



ONE ASEAN  
ONE RESPONSE

# SITUATION UPDATE TROPICAL STORM PODUL AND TROPICAL DEPRESSION KAJIKI Lao PDR

No. **4**

Thursday, 12 September 2019, 20:00 hrs (UTC+7)

This Situation Update is provided by the AHA Centre for use by the ASEAN Member States and relevant stakeholders. The information presented is collected from various sources, including but not limited to, ASEAN Member States' government agencies, UN, IFRC, NGOs, and news agencies.

## TROPICAL STORM PODUL AND TROPICAL DEPRESSION KAJIKI, LAO PDR



Figures are the latest updates, correct as of 12 September 2019

104°E 105°E 106°E 107°E 108°E

**Legend**  
— Lao PDR Adm. Boundary  
— Provincial Adm. Boundary  
✈ Affected People  
✈ Airport

VIET NAM

KHAMMOUAN

✈ 43,117

THAILAND

SAVANNAKHET

✈ 85,018

SARAVAN

✈ 138,861

SEKONG

✈ 121,754

PAKSE

✈ 206,314

CHAMPASAK

✈ 65,455

ATTAPU

CAMBODIA

0 50 100 km

VIENTIANE

### EFFECTS



661K\*  
AFFECTED PERSONS



40K\*  
DISPLACED PERSONS



18\*  
DEAD



298 KM\*  
AFFECTED ROADS



275K HA\*  
AFFECTED FARMLAND



613\*  
AFFECTED SCHOOLS

### GOVERNMENT RESPONSE



39\*  
RESCUE BOATS



> 3,000\*  
PACKS OF DRINKING WATER



120\*  
FAMILY TENTS



US\$570K\*  
(LAK 5 BILLION)  
EMERGENCY AID

\* Estimations are based on data reported/confirmed by the National Disaster Management Organisation of Lao PDR and other verified sources

### ASEAN RESPONSE

#### MALAYSIA

Provided logistical support for the delivery of relief items from the DELSA regional stockpile

#### THE AHA CENTRE

- Handed over DELSA relief items
- Actively supporting the NDMO's emergency response through EOC and ICLT, and Information Management technical assistance



SITUATION UPDATE

## 1. HIGHLIGHTS

- a. On 29 August (Thursday) and 02 September (Monday) 2019, the Lao PDR Department of Meteorology and Hydrology (DMH), Ministry of Natural Resources and Environment, Lao PDR reported potential affected areas in the central and southern part of Lao PDR due to the existence of a Low Pressure Area (LPA), Tropical Storm PODUL, and Tropical Depression KAJIKI. Subsequently, flooding was reported in six (6) provinces: **Champasak, Saravan, Sekong, Savannakhet, Attapeu, and Khammouan** (in descending order of most affected province).
- b. **As many as 89 bridges, 613 schools, 46 health centres and hospitals, 298 km of roads, 274,719 hectares of farmland, 574,742 livestock, and 36 reservoirs** were affected by the floods. Total damage is estimated to **cost US\$10 million (88 billion LA kip)**. Most of the schools are still closed and authorities are considering temporary classrooms to minimise disruption to students.
- c. According to the Vientiane Times, the Government has approved the deployment of **US\$569,878 (5 billion LA kip)** by the Ministry of Labor and Social Welfare (MLSW) for emergency aid.
- d. From the preliminary assessment by UNITAR-UNOSAT of more recent Sentinel-1 imagery acquired on 10 September (Tuesday) 2019, the **flood waters appear to have receded significantly in Saravan, Attapeu, and the northern areas of Champasak (Pakse)**, with only some downstream areas in Saravan (Sedone River) and Attapeu still flooded. In Champasak, where the Mekong River cuts through Pakse in the north and through the spine of the province, there appears to still be some flood waters in the central and southern parts of the valley.
- e. According to the DMH, **rainfall is expected in the central and southern parts of Lao PDR over the next 24 hours**. According to the Mekong River Commission (MRC), two hydrological stations in Champasak province, namely Khong Chiam and Pakse, have forecast that the **water levels, which are currently above alarm levels, will increase but remain below flood levels in the next four days**.
- f. The AHA Centre mobilised its ICLT, which facilitated the **handover ceremony of the following DELSA relief items in Vientiane today (12 September 2019)**, attended by the AHA Centre Executive Director, Acting Director-General, Social Welfare Department, MLSW of Lao PDR, and Ambassadors of ASEAN Member States based in Vientiane ([Press Release](#)):
  - 330 Family Kits
  - 2,596 Hygiene Kits
  - 1,144 Kitchen Sets
  - 1,400 Mosquito Nets
  - 1,400 Jerry Cans (10 litres)
- g. **The AHA Centre mobilised its Information Management specialist to be in Vientiane tomorrow** (13 September 2019) to reinforce the Government of Lao PDR's efforts in planning and conducting a national joint rapid needs assessment in 6 affected provinces. Data and assessment information gathered will feed back into the AHA Centre Emergency Operations Centre (EOC) for further analysis – specifically on gap analysis, GIS and mapping.

