

EXERCISE SIMULATION

5th NPSR Annual Meeting
Singapore, Oct 26 – 28, 2022

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PHILIPPINE NUCLEAR RESEARCH INSTITUTE

South East Asia Map



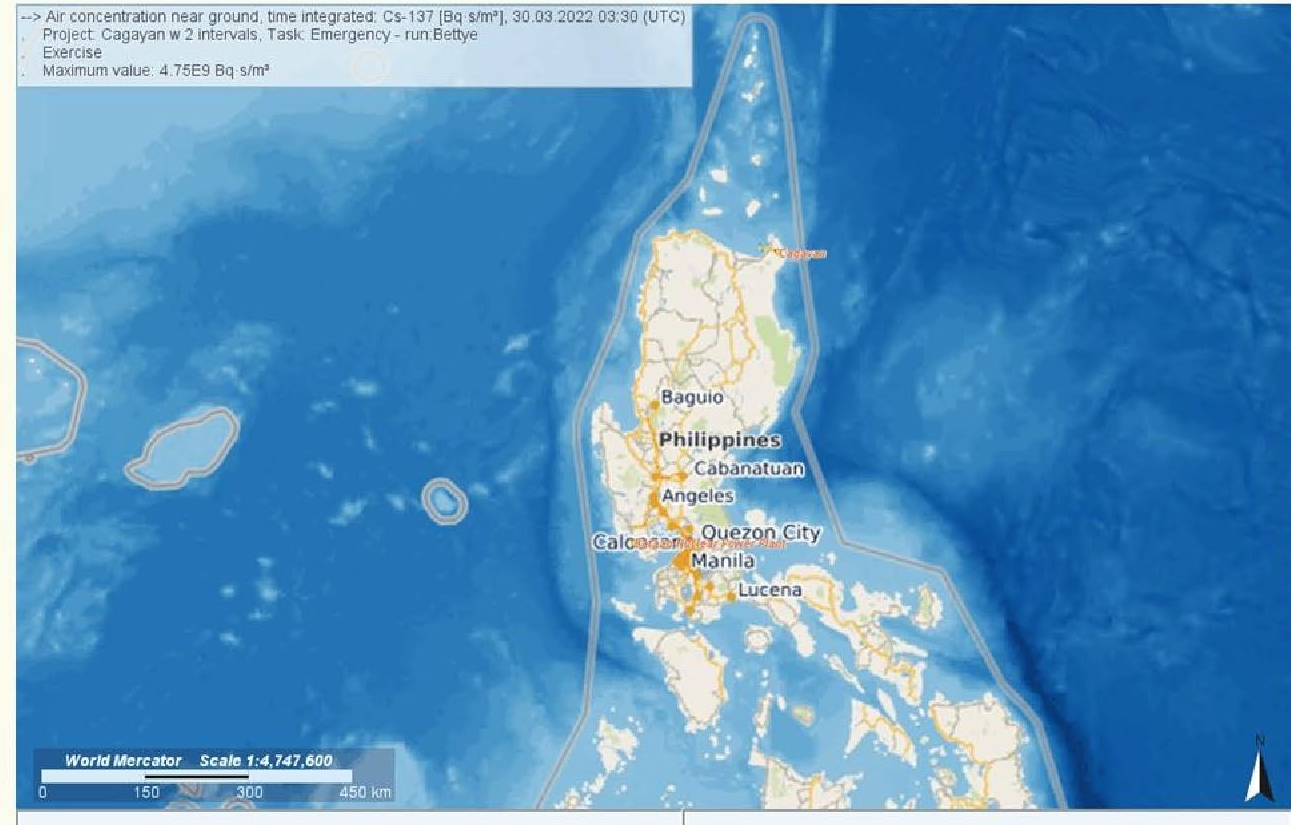
Short summary of input data

On 30 March 2022, 2:30 UTC

- General emergency was declared
- Notified local authorities and the Regulatory Body (RB)

The operator informs accidental release may occur

- Potential release
 - Start: 02:30 UTC; 30.03.2022
 - End: 5:30UTC; 31.03.2022
 - Release height: 100 meters



Exercise Report under EU – INSC Project “Enhancing EPR in ASEAN, Technical Support for Decision Making”, March 2022



Location and Coordinates

Location

Cagayan Valley SMR

Coordinates:

18°21'41.2" North

122°14'20.9" East



Cloud Arrival Time

0 - 2.6 hours

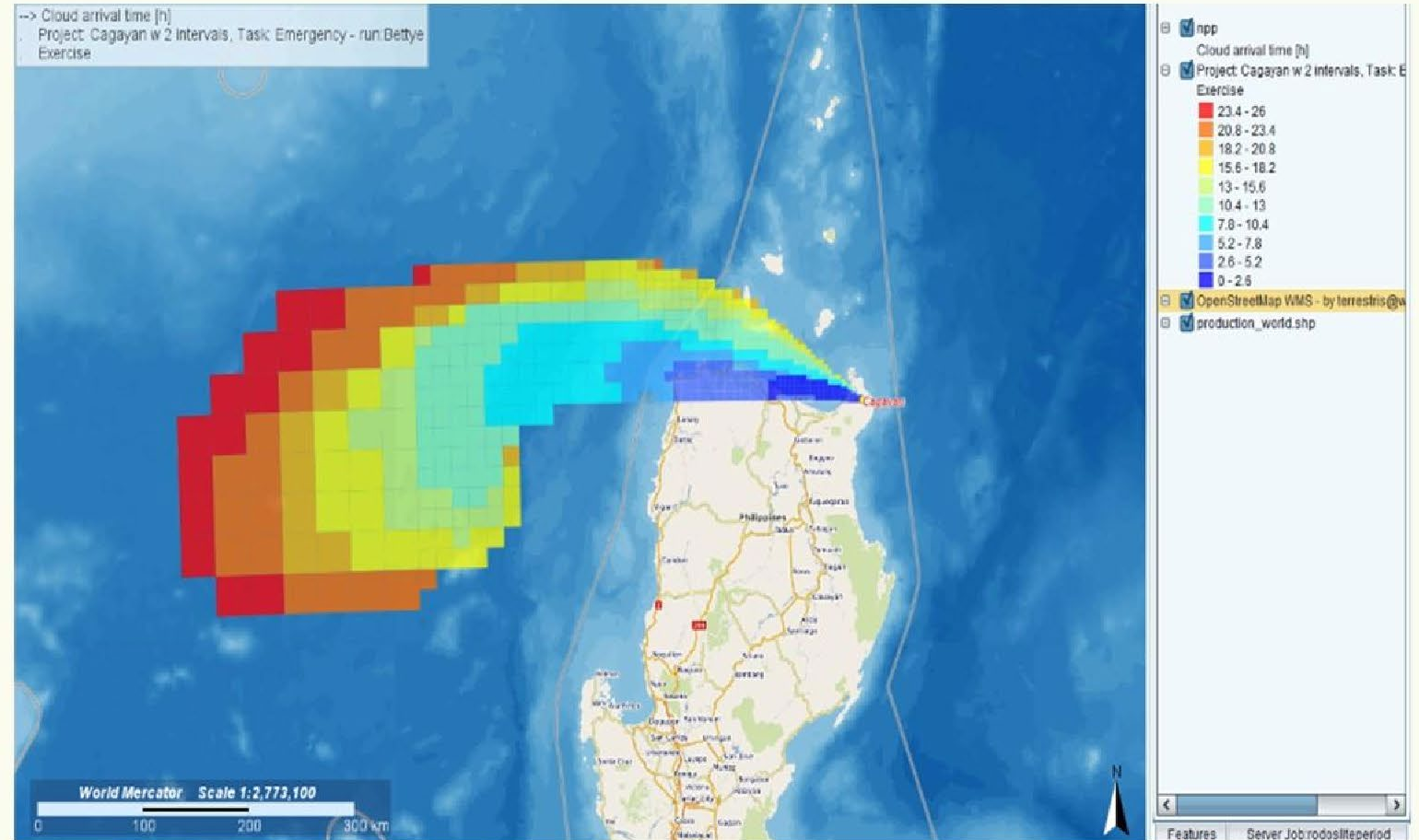
2 Areas affected:

- Coastal 2, Sta Ana, Cagayan
- Abulug, Cagayan

2.6 – 5.2 hours

12 Areas affected:

- Aparri Cagayan
- Ballestros Cagayan
- Pamplona, Cagayan
- Sanchez Mira, Cagayan
- Claveria, Cagayan
- Santa Praxedes, Cagayan
- Adams, ilocos Norte
- Dumalneg, ilocos Norte
- Pagudpud, ilocos Norte
- Bangui, ilocos Norte
- Burgos, ilocos Norte
- Pasuquin, ilocos Norte



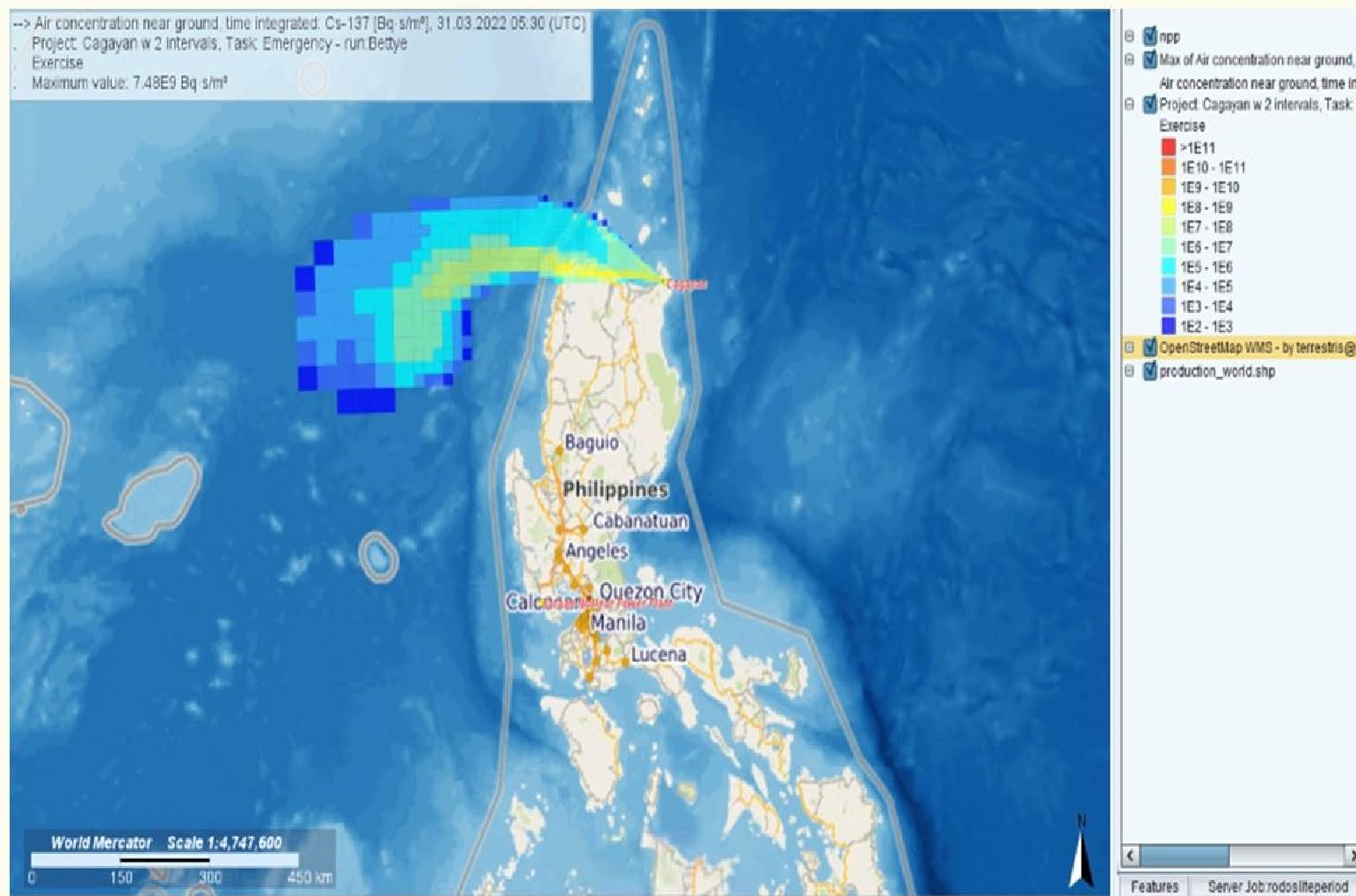
Air Concentration

Maximum Value

7.48E9 Bq/m³

Areas:

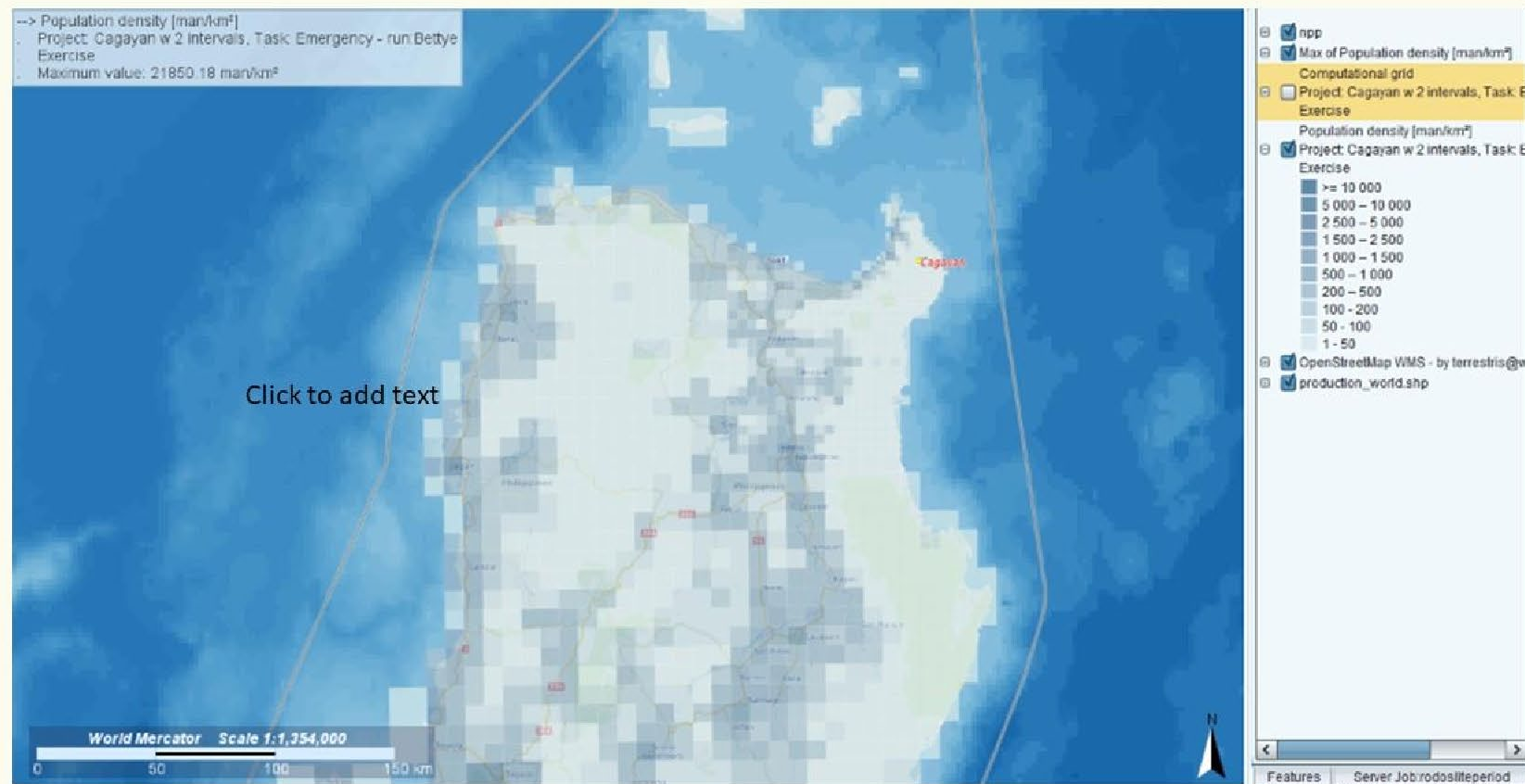
- Coastal 2, Sta Ana, Cagayan
- Abulug, Cagayan



