

# Arrangements for the Termination of a Nuclear or Radiological Emergency

## Case Study Part 3: The Radiological Incident in Hueypoxtla, Mexico

# Purpose

- To present and discuss the emergency response to the radiological incident in Mexico in 2013.
- To analyse the radiological incident in the context of the guidance given in IAEA Safety Standards Series No. GSG-11 for the transition to a planned exposure situation.

*The Case Study is **not** an assessment of the emergency response to this radiological incident but an opportunity to illustrate fulfillment of the prerequisites given in the IAEA Safety Standards Series No. GSG-11 for transition to a planned exposure situation.*

# Learning objectives

- To analyse the emergency response to this radiological incident against the guidance given in IAEA Safety Standards Series No. GSG-11.
- To identify different stages of response to the radiological incident.
- To analyse when the prerequisites for transition to a planned exposure situation were fulfilled and when the emergency could have been terminated.

# Contents



- Overview of the emergency response to the radiological incident in Hueypoxtla, Mexico, in 2013
- Discussion and feedback session

# Expectations from participants



- Following the presentation, participants are expected to discuss the emergency response to this incident within their Working Group and to answer the questions provided in *Case Study Part 2 and Part 3: Analysis of the Fukushima Daiichi NPP accident and the radiological incident in Hueypoxtla, Mexico.*

*Case Study Part 2 and Part 3:  
Analysis of the Fukushima Daiichi NPP accident and the radiological  
incident in Hueypoxtla, Mexico*

| QUESTIONS  | Fukushima Daiichi NPP<br>accident | Radiological incident in<br>Hueypoxtla, Mexico |
|--|-----------------------------------|--|
| 1. What urgent protective actions were implemented and when their implementation was completed?  |                                   |  |
| 2. What early protective actions were implemented and when their implementation was completed?   |                                   |  |
| 3. What activities were implemented to characterize the situation and to support resumption of normal social and economic activity and when preparations for this resumption were completed? |                                   |  |
| 4. When conditions were ensured that allow for the emergency to be terminated?   |                                   |  |

## 2 December 2013

# Background of the event



On 28 November 2013, a truck left the city of Tijuana (Baja California State) carrying a teletherapy unit head (about 3000 Ci or 100 TBq  $^{60}\text{Co}$ ) from the Hospital General Regional 20 (Instituto Mexicano del Seguro Social - IMSS).



**2 December 2013**

## **Background of the event (cont'd)**



Its final destination was a radioactive waste storage facility (Centro de Almacenamiento de Desechos Radiactivos - CADER), located near the town of Santa María Maquixco (Mexico State), a trip of 2800 km.



