

# INVESTMENT IN EMERGENCY PLANNING



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# SUMMARY

Disasters, whether natural or manmade, are unpredictable and heavily disrupt all sectors, one of which is the water sector. In Lebanon specifically, water supply emergencies vary from single incidents to prolonged crises. This heavily affects the population and in particular the most vulnerable. This policy brief aims to shed light on the need to invest in an emergency response plan in Lebanon. The document showcases case studies of previous responses in other countries, then follows through by giving an overview of the Lebanese context and relevant actors. Finally, the brief provides recommendations at different levels in order to assist in next steps.

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# LIST OF ACRONYMS

<b>CCA</b>	Climate change adaptation
<b>CCCU</b>	Climate Change Coordination Unit
<b>CDR</b>	Council for Development and Reconstruction
<b>CEDRE</b>	Conference Economique pour le Developpement par les Reformes et avec les Entreprises
<b>CNRS</b>	National Council for Scientific Research
<b>CWA</b>	Central Water Agency
<b>DRM</b>	Disaster Risk Reduction Management Unit
<b>FAO</b>	Food and Agriculture Organization
<b>IWRM</b>	Integrated water resources management
<b>LRA</b>	Litani River Authority
<b>LRC</b>	Lebanese Red Cross
<b>MEW</b>	Ministry of Energy and Water
<b>MoA</b>	Ministry of Agriculture
<b>MoE</b>	Ministry of Environment
<b>NAPCD</b>	National Action Plan to Combat Desertification
<b>NDCs</b>	Nationally determined contributions
<b>NWSS</b>	National Water Sector Strategy
<b>RWD</b>	Regional Water Directorates
<b>WE</b>	Water Establishment

# INTRODUCTION

Disasters (natural or manmade) may not always be averted and such events often wreak havoc along their paths. The water sector is not immune to such disasters. There is a need to invest in an emergency response plan in Lebanon in order to deal with such events. An emergency response plan in the water sector is a document or series of documents that provide steps in response to, and recovery from, incidents related to situations of emergency. "Emergency planning is an ongoing process. It never really ends. The emergency operations plan is a living document, one that will constantly need revision and adjustment. It grows and changes as the organization changes and improves after testing and real-life experiences" (Smith, 2014). The capability of water sector staff to respond rapidly in emergencies will serve to avert complications in services; damage to water systems and protect end user's safety. If a country is prepared to respond, the impact of the disaster's damage could be reduced. Investing in emergency planning to secure what needs to be acquired or what needs to be set in motion in case a disaster strikes requires preparedness, mitigation, response, and transition to normalcy.

## Emergency Situations and Expected Impacts

Emergency situations related to water supply in Lebanon may vary from single intense incidents to protracted crises, which are prolonged emergencies that often combine natural disasters along with risk multipliers (Maxwell et al., 2011). Risk multipliers are natural or human causes, which exacerbate existing risks (Maxwell et al., 2011). Emergency situations can occur due to natural or anthropogenic causes. Table 1 gives examples of some of these emergencies.

**Table 1. Types of Disasters that may be Faced**

Natural	National Council for Scientific Research
Volcanoes	War
Famine	Cyber-attack
Hurricanes, Tornados, and Cyclones	Biological/chemical threat
Extreme Temperatures	Displacement
Lightning	Terrorism
Earthquakes	Civil disorder
Landslides	Crime
Droughts	Financial & Economical
Extreme precipitation and flooding	Negligence
Wildfires	Structural fails
Diseases	Transportation accidents
Displacement	Contamination

Lebanon is vulnerable to disasters and crises from multiple sources including natural hazards and human induced disasters (CNRS and FAO 2018). Some of the main disasters to consider are floods and droughts due to climate change. The main expected changes in climate are higher temperatures, less reliable precipitation, and more extreme events (in terms of both precipitation and temperature). This in turn will increase the intensity of droughts and floods (Verner, 2012). These changes will create major risks for all sectors related to the water sector, including the agriculture sector. Soil moisture and surface waters will experience decreased flows which will impact agriculture production for example. Moreover, due to higher temperatures, all water storage is likely to suffer increased evaporation. Higher temperatures will also increase crop water demand (McDonnell & Ismail, 2012). These changes will pose challenges on all communities especially those relying on agriculture for a living with a disproportionately negative impact on the poor (World Bank, 2016).