Population Density

Areas Affected with High Population Number

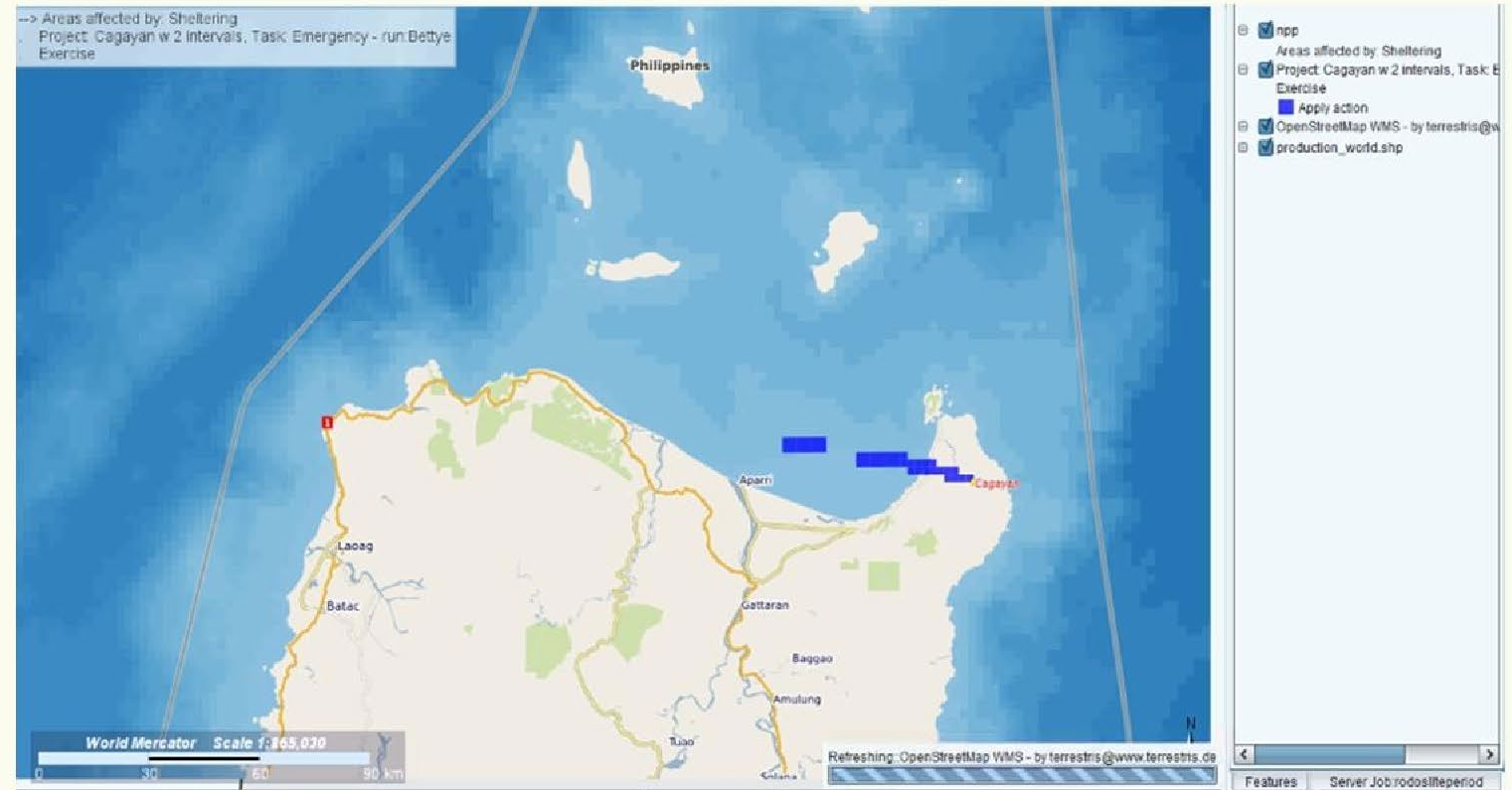
Aparri, Cagayan	±6,000
Ballestros, Cagayan	±3,000
Abulug, Cagayan	±2,000
Sta Ana, Cagayan	±1,500
Claveria, Cagayan	±1,200
Sanchez Mira, Cagayan	±1,000
Pamplona, Cagayan	±800



Sheltering

*Area that will require
Sheltering*

Coastal 2, Sta Ana, Cagayan



Iodine Tablets to Children (Up to 12 years old)