*Image courtesy of CNSNS*



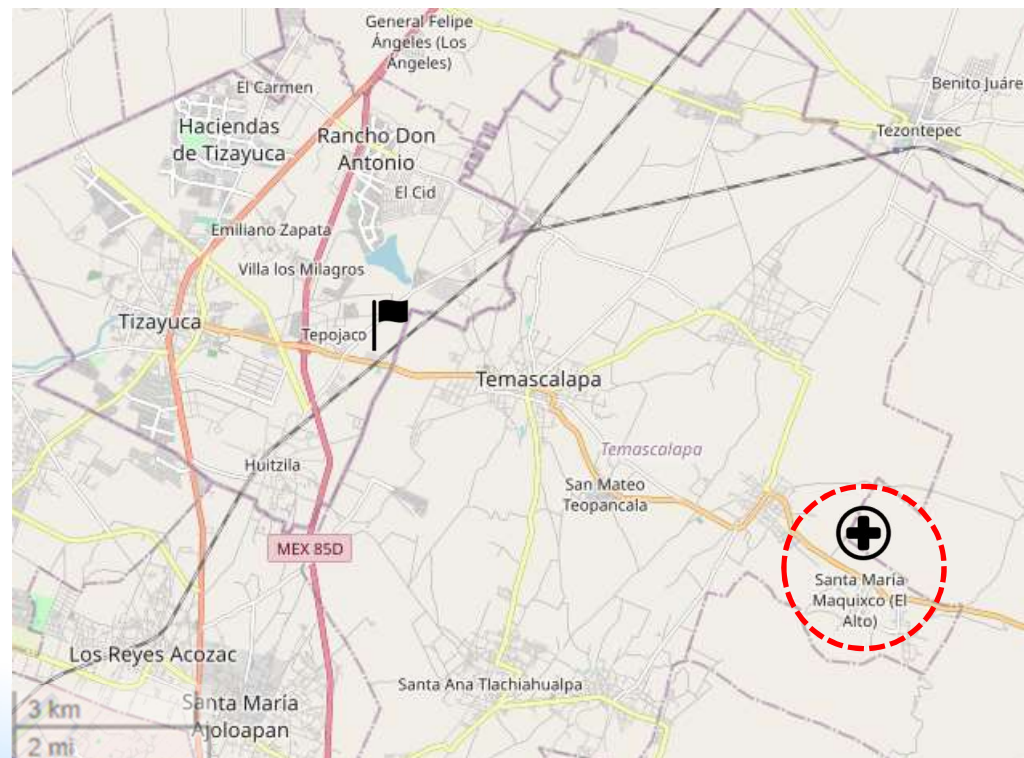


# 2 December 2013

## Background of the event (cont'd)



During the night of 1 December 2013, the driver of the vehicle stopped at a rest stop within the site of a gas station near the city of Tepojaco (Hidalgo State), some 20 km from the final destination.



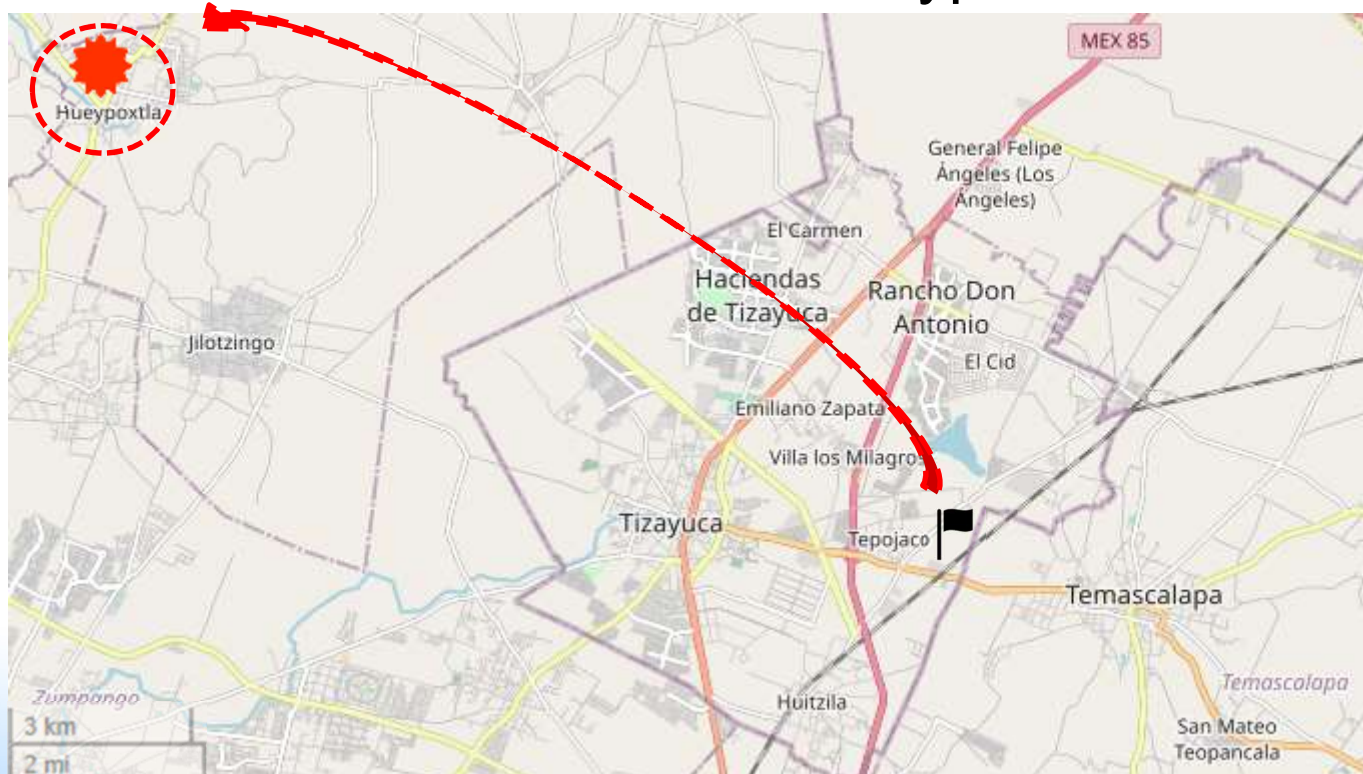
*Image reproduced from @OpenStreetMap contributors CC BY-SA*



# 2 December 2013

## The event sequence

- At about 02:00 on 2 December 2013, a group of armed individuals stole the vehicle, together with the radioactive source.
- The thieves drove to the town of Hueypoxtla.