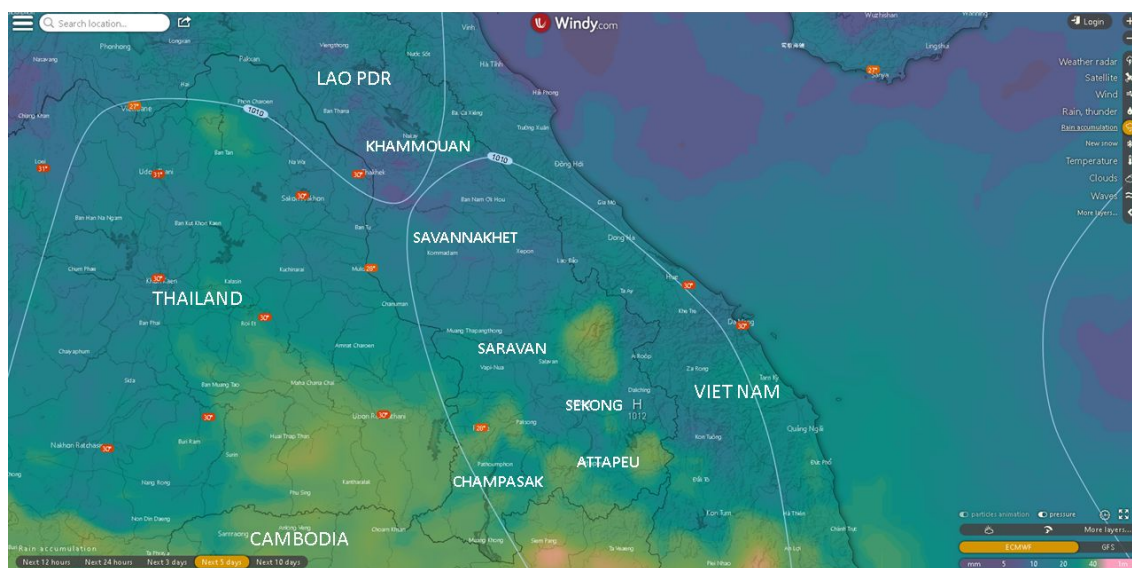


## 2. SUMMARY OF EVENTS, FORECAST AND ANTICIPATED RISK

- a. Tropical Storm PODUL first made landfall in the Philippines on 26 August (Monday) 2019, before exiting and continuing west. On 29 August (Thursday) 2019, Tropical Storm PODUL made landfall in central Viet Nam and continued moving west over Lao PDR and towards Myanmar. This was quickly followed by Tropical Depression KAJIKI, which formed in the South China Sea close to the Vietnam coast on 02 September (Monday) 2019, made landfall in Viet Nam and passed Lao PDR, before moving back out over Viet Nam coast on 06 September (Friday) 2019.
- b. The Department of Meteorology and Hydrology (DMH), Ministry of Natural Resources and Environment, Lao PDR reported potential affected areas in the central and southern part of Lao PDR due to the existence of a Low Pressure Area (LPA), and tropical cyclones PODUL and KAJIKI. Subsequently, thunderstorm advisories and heavy rainfall warnings were issued for six (6) provinces: Champasak, Saravan, Sekong, Savannakhet, Attapeu, and Khammouan. This was followed by reports of flooding in all 6 provinces.

