

**UN OFFICE FOR THE COORDINATION
OF HUMANITARIAN AFFAIRS (OCHA)**

**United Nations Disaster Assessment and Coordination
(UNDAC)**

**MISSION TO SYRIA, HAMA PROVINCE: DAM
COLLAPSE**

6 - 10 June 2002

Mission Report

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SYRIA, HAMA PROVINCE: DAM COLLAPSE

UNITED NATIONS DISASTER ASSESSMENT AND COORDINATION (UNDAC) MISSION 6 - 10 JUNE 2002

EXECUTIVE SUMMARY

The large Zeyzoun earth dam, located in the agricultural Al-Ghab region some 300 km north of Damascus, collapsed on 4 June 2002. The impact of the released water caused serious damage in nearby populated areas with resultant casualties .

To date some 20 people are known to have been killed, and this figure is not likely to change. It is estimated that over 10,000 people were directly affected by this incident to varying degrees, with at least 2,000 rendered completely homeless.

Six days after the disaster, it is considered that the humanitarian situation resulting from this accident is largely under control as a result of a swift and targeted response by the Provincial and Central Syrian authorities. A rapid reaction by the international community, which sent large quantities of emergency supplies, also contributed to quickly stabilize the situation.

It is therefore considered that immediate relief needs are met for the most part. A residual concern is about the capacity of the government to continue to provide emergency food rations over an extended period of time, taking into account damage caused to crops.

Major concerns remain about the mid- and long-term consequences of these events. Over and above the already serious impact of the disaster on the population directly affected (loss of houses, property, agricultural products and livestock), it must be considered that the economy of an entire agricultural region will be severely affected by the sudden disappearance of the major source of irrigation water available. Consequences at the national level are difficult to evaluate at this stage, but cannot be completely ruled out.

Summary of Recommendations

Based on field assessment and on exchange of information with all major partners (government, local authorities, UN Country Team, Red Crescent, donors), the UNDAC team recommends the following:

Immediate Action: It is recommended that the UN Country Team, in close cooperation with the local authorities, should continue to proactively monitor the humanitarian situation, with particular attention to food supplies for the affected population. Further to its current intervention, WFP should stand ready to provide an additional assistance, if gaps are identified in the governmental efforts.

Longer-term Action: as repeatedly pointed out by the local authorities and the central government, the rehabilitation of the irrigation system, including the

rebuilding of the Zeyzoun dam, is an absolute priority in order to avoid that the already heavy consequences of the disaster on the economy of the region become catastrophic.

The government would welcome an international team of experts, to evaluate reconstruction plans of a local team, which will soon be appointed by the directorate in charge of the Zeyzoun reservoir. Such an international team would include experts on dam construction, pumping systems and irrigation.

At the same time, it is important to continue to support the local population coping with some very difficult 12-24 months to come, especially as far as food is concerned.

It is also recommended to elaborate and implement a programme of support for improving the national disaster management capacity.

WORK OF THE MISSION

The mission, working under the auspices of the UN Resident Coordinator and in close cooperation with the UN Country Team, met with appropriate Syrian officials, and had discussions on the various aspects and the most effective ways in which the supplementary international assistance could be mobilized and distributed.

The mission visited the disaster-hit area, and was briefed by provincial officials on the extent of damages incurred, the scope of relief response by the national agencies concerned, the required international assistance, and plans for rehabilitation and reconstruction.

The mission was pleased to note a high level of interest and participation by the donor community both on the field trip and during a discussion in Damaskus.

ACKNOWLEDGEMENTS

The UNDAC team gratefully acknowledges the kind assistance and support offered by the Syrian Central and Provincial authorities, the UN Resident Coordinator, the UN Country Team Heads of Agency and staff, the International Federation of Red Cross and Red Crescent Societies and the Syrian Red Crescent.

Both the Syrian authorities and the UN Office in Damaskus provided every possible support for the mission, including full access to their information, documents, and facilities. They also provided official representatives and interpreters to accompany the mission. Transportation was made available to visit the affected area.

BACKGROUND

The Zeyzoun earth dam, located some 90 km north-west of the town of Hama, approximately 300 km north of Damascus, started developing cracks in the retention wall in the early hours of 4 June 2002. At around 15:00, the initial trickle of water gave way to a massive outpour, which led to the progressive collapse of a section of the dam's wall approximately 40 meters high and 100 meters wide. In about one hour, over 70 million cubic meters of water flooded an area estimated in 60 square km.

The flooded area included mostly agricultural land, mercifully with a relatively low population density. The following villages were affected: Zeyzoun (population 1,000), Al-Imshiak (1,344), Gargoor (2,366) and Tel Wasit (1,696).

IMPACT

Casualties: the latest official figures released by the local authorities (9 June) speak about 20 people dead and one child still missing.