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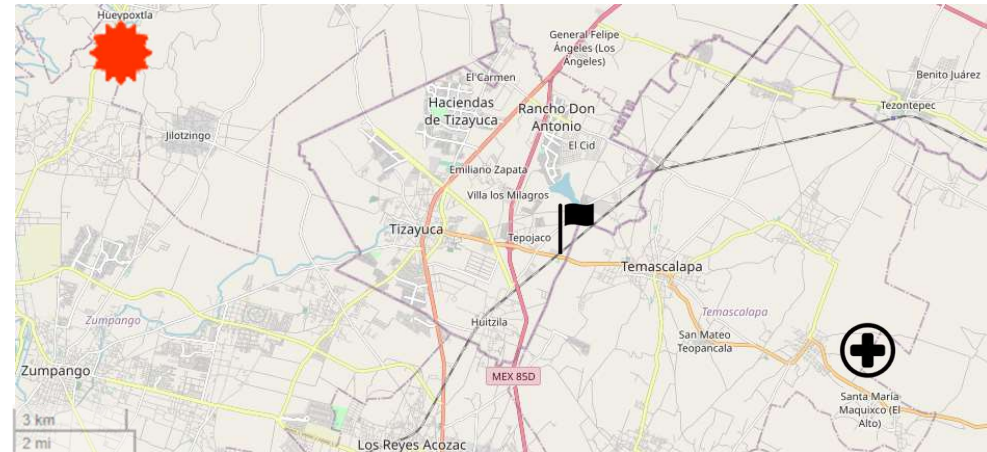
# 2 December 2013

## The event sequence (cont'd)

- The thieves were apparently only interested in the vehicle.
- Still, the teletherapy head was dismantled and the  $^{60}\text{Co}$  source was removed from its shielding.



*Image courtesy of CNSNS*



*Image reproduced from @OpenStreetMap contributors CC BY-SA*

## 2 December 2013

# Notification of the event



At 08:13 on 2 December 2013, the National Commission for Nuclear Safety and Safeguards (CNSNS) was notified by an employee of the transport company.

- The CNSNS searched for information about the serial number and activity of the stolen source and the identification of the shielding;
- The CNSNS prepared an information bulletin for the Civil Protection Agency with details of the incident, potential risks of handling the radioactive source, recommendations for actions and protection of the public and contact numbers for distribution.

## 2 December 2013

# Distribution of information



At 13:00 on 2 December 2013, the CNSNS distributed an information bulletin to the State Governments of Hidalgo, Veracruz, Puebla, Tlaxcala, Mexico, Querétaro and San Luis Potosí, as well as to Mexico City and to the federal authorities.

The IAEA was notified through USIE.



# 2 December 2013

## The search



- In the afternoon of 2 December 2013, the army located the stolen truck in the neighbourhood of Hueypoxtla.
- The federal police sent out officers to confirm the information and search the area for the radioactive source.
- The truck had been abandoned, but the source had disappeared.



# 4 December 2013

## The search (cont'd)

- The Federal Police located the teletherapy head in a local backyard and reported it to the CNSNS. The shielding casing was empty.
  - A local resident had brought the device home thinking that it was a water pump. He could not read English and therefore was not aware of a potential radiation hazard.



*Images courtesy of CNSNS*



# 4 December 2013

## The search (cont'd)

- The CNSNS dispatched two teams with mobile equipment to search for the radioactive source. They focussed on 10 km radius area around the location of the robbery.
- The Federal Police continued their investigation in neighbouring municipalities and their surrounding areas.