### *Forecast and anticipated risk*

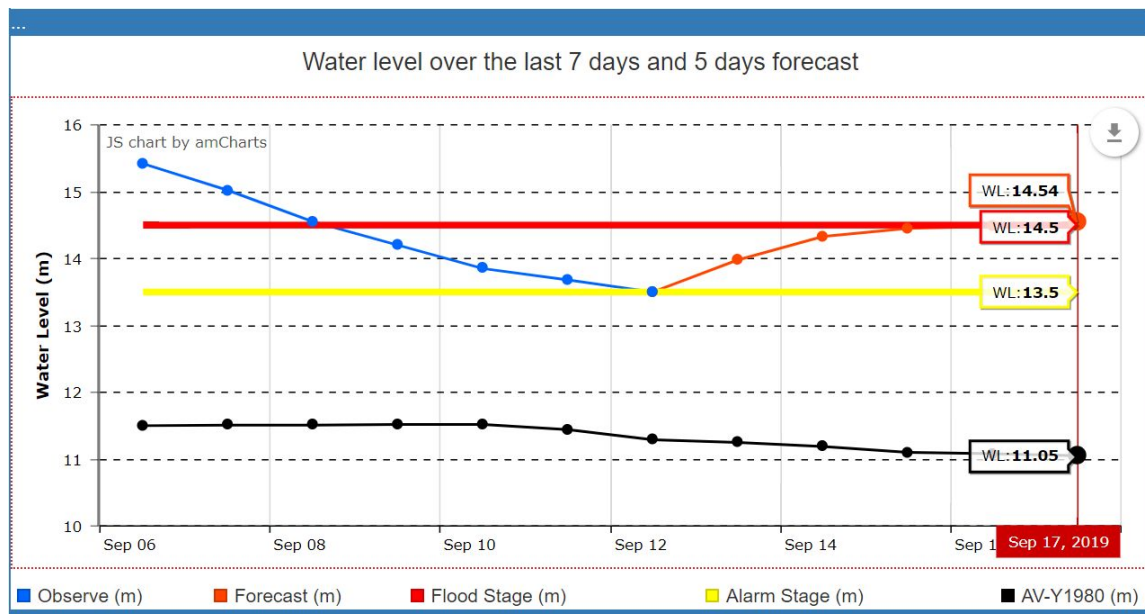
- c. According to the DMH, rainfall is expected in the central and southern parts of Lao PDR over the next 24 hours. The ASEAN Specialised Meteorological Centre (ASMC) generally forecasts above-normal rainfall in the southern portion of Lao PDR for the month of September 2019.
- d. In the next 5 days, the rain accumulation will likely be higher than 40mm in several parts of Southern Lao PDR, particularly in the area of the most affected province – Champasak.