*Areas that will require
Iodine Tablets for children
up to 12 years old*

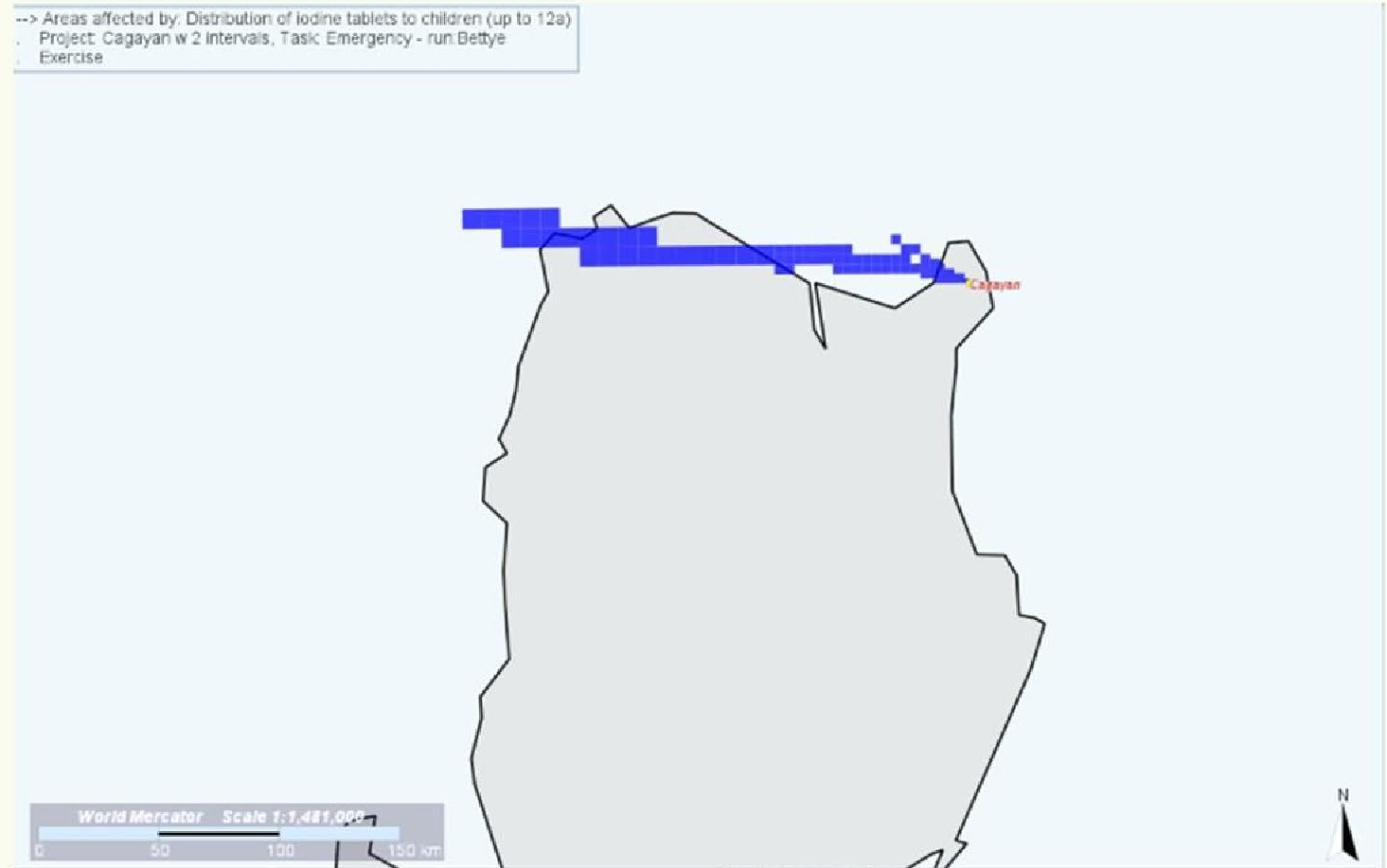
Coastal 2, Sta Ana, Cagayan

Abulug, Cagayan

Pamplona, Cagayan

Sanchez Mira, Cagayan

Santa Praxedes, Cagayan



Iodine Tablets to Adult (12-45 years old)

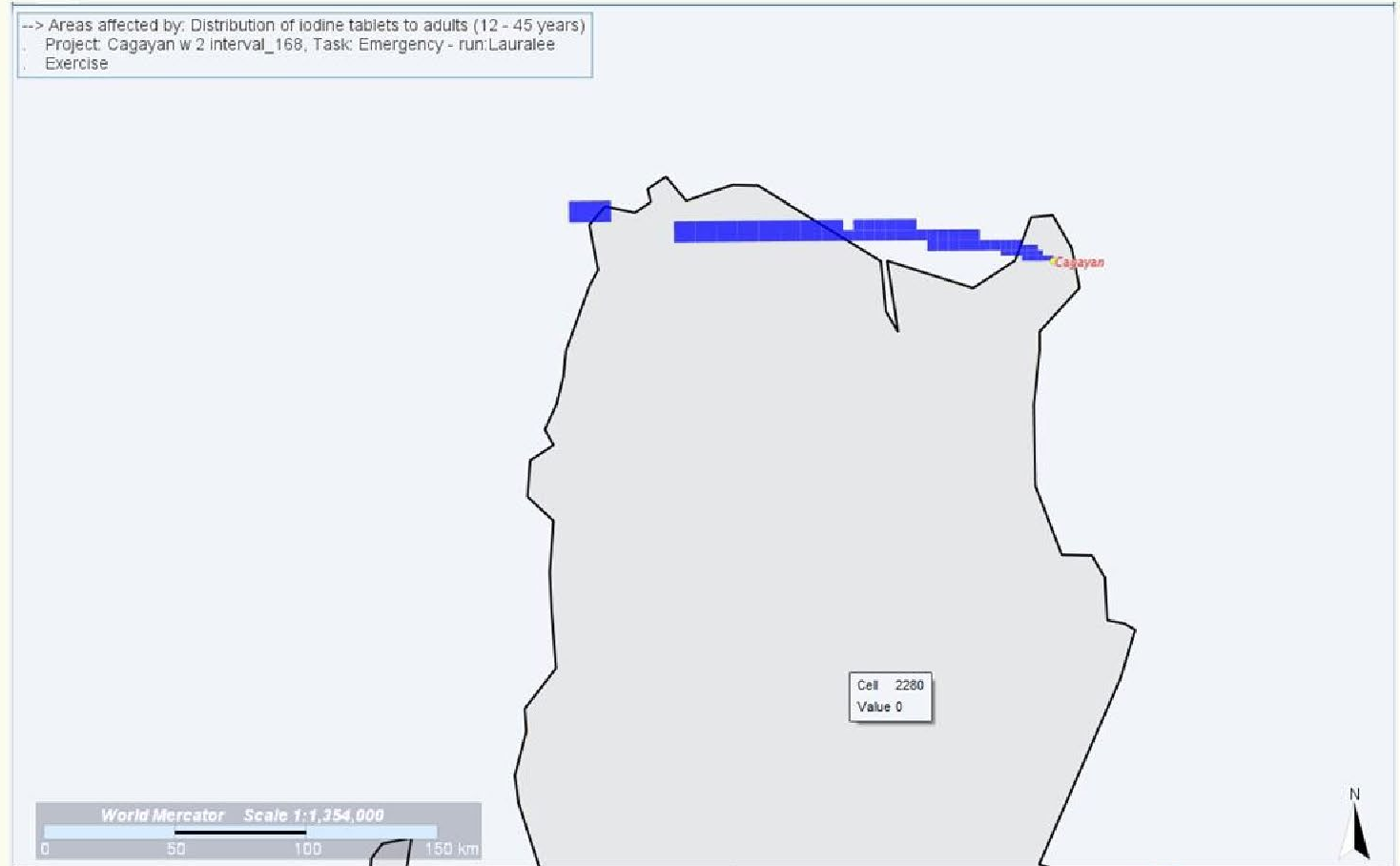
*Areas that will require Iodine Tablets
for Adults 12-45 years old*