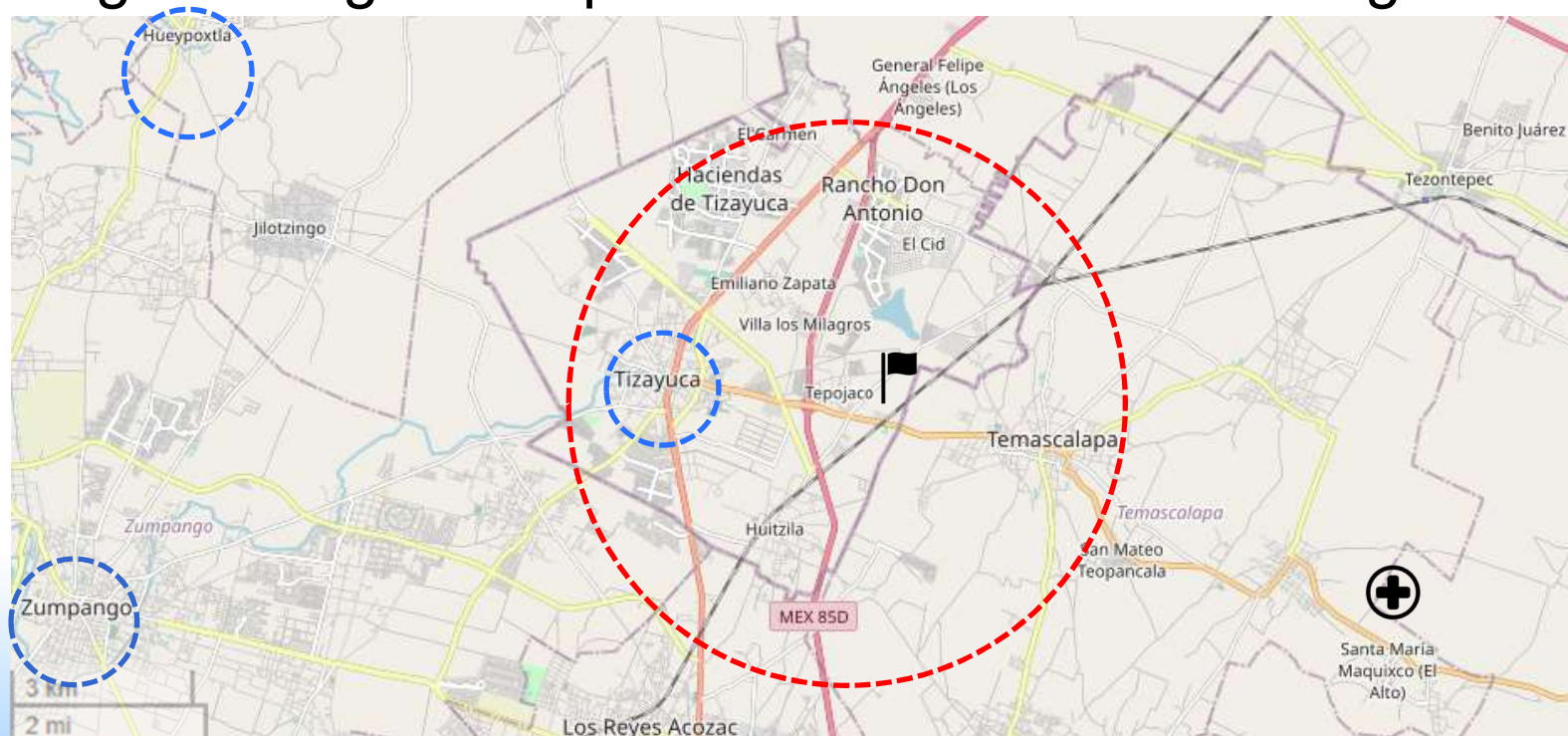


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# 4 December 2013

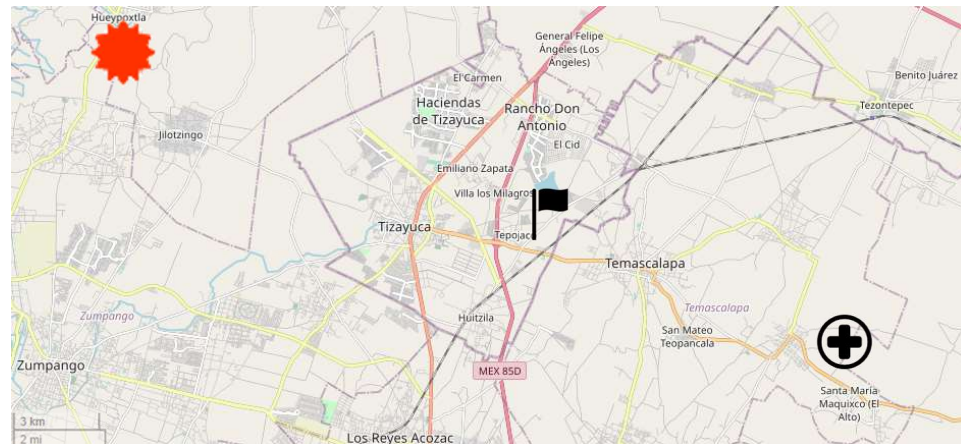
## Locating the source



- The federal police identified an area in the vicinity of Hueypoxtle, where the radiation level exceeded the normal background.
- In the evening, together with a specialized team from the CNSNS, the police located the source; it was lying among the crops in a field. A 500 m radius zone was cordoned off to prevent access.