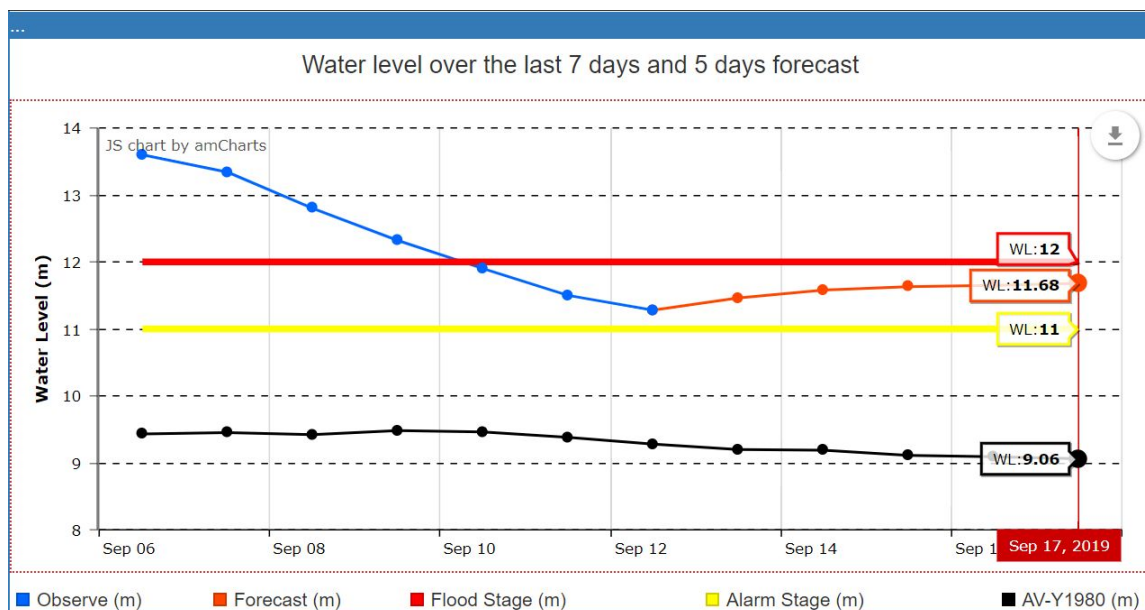
**Figure 1:** Forecasted rainfall accumulation in Southern Lao PDR for the next 5 days.  
Source: Modified from windy.com



- e. According to the Mekong River Commission (MRC), two hydrological stations in Champasak province, namely Khong Chiam and Pakse, have observed that current water levels are above alarm levels. The water levels are forecast to increase in the next five days, with the water level in Khong Chiam expected to rise above the flood level on 17 September (Tuesday) 2019, due to a low pressure area in the next few days over the middle part of the Mekong River that may bring heavy rainfall and affect water levels in the downstream areas (southern parts of Lao PDR), including in Pakse.



**Figure 2:** Observed and forecasted water level in Khong Chiam, Lao PDR. Forecasted water level will increase to 14.54 m on 17 September (Tuesday) 2019, above the flood level of 14.5 m. Source: Mekong River Commission