Governments should invest in emergency planning because whenever institutional responses to water issues are poor; social disorder, civil unrest, and protests often ensue as has been observed in Iran, Yemen, Iraq and Algeria (Ward & Ruckstuhl, 2017). Even though water issues were not the direct cause in the Syrian crisis, the Syrian government's policies, practices, and failed institutional responses to develop sustainable and equitable access was an indirect cause of fragility. This has contributed to the escalation of the Syrian crisis (de Châtel, 2014; Swain & Jägerskog, 2016).

## Emergency Planning and Investment

Organizations can learn from incidents beyond their own sectors and by applying the lessons learned from the common themes to explore the resilience of their emergency plans (Crichton et. al 2009). Science-based and effective investment in emergency planning and management is distributed along the following stages by order of importance (Song and Chen, 2014):

- 1. Mitigation - Overall reduction stage:** Identification and evaluation of risks and hazards. The higher the risk, the more urgent need to prioritize mitigation of the specific vulnerability.
- 2. Preparedness - Emergency readiness stage:** Planning, training, procuring necessary equipment, and testing and updating plans.
- 3. Rescue and response stage:** Deploy rescue teams and execute response plans
- 4. Recovery and reconstruction stage – Returning to normalcy:** Restoring affected areas, sectors, facilities to their previous state.

Preparedness and early action avoid or decrease consequential treatment and reconstruction of emergency situations. Investment optimization is by far the most useful in saving resources, especially when said resources are scarce; and in reducing investment pressure in advance (Song and Chen, 2014). Investing in emergency planning should answer the question of what the difference of losses between results in the scenario without preparedness will be and in the scenario with preparedness. Without an emergency plan, the time between an emergency being declared and the start of response efforts and financial losses would be greater; the contribution to response's effectiveness would be lower in quality; environmental safety and indirect effects – any spillover effects attributable to the investment would not be calculated or foreseen (PwC, 2017).

## Return on Investments

There are different types of return on investment in emergency planning (PwC, 2017).

- Prepositioning of emergency relief items and infrastructure procured internationally demonstrate consistently strong financial, time and carbon savings. Prepositioning of locally procured items has roughly neutral financial and carbon impact and saves time toward emergency response.
- Investments related to staff training show very high proportional returns partly because of the relatively low cost and their repeated use without further investment is repeated without further investment.

- Investments in infrastructure generally require longer payoff time due to high costs, but can have the greatest savings in absolute terms.
- Emergency preparedness investments related to information and data management and systems show very significant returns in terms of cost and time savings. They also result in improvement in the quality of response because of the availability of more reliable data.
- Emergency preparedness investments that have a joint effort rather than one actor show good returns in terms of quality of response, financial and time.

A large number of emergency plan investments showed a decrease in response time and about 1.8x savings on average across the lifetime of the investment.

## Risk Assessment

Risk assessment models offer an all-inclusive view on risk at a defined level of investments. Risk assessment is highly important especially in conditions where there is a lot of stress on the concerned sector and where many related trigger events are highly probable to occur (Deloitte, 2017).

- Building models and scenarios are essential, both for risk assessment along the “with and without” emergency planning scenarios when the method is being used to build a business model; the user must accept that the method is forward looking.
- Use the risk scenarios and models developed through existing country processes, such as contingency planning with the government and risk analysis and planning work.
- The return on investment relies on estimations.
- Risk scenarios should be specific to the geographic area of study.
- Data must fully cover all the investment components in the “with and without” emergency planning scenarios. When data is impossible to collect in some cases, scientific assumptions are sufficient.