*Image courtesy of CNSNS*



*Image reproduced from @OpenStreetMap contributors CC BY-SA*

## 5 December 2013

### Preparing for recovery of the source

- The activities to delineate the area and more accurately locate the position of the radioactive source continued.



*Images courtesy of CNSNS*

- The CNSNS also requested experts from the Laguna Verde NPP and the Ministry of the Navy to assist in planning for the recovery of the source.



**6 December 2013**

## **Preparing for recovery of the source (cont'd)**



- Experts from the Laguna Verde NPP entered the area previously delineated by CNSNS and determined the exact location of the source.
- A transport container was requested from the National Institute of Nuclear Research (ININ) for recovering the radioactive source. The container had to be adapted for the intended purpose.



*Image courtesy of CNSNS*

**7 December 2013**

## **Preparing for recovery of the source (cont'd)**



- Experts from the CNSNS, Laguna Verde NPP, Navy and Federal Police started planning the clearing of the area around the location of the source in order to facilitate the recovery operations.
- Clearing operations continued until 9 December.



*Image courtesy of Federal Commission for Electricity of Mexico*

## 8 – 9 December 2013

### Medical follow-up



- The CNSNS requested the help of the Ministry of Health of Veracruz State and the federal Ministry of Health for support in examining individuals who may have been in contact with the radioactive source.
- A joint team visited the Hospital de Pachuca to examine individuals who might have been exposed.
- The team also went to Hueypoxtla to examine individuals thought to have been in contact with the source.
  - One individual had symptoms of radiation exposure on the left shoulder and right leg and was sent to the Hospital de Nutrición in Mexico City for treatment and follow-up.
  - Another individual showed no signs of radiation exposure (having been in contact with the source in its shielded state).



# 10 December 2013

## Medical follow-up (cont'd)



- People who were present at the site on the day the source was found were questioned about their behaviour.
- Out of 59 persons who were presumed to have been exposed:
  - 22 persons were identified for more detailed dose reconstruction;
  - Of these, 10 individuals were selected for a biological dosimetry.
- The biological dosimetry later revealed that only the person who had handled the source after it had been taken out of the shielding received a dose in excess of 500 mSv.

# 10 December 2013

## Recovery of the source

- The source was successfully recovered with the help of a robot, placed in a transport container and transported to the waste storage facility.



*Images courtesy CNSNS*

# Epilogue



- There was no indication that the source had been damaged or broken up and no sign of contamination to the area.
- Hospitals had been alerted to watch for symptoms indicating high radiation exposure resulting from close proximity to the source, which might include sickness and burns.
- One member of the public, the farmer of the cornfield where the source was found, presented himself with skin damage indicating overexposure after carrying the source on one shoulder. He was hospitalized for medical assessment in Mexico City.

# Discussion



- Based on this information, please discuss and answer the questions distributed for this Case Study (*Case Study Part 2 and Part 3: Analysis of the Fukushima Daiichi NPP accident and the radiological incident in Hueypoxtla, Mexico*) within your working group.