Damage to human settlements: varies from the total destruction of the village of Zeyzoun, located next to the dam, to partial destruction of settlements located between 2 and 3 km from the dam, to flooding of the ground floor of houses in villages further away. The latest governmental estimates speak about 251 houses completely destroyed and some 121 partially destroyed, and about 200 damaged.

Impact on livelihood: for many victims, the individual food reserves have been partially or completely washed away and their sources of livelihood, such as land and job opportunities, have been lost.

Infrastructure: 60 km of roads were reported by the government to be damaged. The vast majority though can still be used. Also damage on the electric power lines and the telecommunication system was reported. No details available as yet. One bridge is damaged, but usable.

Health and social infrastructures: two schools are reportedly completely destroyed and at least three damaged. One health center is partially damaged but still functioning.

Damage to agriculture: it is estimated that up to 8,000 hectares of arable land have been submerged for up to a week. Part of the crops survived and can still be harvested. The damage is still being investigated by a government commission.

Loss of livestock: the numbers of missing livestock remain unclear. This is also still being investigated by a government commission.

Infrastructure for agriculture: one of the storehouses of the agricultural credit bank was reported to be damaged.

The state of the **water management system**, a particularly important subject, has been investigated in some depth. The water management system in the area was composed by:

- 2 reservoirs: the Zeyzoun dam (broken) and the Qastun dam.
 - The two reservoirs that are normally filled during winter and used for irrigation in the summer. The capacity of the Zeyzoun reservoir was 71.000 000 m³, the capacity of the Qastun reservoir is 26.000.000 m³.
 - Although the breach visible in the wall of the Zeyzoun is some 100 meters wide, it is estimated that the wall is displaced and cracked for over 500 meters.
- Canals that redirect water of the Orontes river. The gate of one of the channels is blocked / damaged. No urgent problem.
- Pumping system, which brings water from the river into the reservoirs, consists of 4 stations, which have been affected to a varying degree:
 - The 1st station (6 pumps) used to pump water from the river into a

tower, from where the gravity took water through a system of pipes and open channels to the 2nd station. Station 1 is still flooded and severely damaged.

- The 2nd station (6 pumps), located approximately 1 km from the Zeyzoun dam, pumped water further to a junction from where water could be directed to the 3rd or the 4th pumping station. Station 2 is still flooded and severely damaged.
- The 3rd station (4 pumps) pumped water into the Zeyzoun reservoir through a pipe that went through the dam and ended up in a feeding tower. This station is totally destroyed.
- The 4th station fed water into the Quatsum reservoir. Station 4 was not inspected, but it was reported to be functional.
- An irrigation system, for redistribution the reservoirs' water to the fields. This system is partly damaged.

Medium term effects: As a result of the damage of this water management system, there would be negative consequences in the near future for the local economy. The UNDAC Team was not in a position to ascertain exactly how many people relied on the failed water reservoir for their personal and agricultural needs. The government reported that in total 250.000 people are in some way depending on the reservoir, but it is not entirely clear, at this stage, how this calculation was performed.

A few important points can be highlighted:

- Drinking water doesn't seem to be a problem, as two existing wells are capable of fulfilling the needs of the population.
- Farming: it is estimated that 40.000 – 50.000 people depend directly on the Zeyzoun reservoir to irrigate their farming land (approximately 14,000 ha). Approximately 3400 ha can be irrigated for a few more months, as long the Qastun reservoir still contains water. After that it will also dry out.
- Industry: the Zeyzoun reservoir provided annually around 20 million cubic metres of water to the Jessr Al-Shoghor sugar factory, which is one of the pillars of the local economy.

CURRENT HUMANITARIAN SITUATION

In the immediate vicinity of the dam, practically where the “disappeared” village stood, a temporary camp of about 100 tents has been erected by the Syrian Red Crescent. Current population is estimated at about 1,000 and, according to Red Crescent officials, likely to grow in the days to come. Water is provided through governmental tankers and food is provided by the government as well. Some sanitation facilities had already been erected. A mobile clinic provided by the Ministry of Health is providing basic health services. Living conditions are extremely basic but likely to improve shortly thanks to the planned distributions of non-food items.

The other families rendered homeless have found temporary accommodation nearby their destroyed houses, either in makeshift tents or with neighbours/relatives, and are receiving punctual assistance by the government.

The remarkable level of assistance being provided by the government was also visible in the less damaged areas, where the UNDAC Team could witness a few food distributions and several clean-up and rehabilitation works involving heavy machinery.

At present the humanitarian situation resulting from the dam collapse is largely under control.

NATIONAL RESPONSE

Syrian Central Government. The Government of Syria has set up a National Emergency Committee chaired by the Prime Minister. The Central Government has allocated the necessary financial resources, and has provided food and non-food relief to the affected people.