Risk assessment was conducted by the National Council for Scientific Research (CNRS) on the agriculture sector only, and it determined that the biggest economic losses are seasonal crops, fruit trees, greenhouses and permanent crops, as well as forestry, livestock, and fishery sectors. Economic cost of the damages was estimated to be highest from floods while landslides and erosion were the least costly. Table 2 summarizes the findings of the CNRS study.

**Table 2. Cost of Disasters on the Agricultural Sector (CNRS and FAO 2018)**

Type of Disaster	Cost (USD)
Floods	330 million
Cold waves	241 million
Winter storms	212 million
Heavy rainfall	177 million
Heat waves	149 million
Wildfires	125 million
Strong wind	93 million
Landslides/land erosion	74 million

# CASE STUDIES

## Sondrio Italy response to floods

An example of a failed or non-existent emergency response plans to floods the case of Sondrio, Italy caused by a confluence of natural events – landslide and intense rainfall. A flood event occurred in multiple cities, including the city of Sondrio, due to the formation of a barrage in Spriana as a result of a local landslide. A lake formed behind the barrage which was subsequently breached. This led to flooding and mass debris transportation into Sondrio city and caused destruction in villages, road closures, and high-water level threats. The mass of debris and mud ran about 1.5 km downstream and generated a mud wave that was 35m high which traveled about 2.7 km (Crosta et. al, 2003). The events coincided with a change of government in Italy in 1987, which resulted in a quasi-political vacuum inhibiting proper response to the emergency (Alexander, 1982).

Borujeni et. al (2018) developed an updated plan which was adopted by the government; including the mayor, police, firefighters, red cross, NGOs, and the national gas company, with the aim to establish an administrative, organizational, and operational procedure to respond effectively to flooding emergencies. It is designed to maximize human safety, minimize structural damage, recognize roles and duties of trained staff, identify resources, assure responsive communication between all parties and restore normalcy after the event. The plan is broken down into five phases of monitoring, warning, alert, emergency, and restoration to normalcy).

### Phase 1: Monitoring

- Monitoring and assessing risks (population density, season, high risk zones, which enables the establishing thresholds for alert)
- The above would provide early warning systems
- Informing public with bulletin on the mass media, on the website of the municipality and available public places (schools, companies...)

### Phase 2: Warning

- Running and analyzing models
- Informing public through mass communication systems
- Revising road systems and mass evacuation routes and safety of transport infrastructures

### Phase 3: Alert

- Evacuation into low risk flooding zones and highlands
- Evacuation of vulnerable people
- Dealing with mass traffic jams.
- Preparation of healthcare systems

### Phase 4: Emergency

- Declaring state of emergency
- Ask for external help from adjacent cities and towns
- Mobilizing technical personnel (firemen and police)
- Actions to prevent and/or mitigate electricity blackouts and water supply facilities damages.
- Providing medical and survival supply kits for the general public
- Managing available resources
- Using emergency lines in case of total blackouts
- Ongoing monitoring of weather and updating flood maps according to the situation

## Phase 5: Normalcy

- Damage assessment
- Economic aids
- Decontamination of water resources
- Managing debris
- Managing debris and flooded buildings.
- Search and rescue parties

## Greece response to drought

Drought in Greece (2006-2007 in particular), highlighted the vulnerability of the society to these natural hazards by reducing production of crops and by jeopardizing the constant supply of water. The situation in Greece is defined by limited availability of water resources as well as certain disastrous situations where this limitation of water is aggravated by pollution incidents. The result is connected to both inadequacy of water resources and limitation of required infrastructure and institutions for water management.