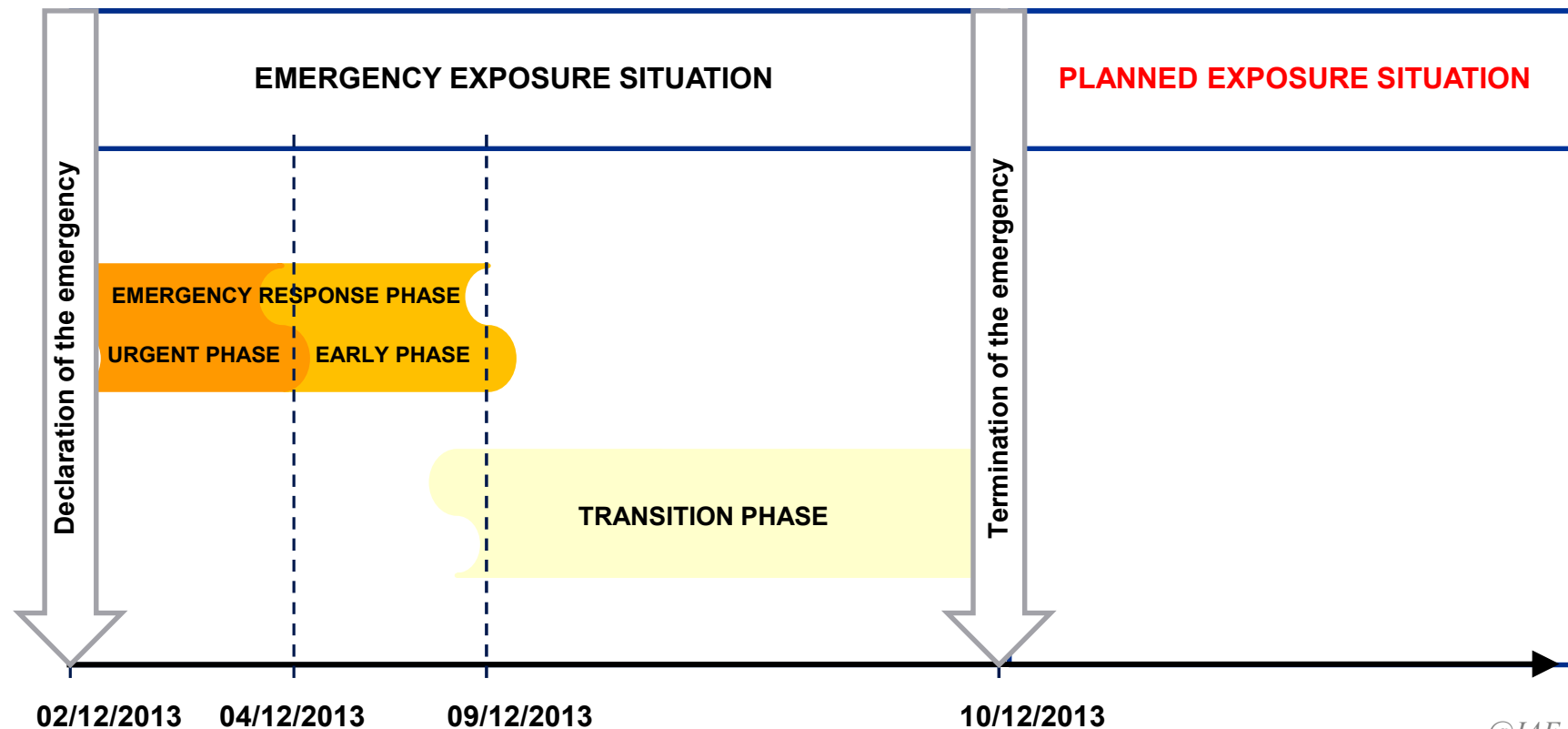
– Time allocated: **15 mins**

# Let's discuss:



- What urgent protective actions were implemented and when was their implementation completed?
- What early protective actions were implemented and when was their implementation completed?
- What activities were implemented to characterize the situation and to support resumption of normal social and economic activity and when were preparations for this resumption completed?
- When were conditions ensured that allowed for the emergency to be terminated?
  - Time allocated: **15 mins**

# Retrospective sequencing and milestones of the radiological incident in Hueypoxtla





# Basis for the milestones

- The emergency started on **2 December 2013**, when the vehicle transporting a dangerous source was stolen (**urgent response phase**).
- Until **4 December 2013**, the emergency response focused on locating the source and issuing warnings and information. On **4 December 2013**, the source was located and the area cordoned off and secured (**early response phase**).
- Until **9 December 2013**, emergency response focused on identifying the exact location of the source among the crops. On **9 December 2013**, the source was isolated and its integrity confirmed (**end of emergency response phase**).
- Plans for recovery progressed in parallel, allowing the rapid recovery of the source on **10 December**, by which time monitoring around the site had been completed and all exposed individuals had been identified for assessment and medical follow-up (**transition phase**).

# Case studies

- Detailed in Annex I of IAEA Safety Standards Series No. GSG-11 for further information



**IAEA**

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*Atoms for Peace and Development*

*Thank you!*