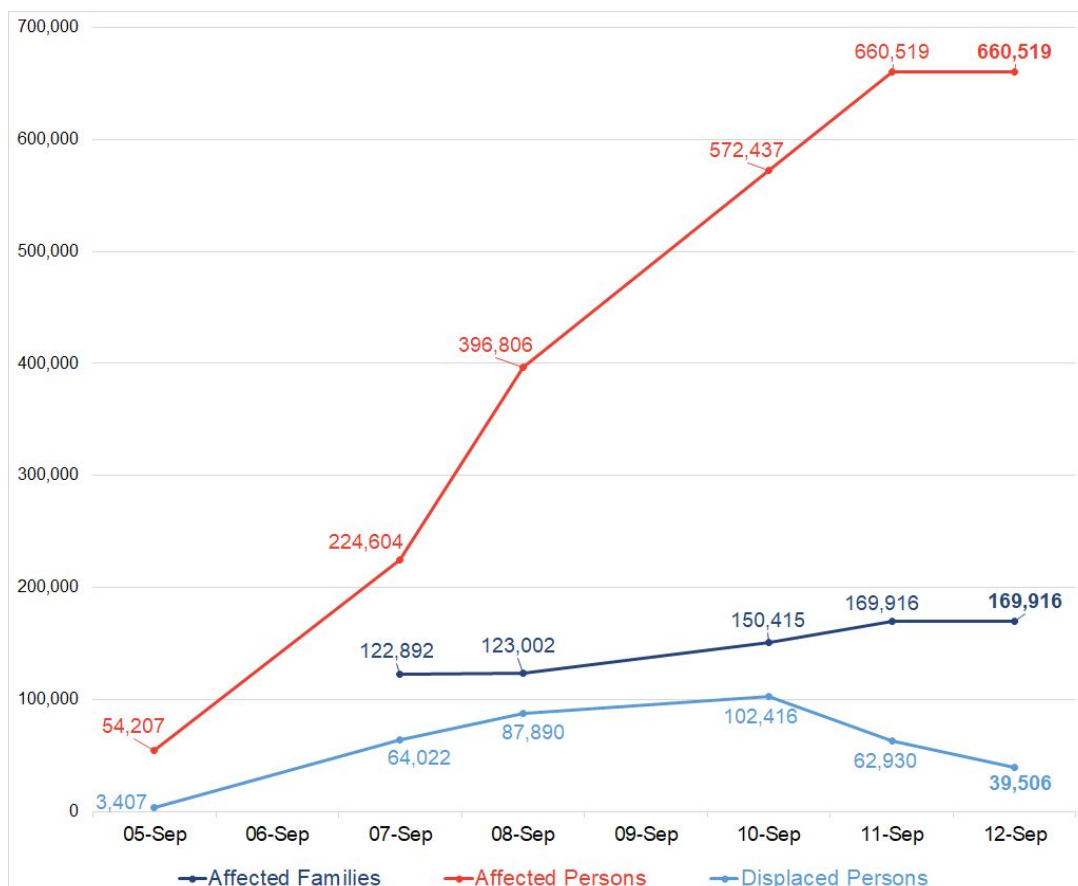
**Figure 3:** Observed and forecasted water level in Pakse, Lao PDR. Forecasted water level will increase to 11.68 m on 17 September (Tuesday) 2019, above the alarm level of 11 m but still below the flood level of 12 m. Source: Mekong River Commission





### 3. ASSESSMENT OF DAMAGE, IMPACT, AND HUMANITARIAN NEEDS

- a. NDMO Lao PDR has identified the following needs:
  - Food: rice, canned fish, drinking water, instant noodles
  - Rescue boats and life jackets
  - Non food items: family kits, personal hygiene kits, kitchen kits, sleeping kits (**the AHA Centre is currently responding to these needs**)
  - Medicines
  - Water treatment equipment
  - Cash support
- b. According to the Pacific Disaster Center's (PDC) All Hazards Impact Model, the maximum potential population exposure based on flood extent layer provided by the Earth Observatory of Singapore ARIA-SG (EOS ARIA-SG) for the 6 provinces is 197,245 people. **Estimated capital exposure is US\$753.4 million**, with the following breakdown: 32% from the residential sector, 28% from the service sector, 18% from the industrial sector, and 22% from schools. These estimates are as of 08 September (Sunday) 2019.
- c. Figure 4 graphs the evolution in key reported impacts. **There was a significant decrease (61% over the past two days) in the number of displaced persons, particularly in Champasak province, and as the internally displaced people in Saravan and Khammouan provinces have returned home.**



**Figure 4:** Evolution of impact figures over the monitored period. Estimated based on the figures provided by NDMO Lao PDR as of 12 September (Thursday) 2019.



- d. The breakdown in impact data by province (in descending order of most affected persons) is given in Table 1 below. In addition, there is one (1) reported missing person in Champasak. Note that the number of affected persons for Attapeu and Savannakhet are estimates based on the reported number of affected families (for Attapeu, one family is assumed to consist of five family members while for Savannakhet, the multiplier of two is calculated from previous reported figures).