The Greek government ratified the UN's convention for combating desertification (UNCCD, 1997) with a law. The law combines multidisciplinary and cross sectoral composition of representatives from various ministries, universities, research institutes and non-governmental organizations. The structure is as follows:

- Two representatives from Ministry of rural development and food.
- One representative from the Ministry for the Environment, Physical Planning and Public Works.
- One representative from the Ministry of National Economy.
- One representative from the Ministry of Development.
- One representative from the Ministry of Foreign Affairs.
- Two representatives from research institutes.
- Three academia representatives.
- One representative of NGOs active in the field of desertification.
- One university professor with expertise in soil science.
- One university professor with expertise in meteorology.

The fourteen members of the Committee are appointed by the Minister of Rural Development and Food upon recommendation by the involved Ministries, Authorities and Institutes. Along with the mentioned above, several Local Committees in each administrative region of the country were established in order to proceed with restructuring and further invigoration of the implementation of the UNCCD and its monitoring procedures.

Moreover, National Action Plan to Combat Desertification (NAPCD) provided guidelines, principles, and strategic objectives in policies to reverse already occurring desertification and prevent new occurrence:

- Fully apply all measures described in NAPCD,
- Incorporate the policies and measures described in the NAPCD into regional and local development plans,
- Implement the NAPCD through coordinated and integrated local projects securing the consent and Active participation of all related stakeholders,
- Develop local agencies that will undertake responsibility for coordination and implementation of NAPCD's policies and measures at local level,
- Elaborate and implement projects, studies and strategies required additionally to those described in the NAPCD for combating desertification at local level,
- Implement the NAPCD starting with six priority sectors, i.e. water sector, agriculture, forests, pastures, wildlife and biodiversity, socio-economic sector and operation of competent agencies.

The strategies in terms of water resources management were the following:

- Implementation of the EU Water Framework Directive (WFD) 2000/60 – to contribute to the mitigation of the effects of droughts. The directive also aims to identify drought at an early stage in order to be prepared to undertake emergency measures. Moreover, a presidential legislation was passed which emphasized the ecological functions of water, river basin management approach, economic evaluation and full-cost pricing of water services.
- Establishment of Central Water Agency (CWA) and Regional Water Directorates (RWD)
- Preparation of integrated water resources management (IWRM) plans for water districts: Management plans for river basins encompass compulsory measures and monitoring programs as well all required data, information and assessments for the protection and management of water resources aiming at addressing water supply and scarcity issues.
- Extension of the water storage facilities (reservoirs and artificial water recharging).

## Management of scarce resources - Cyprus policy reforms

Cyprus is an example of an island enduring water problems, leading to a continuous political conflict. However, due to their investment in emergency planning to droughts and scarce water resources, Cyprus is an excellent case for examining how an integrated policy can help to ensure safe water supply in areas of conflict. Policy reforms have considered the following (Joo Park, 2020):

- Ownership of water and water management to be divided into territories; their studies reinterpreted extraterritorial conditions of contemporary Cyprus and a plan to realign the island's water system through the creation of a new post-national territory.
- New water networks to minimize the gap between water supply and demand via transportation of rainwater from the roofs of domestic households through downpipes into storage tanks.
- Strategies to consider political and social issues for future urbanization, where new urban areas should be designed with self-sufficient water systems.
- Recycling and use of tertiary treated wastewater for groundwater recharge and agriculture.
- Desalination plant.
- Public campaigns and education promoting conservation.

The three case studies presented highlight two main issues – first, the need for policies that ensure coordination, cooperation, and timely responsiveness by the relevant authorities concerned with the various forms of water-related emergencies; and second the need for plans to be clearly outlined and which are automatically triggered independently of governments.

# CURRENT SITUATION IN LEBANON

Existing policies and plans have failed to address and prepare Lebanon for the many water related emergencies. Current events (namely COVID-19 pandemic, economic crisis, and the Beirut Port explosion of August 4, 2020) have shown that the connectivity and coordination between the various branches of the government are poor and the lack of investment in assets and infrastructure are glaring. Progress has been made by branches of the Lebanese government and international organizations operating in Lebanon in addressing climate change related disaster risk. Leading these efforts is the Climate Change Coordination Unit (CCCU) of the Ministry of Environment (MoE), the Ministry of Agriculture (MoA), the Disaster Risk Reduction Management Unit (DRM), the National Centre for Scientific Research, the Food and Agriculture Organization (FAO), and the Lebanese Red Cross (LRC).