Coastal 2, Sta Ana, Cagayan

Abulug, Cagayan

Pamplona, Cagayan

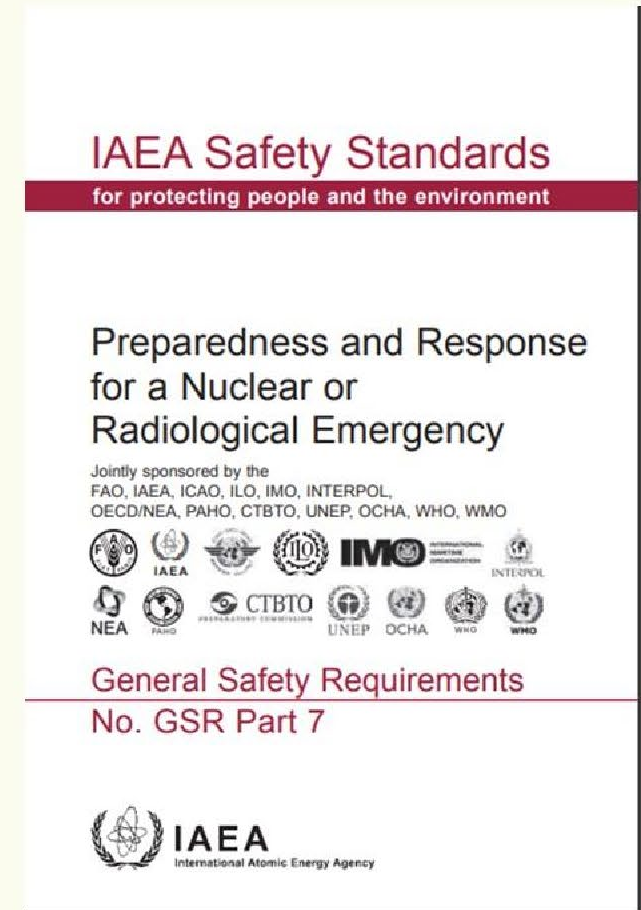
Sanchez Mira, Cagayan



Adoption of Preparedness and Response for a Nuclear or Radiological Emergency General Safety Requirements

IAEA Safety Standards Series No.
GSR Part 7 2015

Philippines has adopted IAEA standards as
it is still developing standard for nuclear
and radiological emergency preparedness
and response.



The urgent phase: Protective actions for the first 48 hours



Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 0 – 30 km				
Sheltering	Coastal 2, Sta Ana, Cagayan	0 - 9.3 Km west	1.37E1 mSv/hr	>1000 uSv/hr: OIL1 Consider immediate sheltering in Coastal 2
Evacuation	Coastal 2, Sta Ana, Cagayan	12.5 Km west	1.8E3 mSv	>1000 uSv/hr: OIL1 Consider evacuation within 48 hr
ITB to children	Coastal 2, Sta Ana, Cagayan	3.85 Km west	4.03E4 mSv	>50 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) Consider to provide ITB to children in the first 7 days
		15.66 Km west	4.85E3 mSv	
Food restrictions	Coastal 2, Sta Ana, Cagayan	10.629	1.37E1 mSv/hr	>1 mSv/hr – Oil (operational intervention levels for ground deposition dose rates) IAEA EPR NPP Public Protective Action Consider stopping the distribution of commodities until they have been assessed
Others ⁵⁾ – Cloud Arrival Time	-	30 Km west	0 – 2.6	-



The urgent phase: Protective actions for the first 48 hours



Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 30 – 100 km				
Sheltering	-	78 – 100 km	1.87E-1 mSv/hr	< 1000 uSv/hr: OIL1 No sheltering required
Evacuation	-	78 – 100 km	1.87E-1 mSv/hr	< 1000 uSv/hr: OIL1 No Evacuation required
ITB to children	Abulug, Cagayan Pamplona, Cagayan	30-100 Km west	5.12E2 mSv	>50 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) Consider to provide ITB to children in the first 7 days
Food restrictions	Abulug, Cagayan Pamplona, Cagayan	30-100 Km west	2.07E-1 mSv/hr	>1 mSv/hr – Oil (operational intervention levels for ground deposition dose rates) IAEA EPR NPP Public Protective Action Consider stopping the distribution of commodities until they have been assessed
Others ⁵⁾	-	-	-	-





The urgent phase: Protective actions for the first 48 hours

Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 100 – 300 km				
Sheltering	-	100 - 179 Km west	1.87E-1 mSv/hr	< 1000 uSv/hr: OIL1 No sheltering required
Evacuation	-	100 – 179 km west	1.87E-1 mSv/hr	< 1000 uSv/hr: OIL1 No Evacuation required
ITB to children	Sanchez Mira, Cagayan Santa Praxedes, Cagayan	104 Km west	5.12E2 mSv	>50 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) Consider to provide ITB to children in the first 7 days
Food restrictions	Sanchez Mira, Cagayan Santa Praxedes, Cagayan	110.5 Km west	1.48 - 1 mSv/hr	>1 mSv/hr – Oil (operational intervention levels for ground deposition dose rates) IAEA EPR NPP Public Protective Action Consider stopping the distribution of commodities until they have been assessed
Others ⁵⁾	-	-	-	-



The urgent phase: Protective actions for the first 48 hours

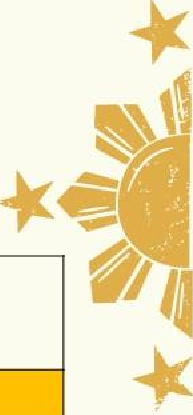
PRESS RELEASE

The nuclear accident was registered from a Small Modular Reactor (SMR) in the province of Sta. Ana, Cagayan. For the past 48 hours, The Philippine Nuclear Research Institute has been monitoring the conditions and is recommending the following:

- Residents within 30 km west of the nuclear accident are asked to stay within the confines of their homes.
- Within seven days, It is highly recommended that residents evacuate the affected areas
- Prevention of the consumption of significantly contaminated foodstuff and water
- Prophylactic administration of iodine tablets (ITB)



The early phase: Protective Action for the first week



Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 0 – 30 km				
Sheltering	Coastal 2, Sta Ana, Cagayan	9.5 km	4.84E2 mSv	>100 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) For those who are still in sheltering, Consider immediate sheltering in Coastal 2
Evacuation	Plant site	1.0	1.5E3 mSv	>100 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) For those who are still in sheltering, Consider evacuation in the first 7 days
ITB to children	Coastal 2, Sta Ana, Cagayan	0 - 9.5 Km west	1.5E3 mSv	>50 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) Consider to provide ITB to children in the first 7 days
Food restrictions	Coastal 2, Sta Ana, Cagayan	10.629	Chicken: 1.09E4Bq/kg	>1 mSv/hr – Oil (operational intervention levels for ground deposition dose rates) IAEA EPR NPP Public Protective Action Consider stopping the distribution of commodities until they have been assessed
Others ⁵⁾ – Cloud Arrival Time	-	-	-	-