Provinces	Affected Families	Affected Persons	Dead	Displaced Persons	Damaged Houses
Champasak	42,187	206,314	8	15,638	-
Saravan	35,905	138,861	3	-	-
Sekong	24,019	121,754	-	-	9
Savannakhet	42,509	85,018*	3	23,868	-
Attapeu	13,091	65,455*	4	-	-
Khammouan	12,205	43,117	-	-	311
<b>Total</b>	<b>169,916</b>	<b>660,519</b>	<b>18</b>	<b>39,506</b>	<b>320</b>

**Table 1:** Figures for impacts in the 6 affected provinces of Lao PDR. Data obtained from NDMO Lao PDR as of 12 September (Thursday) 2019.

- e. Figures for the number of displaced people in Sekong and Attapeu are still to be confirmed, as the ground assessment is still ongoing. Currently, there are some challenges in data collection and gap analysis. To address this, NDMO Lao PDR requested the AHA Centre for technical assistance (refer to Section 4. Actions Taken).
- f. The total damaged houses reported as per 12 September (Thursday) 2019 is 320 units, of which 311 are partially damaged and located in Khammouan province.
- g. **As many as 89 bridges, 613 schools, 46 health centres and hospitals, 298 km of roads, 274,719 hectares of farmland, 574,742 livestock, and 36 reservoirs** were affected by the floods. Total damage is estimated to **cost US\$10 million (88 billion LA kip)**. These figures are correct as of 11 September (Wednesday) 2019. Most of the schools are still closed and authorities are considering temporary classrooms to minimise disruption to students, according to the Vientiane Times on 12 September (Thursday) 2019.
- h. According to Champasak's Industry and Commerce Department, as reported by the Vientiane Times, **the price of rice has doubled to 11 US cents per kg** (1,000 LA kip per kg) while the price of pork has increased by about 57 US cents per kg (5,000 LA kip per kg), but both **prices are within manageable levels due to the Government's intervention**.



- i. From the preliminary assessment by UNITAR-UNOSAT, within the analysed extent of about 60,000 km<sup>2</sup> in Southern Lao PDR, **a total of about 1,000 km<sup>2</sup> of land appears to be flooded** as of 06 September (Friday) 2019. This preliminary analysis was based on observation from Sentinel-1 imagery acquired on 06 September (Friday) 2019 (Annex 1). As expected, the current report of affected population on the ground is much higher than the potential figures in the preliminary assessment (Table 3), which may be due to backscattered radar signals that underestimate flood extent and also population figures in the preliminary assessment are limited to the population statistics inside the areas of interest. As reported by NDMO Lao PDR, through the AHA Centre's In-Country Liaison Team (ICLT) on 10 September (Tuesday) 2019, **several areas in Sekong are not yet accessible for ground assessment**.
- j. From the preliminary assessment by UNITAR-UNOSAT of more recent Sentinel-1 imagery acquired on 10 September (Tuesday) 2019 (Table 2 and Annex 1), the **flood waters appear to have receded significantly in Saravan, Attapeu, and the northern areas of Champasak (Pakse)**, with only some downstream areas in Saravan (Sedone River) and Attapeu still flooded. In Champasak, where the Mekong River cuts through Pakse in the north and through the spine of the province, there appears to still be some flood waters in the central and southern parts of the valley. This assessment of receded flood waters in Champasak and Saravan is in line with the conditions on the ground, where there was a decrease in the number of internally displaced people in those provinces over the past two days.

Provinces	Flood Extent (km <sup>2</sup> ) – 06 Sep	Flood Extent (km <sup>2</sup> ) – 10 Sep	Total Analysed Extent (km <sup>2</sup> )
Champasak	332	53	14,400
Saravan	119	4	4,000
Sekong	No apparent flooded area analysed yet		-
Savannakhet	352	-	-
Attapeu	96	14	6,000
Khammouan	101	-	-
<b>Total</b>	<b>1,000</b>	<b>N.A.</b>	<b>60,000</b>

**Table 2:** Figures for area of likely flood extent in the 6 affected provinces of Lao PDR. Data obtained from UNITAR-UNOSAT as of 06 September (Friday) and 10 September (Tuesday) 2019.