Hama Provincial Government. The Provincial Government is the principal coordinator of the response operations. They have established an emergency co-ordination committee, chaired by the Governor of Hama. This committee includes all principal provincial sectors. The emergency committee has formed four sub-groups to address specific areas of interest, these are an assessment committee to look into damage to agriculture, infrastructure, public property and private property.

The local authorities are currently overseeing the distribution of practically all relief supplies, including those provided by the central government and by the numerous bilateral donors. In addition to that, local authorities provide drinking water (tankers and bottle water) and emergency health assistance (mobile clinic). Also the local government is planning for provisional housing for 800 people.

Military Authorities. The military authorities have been involved in the response to this incident, particularly for the early evacuation of people most at risk.

Syrian Red Crescent Society (SRCS). The SRCS has been the principal non-government actor involved in the operation relief operation. They have reacted with speed and professionalism, providing first aid for the victims of the disaster and

quickly setting up a temporary camp for the homeless. They are the channel through which the assistance of the Red Cross/Red Crescent Movement is provided (including donations from the United Arab Emirates Red Crescent and the incoming substantial assistance from the International Federation).

INTERNATIONAL RESPONSE

United Nations Agencies and other international organizations

The UN Country Team in Syria, under the leadership of the UN Resident Coordinator, immediately established a coordinating mechanism to bring together the UN response and to establish a common interface with government authorities, other agencies, as well as with bilateral and multilateral donors.

The UN agencies in Syria within 24 hours of the event undertook a preliminary needs assessment and maintained a presence in the field ever since. National Program Officers have been assigned on a rotation basis to serve in the office of the Governor of Hama as liaison and support to the local authorities' coordination efforts.

The office of the Resident Coordinator in Damascus was instrumental in ensuring liaison with the highest governmental authorities and in keeping the donors up to date, in particular convening a donor briefing meeting on 10 June.

UNICEF has sent 100 tents and first aid kits for the camp.

UNHCR has sent 10 trucks with the following relief items:

- 1446 mattresses
- 620 tents
- 165 metallic containers
- 190 pair of shoes for women
- 171 pair of shoes for children
- 237 jackets for children
- 454 boiler tanks
- 1100 kitchen sets
- 614 high quality blankets
- 25 outfits for men
- 1804 water jerricans (20 liter)
- 46 water jerricans (10 liter)
- 64 water jerricans (25 liter)
- 395 plastic containers
- 306 water jugs
- 48 plastic ships
- 100 small ovens
- 3650 blankets
- 312 plastic sheets
- 300 outfits for women

UNDOF has offered 10 trucks for transportation purposes.

UNFPA has made available USD 30,000 for the purchase of 1,000 reproduction health emergency kits, medicines and disinfectants.

WFP is making the necessary arrangements for the provision of food rations for 10,000 people for 1 month, which should be available in one-week time.

WHO has provided water purification kits, and has offered essential drugs, disinfectants, baby milk powder and insecticides (total value of USD 10,000).

IOM has offered trucks for transportation. It also has in stock in some neighbouring countries 250 tents and some non-food items. IOM will provide USD 3,000 to cover costs of transportation of the above-mentioned relief items from UNHCR.

OCHA has released an emergency relief grant of USD 50,000 to be transferred to the UNDP office in Damascus. The UN Country Team is currently evaluating proposals for their use. OCHA fielded a five-member UNDAC team that arrived in country early morning on 6 June, to assist the UN Resident Coordinator, the UNCT, and the national authorities in assessing the situation.

IFRC made available CHF 200,000 (approximately USD 130,000) from their Central Emergency Revolving Fund to support the relief efforts of the Syrian Red Crescent Society. IFRC also issued an appeal on 7 June for support to 8,000 beneficiaries for a period of one month, focusing on family food parcels and non-food items.

Bilateral Donors

A number of donors have already made contributions or pledges for support of people affected by the dam collapse. These are as follows:

Algeria has sent 2 airplanes with medicines, food and blankets; has also dispatched a medical team.

Japan has made available USD 50,000, and has sent a technical team to inspect other dams.

Iran has dispatched doctors and volunteers from the Red Crescent to work in the camp.

Iraq has sent 12 airplanes with food, medicines and blankets, and also dispatched a 12-member medical team.

Italy is sending 1 airplane from Brindisi UN Warehouse with medicines (mostly antibiotics), tents and blankets. It considers the provision of 10 trucks for transportation, as well as a possibility of making a financial contribution for rehabilitation purposes.

Morocco has sent 4 airplanes with food and medicines.

Saudi Arabia has sent 1 airplane Boeing 747 with food, tents and medicines.

United Arab Emirates have sent 2 trucks and 1 airplane with medicines, food and blankets.

A group of experts has arrived from French Communication Sans Frontiere.