The early phase: Protective Action for the first week

Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 30 – 100 km				
Sheltering	-	-	-	-
Evacuation	-	-	-	-
ITB	-	-	-	ITB is usually given prior to or immediate the nuclear accident
Food restrictions		85-100 km	Sample based on the computation Cs:Chicken: 5.49E2Bq/kg	200Bq/kg (OIL7:IAEA EPR-NPP Public Protective Action) Stop consumption of non-essential food, milk or water
Others ⁵⁾	-	-	-	-



The early phase: Protective Action for the first week



Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 100 – 300 km				
Sheltering	-	100-172 km	1.78E1 mSv	>100 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) For those who are still in sheltering, consider immediate sheltering in Coastal 2
Evacuation	-	-	-	-
ITB	-	-	-	ITB is an urgent protective action prescribe if exposure due to radioactive iodine is involved, before or shortly after the release of the radioiodine and within a short period before or after the intake of radioiodine. (GSR Part 7)
Food restrictions	-	100-173km	Sample from the computation: Cs:Chicken: 7.19E2Bq/kg	200Bq/kg (OIL7:IAEA EPR-NPP Public Protective Action) Stop consumption of non-essential food, milk or water
Others ⁵⁾	-	-	-	-



The early phase: Protective Action for the first week

PRESS RELEASE

The nuclear accident was registered in Small Modular Reactor (SMR) in the province of Sta. Ana, Cagayan. The Philippine Nuclear Research Institute has been monitoring the conditions a week after the incident, and is recommending the following:

- Residents within 100 km west of the nuclear accident are asked to stay within the confines of their homes.
- For residents that are within 30 km west of SMR, It is highly recommended they evacuate the affected area within the first seven (7) days.
- Stop consumption of contaminated, non-essential food, milk or water
- Prophylactic administration of iodine tablets



The early phase: Protective Action for the Month

Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 0 – 30 km				
Temporary relocation		1-9 km	1.91E1 mSv	>100 mSv - Generic criteria for protective actions. (IAEA GSR Part 7) Consider to relocate
Food restrictions		1-9 km	Sample computation: Cs: 9.66E3 Bq/kg	OIL7 – IAEA EPR-NPP Public Protective action Consider to Replace essential food, milk and drinking water as soon as possible or relocate the public
Others ⁵⁾	-	-	-	-



The early phase: Protective Action for the Month



Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 30 – 100 km				
Temporary relocation	Coastal 2, Sta Ana, Cagayan	78-100 km west	5.71E2 mSv	>100 mSv - Generic criteria for protective actions. IAEA GSR Part 7 For those who are still in the shelters, Consider for temporary relocation
Food restrictions	Coastal 2, Sta Ana, Cagayan	78-100 km west	Sample computation: Cs: 9.66E3 Bq/kg	OIL7 – IAEA EPR-NPP Public Protective action Consider to Replace essential food, milk and drinking water as soon as possible or relocate the public
Others ⁵⁾	-	-	-	-
Zone 100 – 300 km				
Temporary relocation		100 –178 km west	1.34E1 mSv	>100 mSv - Generic criteria for protective actions. IAEA GSR Part 7 For those who are still in the shelters, Consider for temporary relocation
Food restrictions		100-178 km west	Sample computation: Cs: 2.69E2 Bq/kg	>200 Bq/kg: OIL7 – IAEA EPR-NPP Public Protective action Consider to Replace essential food, milk and drinking water as soon as possible or relocate the public
Others ⁵⁾	-	-	-	-



The early phase: Protective Action for the Month

PRESS RELEASE

The Philippine Nuclear Research Institute has been monitoring the conditions arising from the nuclear accident in the Small Modular Reactor (SMR) in Cagayan, and is recommending the following:

- **Consider relocating all the affected families within the affected area**
- **Consider Replacing the essential food, milk and drinking water as soon as possible**



The early phase: Protective Action for the First Year



Protective action	Sectors ¹⁾	Distance ²⁾	Justification ³⁾	Optimization and Constraints ⁴⁾
Zone 0 – 30 km				
Temporary relocation		0-7 km	2.88E2 Bq/kg	>100 mSv - Generic criteria for protective actions. IAEA GSR Part 7 Consider for temporary relocation
Food restrictions		0 – 9 km	Sample computation: Cs: 2.32E3 Bq/kg	200 Bq/kg: OIL7 – IAEA EPR-NPP Public Protective action Consider to replace essential food, milk and drinking water as soon as possible or relocate the public
Others ⁵⁾	-	-	-	-
Zone 30 – 100 km				
Temporary relocation		89- 100 km	Background Level	>100 mSv - Generic criteria for protective actions. IAEA GSR Part 7 No need relocation
Food restrictions		89 - 100 km	Sample computation: Cs: 2.83E1 Bq/kg	<200 Bq/kg: OIL7 – IAEA EPR-NPP Public Protective action Essential food, milk and drinking water can be consumed
Others ⁵⁾	-	-	-	-



The early phase: Protective Action for the First Year

Areas (sectors, distances from the source) with the highest contamination for the first year after the accident.

Areas with highest ground contamination	Protective actions recommended
Coastal 2, Sta Ana, Cagayan	<ul style="list-style-type: none">• Consider for temporary relocation• Consider to replace essential food, milk and drinking water as soon as possible or relocate the public

PRESS RELEASE

The Philippine Nuclear Research Institute is monitoring the nuclear accident in the Cagayan SMR, and after a year, is recommending the following:

- **Advice all evacuated residents that they can safely return to their homes.**
- **Replace all food, milk, and water produced within 30 km west of SMR**
- **Advice residents outside the 30 km radius that all food, milk, and drinking water are now safe to be consumed.**