## Ministry of Environment – CCCU

The CCCU covers all sectors: energy, transport, agriculture, forests and land use, water and wastewater, industrial processes, solid waste, tourism, public health, and coastal zones. Within these sectors, they focus on adaptation, mitigation and means of implementing climate change action. The CCCU reports on the progress Lebanon has made in reducing GHG emissions and in achieving the country's nationally determined contributions (NDCs). One of the main goals of the unit is to improve climate change governance through developing national and sectorial plans to coordinate climate change initiatives a key aspect of which is disaster reduction.

## Ministry of Energy and Water

The Ministry of Energy and Water took a step forward in addressing emergency planning in the water sector through its updated National Water Sector's Strategy (Vol 3, 2020) which includes a water safety plan with 11 modules that include:

1. Formation of a water safety team.
2. Detailed and updated water supply system description.
3. Identification of hazards and hazardous events and risk assessment.
4. Determine and validate control measures, reassess and prioritize the risks.
5. Develop, implement and maintain an improvement/upgrade the water safety plan.
6. Define monitoring of the control measures.
7. Verify the effectiveness of the water safety team.
8. Prepare management procedures.
9. Develop supporting programs.
10. Plan and carry out periodic review of the WSP.
11. Revise the water safety plan following an incident.

Under module 8, management procedures for normal and incident/emergency conditions are mentioned and they address the following:

- Response actions.
- Operational monitoring.
- Responsibilities of the utility and other stakeholders.
- Communication protocols and strategies, including notification procedures and staff contact details.
- Responsibilities for coordinating measures to be taken in an emergency.
- A communication plan to alert and inform users of the supply and other stakeholders (e.g. emergency services).
- A program to review and revise documentation as required.
- Plans for providing and distributing emergency supplies of water.

# Ministry of Agriculture

- MoA plans to assist the agricultural sector in many areas of intervention to better:
  - Adapt to climate change.
  - Introduce the adaptation measures through the various implemented programmes, and
  - Conduct a study to estimate the greenhouse gas emissions from the agricultural sector, land use changes and forestry.
- In their sixth course of action, the MoA strategy identifies an entry point for intervention through “Supporting and activating the mutual fund for the insurance of agricultural sector against natural disasters and reviewing and assessing the proposed financial mechanism”.
- The MoA, though, does not specifically tackle disaster reduction or risk management in agriculture.

## Disaster Risk Reduction Management Unit

The DRM unit’s vision is to build resilience in Lebanon to withstand man-made and natural disasters.

- The DRM unit covers:
  - strategies
  - policies
  - action plans and
  - tracks their implementation
  - awareness
  - early warning systems
  - research studies and understanding disaster risk
- Collaboration of every organization with the DRM is issued by a decree via the prime minister.
- Contains a National Crisis Coordination Committee to cover response in the case of a national crisis.
- A national taskforce (activated in 2018) in order to develop:
  - National reduction strategy
  - Response framework
  - Recovery framework
  - Mitigation and prevention framework.
- In 2018, government’s priority shifted from focusing on preparedness, recovery and response to adaptation and mitigation to flood events.
- Develops multi-hazard risk assessments, studies, and flood risk maps, as well as usage of drones for scientific purposes.
- The supporting scientific research is conducted by the National Council for Scientific Research (CNRS).
- Provides early warning systems that cover floods and wildfire simulations among others.

The new DRM national strategy will focus on the following priorities (Prime Minister Decree, Appendix B):

- The role of public sector in prevention and disaster risk.
- The establishment of a policy for the systematic assessment of current risks.
- The reduction of risk at the sector and ministry level.
- The development of a compilation of analysis of disaster losses.
- The preparation of early warning systems.

