# Summary Mission Report

# Technical Support to Assessment of River Contamination in the La Pasion River, Guatemala, July 2015

UNEP

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## Executive Summary

Significant numbers of dead fish were reported in the river La Pasión in the Petén region in Guatemala during two instances in April and June 2015. Pesticide contamination or the depletion of oxygen by organic matter, alternatively a combination of both these factors, was put forward as a possible cause of the mortalities. The source of the pollution was believed to be overflowing at the oxidation basin of a nearby palm oil production plant. The events led to severe impacts on the livelihoods of approximately 15,000 people living in the riverine communities, dependant on La Pasión's waters for drinking, sanitation, cooking and fishing.

Sampling and analysis of river water was undertaken in connection with the two events by national laboratories and showed traces of the pesticide malathion. To confirm the results, the Guatemalan Government requested support from the international community to investigate the immediate risks to human health due to residual contamination. Subsequently, two international experts were mobilized through the United Nations Environment Programme (UNEP) / Office for the Coordination of Humanitarian Affairs (OCHA) Joint Environment Unit with support of the European Commission's Humanitarian Aid and Civil Protection department and the Swedish Civil Contingencies Agency to provide technical sampling and analysis advice to the national and local authorities.

The experts collected six water and two sediment samples which were tested for a range of pesticides. The sampling and analysis, carried out two months after the first reports of an incident, could not determine the content of the previous discharge(s). Access to the palm oil production plant was denied and information on processes and chemicals use could not be verified. As such, the cause of the fish mortality could not be conclusively determined. However, field measurements of the river pH, conductivity and oxygen show the conditions to be average. While no pesticides were detected in the water samples, one of the sediment samples showed traces of the insecticide endosulfan sulphate.

No residual pesticides were found in the river water samples which would pose immediate risks to human health. Laboratory results of samples taken earlier by other teams from the palm oil oxidation pond support the theory of oxygen depletion causing the fish mortality, but do not explain the reported additional impacts on animals, including birds, or the reported impacts on human health such as skin rashes. While no analytical evidence of pesticide contamination was found, on-site observations and interviews make it clear that the aquatic system is under threat of contamination. The river is affected by untreated wastewater from communities, by waste and agriculture and industry runoff. These underlying factors can rapidly change the status and conditions of the water in the river and its tributaries, making it difficult to assess the watercourse as permanently suitable for drinking water.

It is recommended that distribution of water continue until safe water sources have been identified for all affected communities. A sampling plan focusing on the use of river water for consumption and livelihoods in affected communities should be developed and must explore options for alternative sources of drinking water. Existing emergency response plans should be reviewed and updated and need to include early warning and monitoring of, and communication with, the region's agriculture and industries. In the long-term, national legislation related to environmental monitoring of industrial and agricultural activities should be strengthened, implemented and enforced.

## Background

The river la Pasión is approximately 80-100 meters wide with a depth reportedly ranging up to five meters. The water in the river, tributaries, sources and lakes is used for drinking, washing, cooking and fishing. During the rainy season, the river increases in flow, depth as well as areal coverage, and in the past, wells for drinking water located near the river have become inundated. The quality of the river water as well as of surrounding lakes and tributaries depends on the seasonal hydrological variations. Flooding events in the river La Pasión typically progress gradually, posing a larger threat to property than to human lives.