CONCLUSIONS AND RECOMMENDATIONS

Immediate Humanitarian Needs

At present the humanitarian situation is largely under control, thanks to a rapid response by the Government, supplemented by international assistance. The victims of the disaster have lost a great deal, but they are not at risk of an immediate aggravation of their situation. This assessment is based on the following considerations:

Since cholera and malaria are not endemic in the region, there is a very low risk of such epidemics.

The nutritional situation of the population before the disaster was more than acceptable (baseline data for Syria speak of 13 % of moderate children malnutrition, and figures are likely to be much lower in an agriculture-intensive area). Therefore, the victims are not at immediate risk of starving. WFP is taking the necessary steps in helping the government to overcome difficulties in replenishing stocks for food distribution.

There are already large amounts of relief supplies coming into the country, including food, tents, blankets, jerry cans, plastic sheeting, cooking sets and medicines. This should be of great help in stabilising the situation of the victims for the months to come until houses are rebuilt.

There has been a coordinated effort by UN agencies and a rapid direct response to the immediate relief operations with material and financial donations. Relevant UN agencies are developing project proposals for medium- and longer-term activities, and stand ready to assist in any subsequent rehabilitation work. The United Nations stand ready to intervene, should any emergency need arise in the next weeks or if incoming supplies are not enough to cover needs, especially in the food sector.

It is recommended that the UN Country Team, in close cooperation with the local authorities, should continue to proactively monitor the humanitarian situation, with particular attention to food supplies for the affected population. WFP should stand ready to intervene to fill possible gaps in the governmental assistance.

Medium- to Long-term Issues

Like in any other disaster, in any country, the primary responsibility to help the suffering population and improve the situation in the future belongs to the Government of the affected country.

It is clearly understood that any international assistance is not to substitute, but only to supplement governmental activities. For this reason, such assistance should be

carefully targeted, and be focused on those areas where it could produce most positive, practical results.

As repeatedly pointed out by the local authorities and the central government, the rehabilitation of the irrigation system, including the rebuilding of the Zaizoon dam, is an absolute priority in order to avoid that the already heavy consequences on the disaster on the economy of the region become catastrophic. At the same time, it is important to find ways and means to support the local population coping with some very difficult 12-24 months to come.

Urgent rehabilitation needs in the agriculture sector

In light of the devastating consequences of the loss of the Zeyzoun reservoir, two types of action are required:

In the immediate phase, it is important to rehabilitate the pumping system (particularly by rehabilitating Stations 1 and 2). Failure to do so in the very short term will aggravate the situation even further, as the Qastun reservoir, which is still perfectly functional, won't be able to be replenished.

In the medium term, at least 500 metres of the wall of the Zeyzoun wall need to be rebuilt. Also the complete rebuilding of pumping Station 3 and rehabilitation of part of the irrigation system is required.

The local authorities have indicated that, more than material resources, technical expertise is in great demand in order to carry out the rehabilitation and reconstruction work according to best practices, and ultimately avert the possibility of further tragic events.

The local government would welcome an international team of experts, to evaluate reconstruction plans of a local team, which will soon be appointed by the directorate in charge of the Zeyzoun reservoir. The team should include experts on dam construction, pumping systems and irrigation.

Disaster Management

This disaster, as a man-made incident, demonstrates the necessity to improve the emergency management capacity and contingency planning in the country. The role of prevention and preparedness is clearly recognized as being the most effective form of defence against disaster. This capacity should be strengthened by appropriate international assistance.

An effective contingency plan can make the difference between a successful and an unsuccessful response to a disaster. Such a plan should not just be a document, but needs to be a tested mechanism that is sufficiently flexible, robust and practical to meet the unpredictable demands placed upon it by a disaster. Such plans should exist at all levels and for all organisations, tying together into a coherent system.

It is difficult to completely avoid similar accidents in the future. Many other dams exist in Syria, and it is important to take the necessary steps for a better prevention

and preparedness arrangements, as well as for an increased awareness of existing hazards and associated risks for surrounding populations.

If a population is aware of the threat and the most effective way to survive, then lives will be saved, relief needs will be reduced and the significance of an event can be reduced. These benefits can also be translated into financial savings at both the national and donor level.

It is therefore recommended to elaborate and implement a programme of support for improving the national disaster management capacity. Such a programme should take into account all aspects of disaster management, including prevention, preparedness, awareness, policy development, contingency planning, vulnerability mapping, risk assessment, early warning systems, training, information-sharing and communication.

In particular, it is recommended to apply the UN Environment Programme's "Awareness and Preparedness at Local Level" (APELL) process to various potential hazardous sites (including other dams) in the country.

Relevant UN agencies are planning to prepare project proposals which would address some key areas of concern, including those outlined above. Therefore, it is recommended that potential donors consider the possibility of funding.