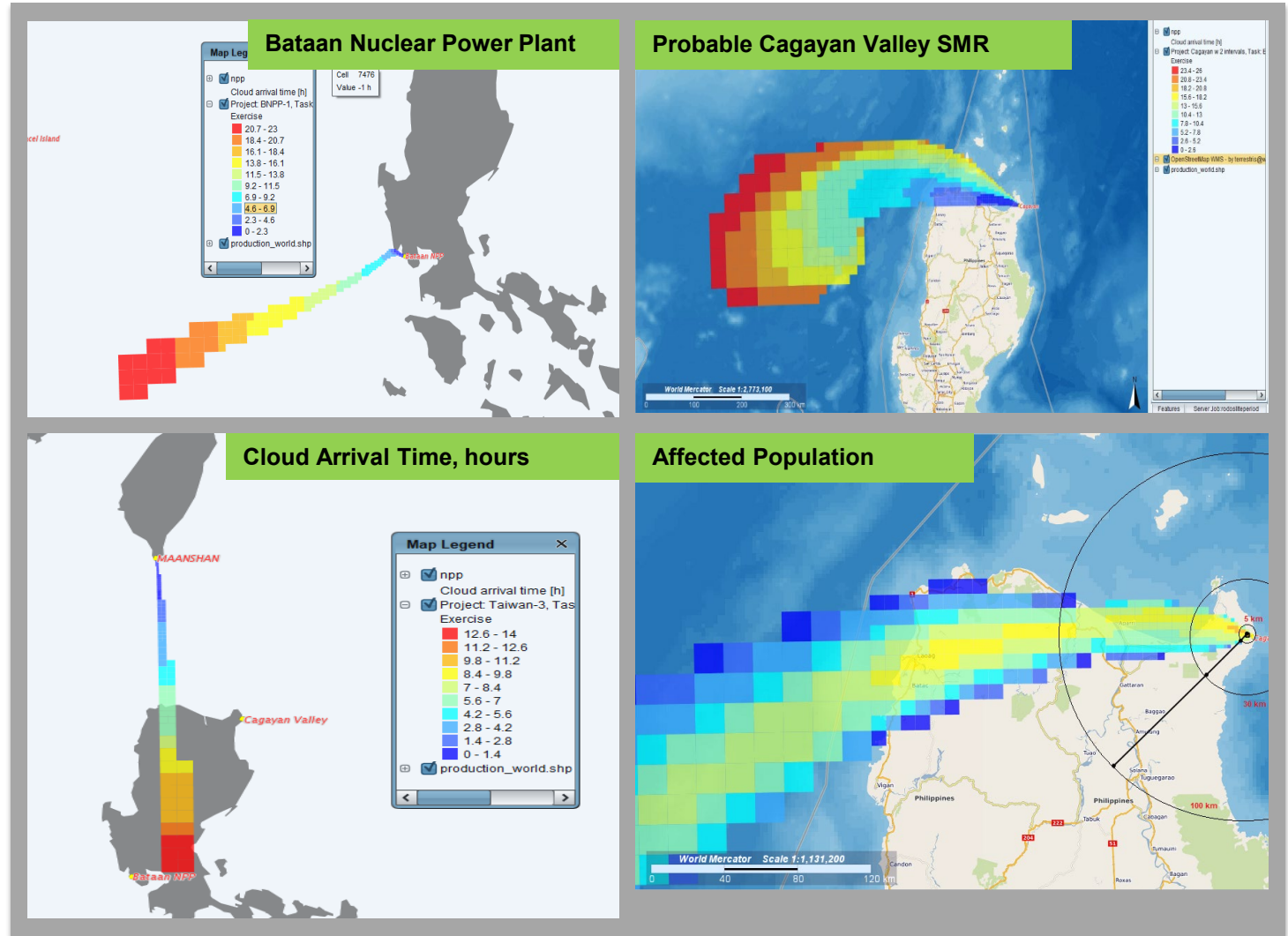


Radiological assessment via the JRODOS decision support system

Table-top exercises participated online and in-person by the Junior Operator (MA Vitug), Radiological Assessor (MQ Mundo), and Decision Maker (CA Arcilla) on the use of JRODOS used for off-site emergency management during nuclear accidents performed in national or regional nuclear emergency centers in the ASEAN MS, 27 March – 1 April 2022



Source: Office of Atoms for Peace, Thailand



JRODOS Exercise results

Establishment of early warning radiation gamma dose rate monitoring network

Installation of 10 solar-powered gamma dose rate monitoring system (GDRMS) to measure ambient gamma radiation equivalent dose



MIRA Monitoring Station

7 stations collocated with PAGASA (MOA approved) and 3 stations located in national Universities (ongoing negotiation)



Siting inspection in PAGASA stations

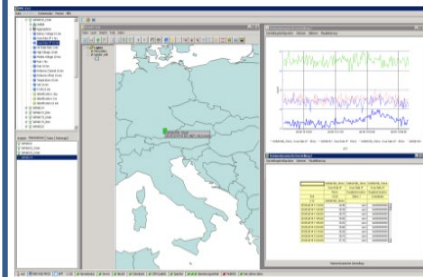


Quezon, Palawan | 25-26 Nov 2021

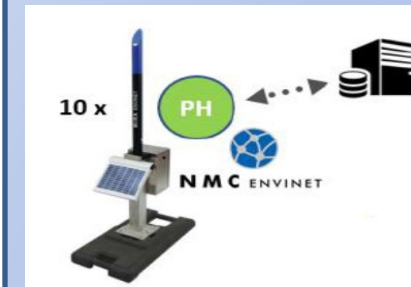


San Jose, Occidental Mindoro
26-28 Apr 2022

Data will be transmitted to the Network Monitoring Center in Nuclear Response and Support Center

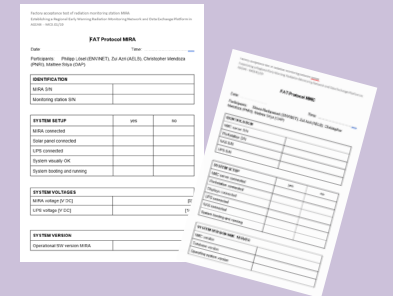


NMC Software



Future Activities:

17-19 May 2022 - Test (FAT) Onsite



June 2022 – Delivery of the 10 GDRMS from ENVINET funded by EU

July to November 2022 – Installation of GDRMS by the Regulatory body

THANK YOU FOR YOUR ATTENTION !!!

Courtesy of:

The RADIOLOGICAL IMPACT ASSESSMENT SECTION

- Cecilia De Vera
- Mary Rose Mundo
- May Vitug
- Joseph Christina Isidro