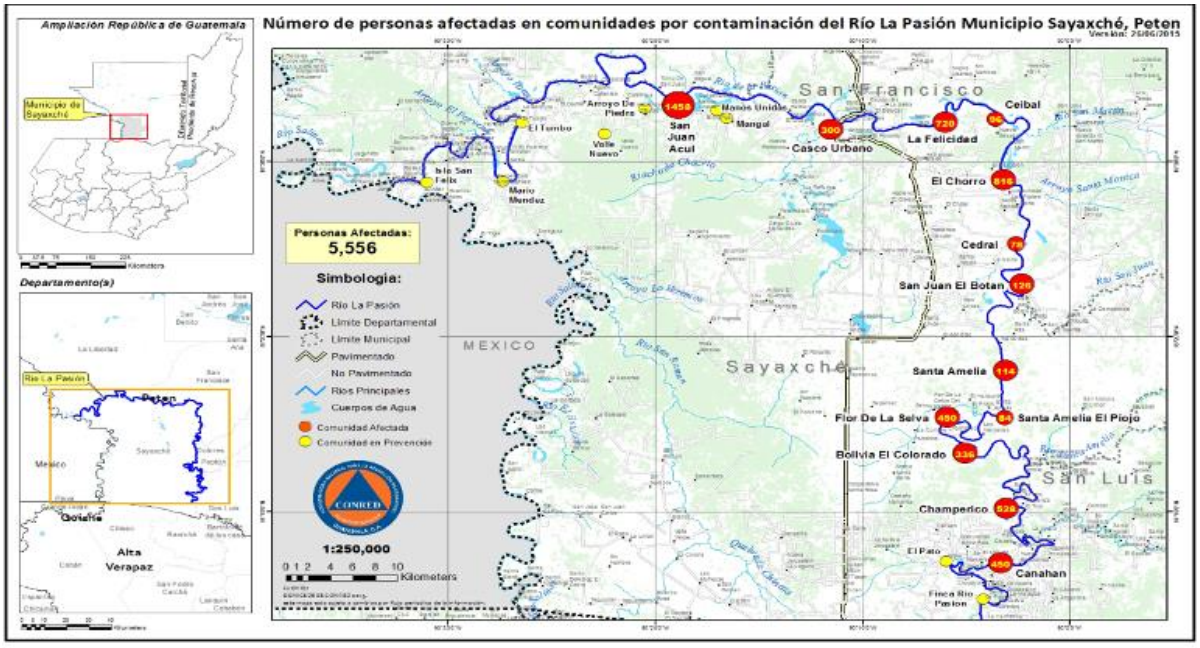


*Figure 1: Map of the affected area along the river La Pasión. Yellow circles depict communities at risk, red circles depict communities and number of people affected.*

In the end of the spring 2015, on two separate and successive occasions, significant numbers of dead fish were reported from areas along the river in the Petén region, Guatemala. The first event of fish death occurred on 28 April 2015, and the more severe second event, when thousands of fish where found floating on the surface, was reported on 6 June 2015. Following the second event, inhabitants were advised not to eat affected animals or to drink the river's water. It was estimated that approximately seventeen communities had been affected, placing five communities or 14,827 people at direct risk of the contamination in the river.

Upon the request of the Government of Guatemala, river water samples were taken after both events and analysed in-country. Following the first spill in April, a humanitarian response was mobilised by local authorities. After the analysis of samples taken after the second event proved inconclusive the Guatemalan authorities requested international technical assistance to support further sampling and analysis. A mission comprised of two international experts was subsequently mobilized through the Joint UNEP/OCHA Environment Unit with support of the European Commission's Humanitarian Aid and Civil Protection department (ECHO) and the Swedish Civil Contingencies Agency. The objective of the expert mission was to, in coordination with local authorities, the UN county team and other actors, to support the national authorities

with conducting further sampling and analysis and to make recommendations for food and water security as well as for future preventive actions.

The investigation of the cause of the spill was conducted separately by two experts from United States Environmental Protection Agency upon request by the Ministry of Environment and Natural Resources. Findings of this mission were not available to the team at the time of writing (August 2015) or at the time of the publication of the summary report (September 2015).

## Methodology

The following four steps provided the basis of the mission's analysis and recommendations:

- *Field observations and information:* A number of communities were visited to carry out interviews, field measurements and to gather information to develop a sampling plan.

- *Sampling:* Sampling was carried out according to a sampling plan (see full report, annex 5) focusing on the presence of residual pesticides. Six water samples and two sediment samples were collected and analysed. As the team did not have access to the industrial site, sampling was not conducted at the palm oil processing plant and its oxidation basins. Similarly, the team was also not able to verify detailed information on plant processes and the chemicals used therein.

  Sampling and related analysis results were affected by the hydrological condition at the time of the mission, which was different to the conditions at the time of the contamination events. Water levels were elevated at the time of fieldwork due to the arrival of the rainy season. Sampling of water was done in the area of the discharge from the palm oil processing plant but the effluent pipes could not be exactly located since they were inundated. The higher water levels made it more difficult to sample sediment in areas of accumulation, since the flow of the river changed the accessibility of the selected sites as well as the conditions for accumulation of sediment. These factors severely constrained the assessment.

- *Analysis of previous sampling and analytical results*: The first sampling and analysis was undertaken of the water and fish in the river after the first event and identified traces of the pesticide Malathion, an organophosphate. Samples were again collected after the second event, on 7 and 9 of June, but no pesticides were detected in these. Analysis of water in the nearby palm oil processing plant's oxidation basin showed a high chemical oxygen demand of 13,125 mg/l and a biological oxygen demand of > 2,000 mg/L, respectively.[1] Overflow of such an oxidation basin could cause hypoxic conditions in the river.