Amongst the important actions that were highlighted by the DRM over the next five years are:

- To mainstream disaster reduction into ministries.
- To plan development.
- To build the capacities and technical resources of vulnerable communities.

- To develop comprehensive community early warning system which has four components:
  - Understanding the risks.
  - Developing a contingency.
  - Setting up the basis for early warning systems.
  - Communication and awareness with the mass population (which requires working closely with the municipalities).
- The Disaster Risk Management Unit's website has pamphlets to guide the general public on how to remain safe during certain disasters.

## Lebanese Red Cross (LRC)

- Climate related hazards have been addressed before, as these often come up during community-based vulnerability and capacity assessments, allowing LRC to identify these hazards.
- The LRC DRR Unit focuses mostly on community resilience, disaster preparedness, mitigation and prevention.
- The Lebanese Red Cross works on all levels, ranging from individual and local to district, national and even international.
- Community resilience and sustainability are achieved by creating a DRM structure within a community.
- Capacity building is part of LRC activities. There is no specific focus on agriculture or agricultural areas, however, all mentioned hazards are targeted.

## CEDRE, CDR, Water Establishments, and Litani River Authority

Current mandates mention the need to:

- Develop emergency plans for floods, droughts, and dam failures – CEDRE's investment in the Emergency Action Plan is to identify emergency situations that could threaten the dams, and to plan for an expedited, effective response to prevent their failure (CEDRE, 2018).
- Include components in drought management plan (but not limited to) the ability to declare a drought emergency implemented directly by water establishments, CDR, and LRA. (Water security analysis, 2017).
- Improve storage capacity to meet increasing demands by building additional reservoirs (LRA, CDR), or by artificial recharge of groundwater aquifers, surface water storage (lakes and dams) (CDR).
- Emergency relief plan for about 50% increase in population in Lebanon due to displacement of refugees caused by the Syrian Crisis. (CEDRE, 2018) –Those are related to small scale interventions by NGOs in Syrian refugee camps.
- Flood mitigation management plan needs to be put forth, (CDR) to delineate high risk flood zones, and to reuse of flood water via holding tanks to recharge groundwater aquifers.
- CDR also proposed support to combat desertification.
- Lebanon Crisis Response Plan by CEDRE (2018) tackled Expansion and Improvement of the existing water supply system networks and dam conveyance systems. Also, by mobilizing additional water resources via new dams.
- Response to the financial/economic and political crises and COVID-19, are being dealt with via foreign aid; without which, the WEs could not have maintained operations. (Water Establishments)

All the above entities and stated plans though present on paper have been shown to be ineffective once an emergency occurs. The Port of Beirut explosion of August 4, 2020 clearly showed the hierarchy and channels of communications were not respected; the mass fish kill of April 2021 also failed to trigger the proper reaction and cooperation of government authorities. These are only two recent examples amongst a history of many.

# RECOMMENDATION AND NEXT STEPS

There is a need to consider response plans to all kinds of disasters (natural and man-made). The past year and a half (2019-2021) have proven that Lebanon is prone to a variety of emergency situations. Also, most of the reviewed documents failed to demonstrate how the strategies will be implemented. Failure to invest in emergency response planning will result in a high cost of damages to a cross section of sectors, as well as little or no freshwater supply to a large number of the Lebanese population, especially the vulnerable.

The case studies provided are similar to the challenges faced by Lebanon. To overcome the confusion and near-paralysis that has been witnessed in the past year and a half, policies must clearly be drawn that would coordinate if not integrate the activities of the various entities and ministries such that emergency action is triggered and the support infrastructure activated automatically. For this to happen the following actions are recommended:

## Administrative action:

There are recommended actions to tackle policy making, joint efforts and communication, as well as establishing effective database networks for all key players in the water sector. The following actions need to be addressed in the short term because the legal procedures take a lot of time to process and because the water sector's improvement is impeded by the lack of collaboration and distribution of duties among key players.

