demolition waste, and related Environmental Impact Assessments (EIAs)

Roadmap to Implementation – *Cont'd*

Cross-sectoral and Governance

- Strengthening the governance and law enforcement
- Systemizing and standardizing data management
- Improvement of public administration management and inter-agency coordination
- Physical and chemical monitoring systems
- Masterplan for the LL Basin
- Monitoring and evaluation of proposed sectoral interventions of the Upper Litani basin to build on lessons learned.



Availability of the Study for Further Comments & Consultation

Study shall be shared with stakeholders through the Council for Development and Reconstruction

THANK YOU