- *Laboratory analysis of samples taken during the mission:* The laboratory Investigación Laboratorio Análisis Servício Asesorias analysed collected samples for content of pesticides (organohosphates, organochlorides and pyrethroids).

[1] Reference values: The average chemical oxygen demand at communal waste water treatment plants is 300-800 mg/L for the influent and 10-35 mg/L for the effluent. For the biological oxygen demand the reference values is 200-400 mg/L for the influent and less than 10 mg/L for the effluent.

## Findings

Field measurements showed the pH of the river water to range from 7.25 – 7.7 with oxygen levels ranging from 4.4 – 5.8 mg/l, which is in the lower range for river waters. No significant difference between samples upstream and downstream of the palm oil processing plant was observed.

One water sample (from a well in Santa Marta) indicated a significantly lower oxygen level, with a lower pH (6.9) and higher conductivity than for the other samples. These measurements are coherent with still water with no flow, typical of a well where the water has not been replenished in some time. It is reasonable to attribute the difference in water quality to these circumstances.

Results of the pesticide content of the water samples were provided by laboratory after the completion of the mission. The results for all individual parameters were negative with pesticide contents lower than the detection limit. In one of the two sediment samples endosulfan sulfate, a chlorinated pesticide, was detected at a concentration of 0.03 mg/kg.

## Conclusions

The time elapsed between the events on 29 April and 6 June, 2015, and the sampling undertaken by the international experts in July 2015, make it difficult to conclusively link the results with the incidents. The river water samples analysed after the events indicated traces of Malathion. It is reported that oxidation ponds at nearby palm processing plants overflowed at the time the fish deaths were reported. Analysis of the wastewater in the oxidation pond, conducted independently from this mission, shows a high chemical oxygen demand, supporting the assumption that the incidents were caused by a combination of oxygen depletion and toxic substances.

From the upper part of the river, the water flow is steadily replenished leading to transport and dilution of any possible contaminants. A mixture of organic material and pesticides would with time be transported, diluted and dispersed throughout the river system and is therefore not expected to cause long-term harmful effects on the ecosystem. As no residual pesticides were detected in the water, the mission concludes that the water from the river and the tributary El Mico does not pose a health risk from pesticides. However, the mission did not assess the full water quality and can therefore not exclude the possible presence of pathogens or bacteria or other contaminants in the water. Water provision for affected communities should continue until a full water quality assessment has been made.

The sediment sample containing endosulfan sulfate cannot be connected to the event, but does imply that there is an underlying contamination risk from pesticide use in the area. Interviews and observations also support the assumption that the aquatic system in la Pasión is under permanent stress from untreated wastewater and waste. The two incidents highlight how industry and agriculture, and specifically the lack of adequate retention and water treatment systems, also poses risk to the river environment. All these factors combined can rapidly change the status and conditions of the water in the river as well as tributaries and makes it difficult to assess a watercourse as being suitable for drinking water purposes. It is likely that small-scale

spills occur yet remain undetected by the population, who thus are not informed to stop taking river water for a certain period of time.

## Recommendations

A number of recommendations have been formulated:

*Short term:*

- In July 2015: While no residual pesticides have been detected, continue to provide safe drinking water for coming weeks to affected communities until a full water quality assessment has been conducted.

*Medium term:*

- Relevant government authorities to strengthen monitoring and enforcement of agricultural and industrial activities, carrying out regular inspections to assure that relevant regulations in terms of discharge, waste treatment, waste disposal or application of pesticides are fulfilled.
- WASH sector to work with relevant authorities to develop a regional sampling programme of the river water and its tributaries. The sampling plan should include wells. After a six-month period the results can be evaluated and the sampling programme revised. Systems for rain water harvesting from roofs, should ideally be promoted as an additional source of drinking water.
- An emergency response plan should be developed or refined, with the aim of improving the response for events of discharge of waste or chemical spills. The emergency response plans should include early warning actions and can be developed based on principles described in the Awareness and Preparedness for Emergencies at Local Level (APELL) programme[2].

*Long term:*

- Support the adoption of integrated water resources management, including the establishment of river basin organizations and the subsequent development and adoption of river basin management plans.
- Review national legislation regulating communal and industrial discharges, including revising environmental quality standards for water bodies and improving authorities' means to control and improve water management at agricultural and industrial facilities. Adequate legislation can support the equitable distribution, use and protection of Guatemala's water resources between communities, agriculture, industry and other stakeholders.

[2] http://www.unep.org/apell/