### Short term

- Quick action to link and focus the policy and governance frameworks for DRR, poverty reduction, and CCA in a way that can bring these local and sectorial approaches into the mainstream.
- Lebanon's many commitments to international agreements (e.g. PA, Agenda 2030, Sendai, UNCCD) require a combined effort from the CCCU, DRM unit, SDGs unit and others.
  - Coordination protocol should be formulated that mainstreams the activities at all levels: conceptualization, initiation of actions, conduct and implementation actions, and monitoring of results.
  - This could be done through an independent monitoring unit that tracks the mainstreaming effort and ensures that all stakeholders are well informed of any obstacles and barriers to allow for swift response to overcome them.
- Strengthen national policy and planning processes to reflect the importance of a strong, enabling environment for DRR and CCA initiatives at local (e.g. community and enterprise) level by ensuring policy cohesion and mainstreaming across all development sectors.
- Organizations and NGOs working on projects in Lebanon must start combining both DRR and CCA within their projects. FAO for instance, has been tackling climate change, especially within the agricultural sector, through a series of projects that amongst other aspects promote the SDGs and climate changes measures within national policies.
  - Establish and continually maintain a single, online database of past, current and planned DRR, SDG, CCA and related projects that have multi-country involvement. The database should include information on tangible benefits and learning generated, to promote joint planning, evaluation assessments and other activities.

## Financial Investments – funds and physical infrastructure

Financial investments include proper distribution of international aids as well revenue from tariff collection; and reinvestment in physical infrastructures for better storage and response to emergencies.

## Short term

- Maintain international aids and invest properly in order to operate independently.
- The government should develop a funding priority list targeting CCA and DRR and their integration that is free from political interference and donor bias.

### Medium to long term

- Preparation of facilities to mitigate damage to structures that might lead to electricity blackouts.
- Preparation of reservoirs and pipe networks to provide emergency water supplies.
- Procurement of emergency equipment such as generators, fuel, spare pipes and fittings, etc. to use for drinking water delivery via the existing or emergency water networks.
- Procurement of emergency water storage facilities that could be used to provide water to areas that need water for several days.
- Invest, in coordination with water establishments, in rainwater harvesting projects to capture and store rainwater at the individual lot/household/establishment level.

## Education and Capacity Building

Another form of investment to be put in action is human capital; the general population, as well as employees and professionals in the water sector.

### Short to medium term

- CCA innovations are more science oriented and the generated knowledge needs to be transferred to the local level. This knowledge transfer could be done in association with DRR awareness activities at the community and local levels.
- Focus on bottom-up community-based approaches. These approaches have proven to be successful in the past in Lebanon on small scale agricultural projects conducted by the CNRS and FAO within small scale farming communities; however, the institutional framework was not available to further enable and follow up on these projects.
- Document case studies, good practices, lessons learned, methodologies and tools that can be used to enhance the integration of DRR and CCA at regional, national and community levels
- Make every reasonable effort to co-convene DRR and CCA meetings at times and locations that maximize the coordination and integration opportunities.
- Training onsite staff for a general and specific preparedness of facilities in order to mitigate damage.

## Plan for Emergency Response Action

Actual plans for response in case of specific emergencies – floods and droughts for example – should be well prepared and include the following for a more effective response in terms of financial and human losses.

### Short term

- Establishing effective monitoring networks to alert of an upcoming disaster.
- Teams of various disciplines to respond during the emergency and to conduct outreach to affected facilities; assess damages, provide support as well as coordinate among all parties involved.

### Long term

- Prepare emergency mass communication systems pre, intra and post disasters given the high chance that standard communication servers are destroyed as well as.
- Preposition medical, and survival supply kits in high risk zones.
- Preparation of healthcare system response.
- Prepare mass evacuation plans via predetermined evacuation routes taking into consideration traffic jams should evacuations need to be done in a limited amount of time.

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