Provinces	Potentially Affected Population – 06 Sep	Potentially Affected Population – 10 Sep	Reported Affected Population
Champasak	42,350	5,940	206,314
Saravan	16,250	385	138,861
Sekong	No apparent flooded area analysed yet		121,754
Savannakhet	32,680	-	85,018*
Attapeu	3,290	420	65,455*
Khammouan	5,840	-	43,117
<b>Total</b>	<b>100,410</b>	N.A.	<b>660,519</b>

**Table 3:** Figures for affected population in the 6 affected provinces of Lao PDR. Data obtained from UNITAR-UNOSAT as of 06 September (Friday) and 10 September (Tuesday) 2019, and from NDMO Lao PDR as of 12 September (Thursday) 2019.

- k. The floods mostly occurred in the major river valleys and floodplains along the Mekong River, which forms part of the border between Lao PDR and Thailand to the west. Some flooding occurred in the valleys of Sebanghieng River in Savannakhet province, Sedone River in Saravan province, along the western provincial borders of Attapeu in the valley of Sekong River (Annex 1).





#### 4. ACTIONS TAKEN AND RESOURCES MOBILISED

##### Response by Government of Lao PDR

- a. According to the update released by Lao PDR's National Disaster Management Organisation (NDMO Lao PDR) on 05 September (Thursday) 2019 at 09:00 (UTC +7), the Provincial Disaster Prevention and Control Committee called for an emergency meeting and planning for response, especially to deploy rescue boats for evacuation in collaboration with the army and police. Emergency relief items had been distributed to the affected population.
- b. On 07 September (Saturday) 2019, the Prime Minister (PM), Mr. Thongloun Sisoulith, called for an emergency meeting and gave orders to the relevant agencies to quickly assist the affected areas. Working with the Local Disaster Management and Control Committees in the provincial and district levels, the Government has already deployed emergency response teams from the military, police, and health sectors, equipped with trucks, boats, vehicles, helicopters, other aircraft, tools, and other equipment to evacuate affected people and distribute the following relief: **39 rescue boats, 120 family tents, and more than 3,000 packs of drinking water.**
- c. According to the Vientiane Times, on 07 September (Saturday) 2019, the PM, National Government leaders of Lao PDR and leaders of provincial authorities visited the affected areas, namely Champasak, Saravan and Savannakhet, to assess the status of the affected population and to lead the ongoing emergency response. The officials also provided consolation to the victims and support to the responders. The PM directed local authorities to take care of the health and hygiene of those affected, deploy nurses, and provide adequate food and drinking water. He also suggested that authorities monitor prices of goods and prevent any thefts.



**Figure 5:** PM and Government leaders visited the affected areas on 07 September (Saturday) 2019. Source: Vientiane Times

- d. NDMO Lao PDR, through the National Focal Point (NFP), made a request for assistance to the AHA Centre on 08 September (Sunday) 2019, calling for logistical relief items support.
- e. Authorities are having trouble reaching some areas because 298 km of roads and 89 bridges have been reportedly affected by the floods. As a result, authorities have used helicopters and other aircraft from the Ministry of National Defence to reach the affected people in these areas.
- f. According to the Vientiane Times, the Government has intervened in the market for rice and pork to keep prices within manageable levels.
- g. The Government has approved the deployment of **US\$569,878 (5 billion LA kip)** by the Ministry of Labor and Social Welfare (MLSW) for emergency aid. The MLSW has also been mobilising funds, food, and drinking water from many sectors since 09 September (Monday) 2019.
- h. According to the Vientiane Times on 09 September (Monday) 2019, the Ministry of Health has assigned medical personnel with essential medicines to assist the affected people, especially in Champasak and Saravan. Authorities have also set up drinking water production equipment at the border of Sekong and Saravan, for delivery of clean drinking water to the affected areas.
- i. Emergency assessment teams are being deployed to evaluate the damage and needs.
- j. Authorities are currently repairing infrastructure and facilities, especially roads (Ministry of Public Works and Transport), bridges, schools, and hospitals.

#### **Response by ASEAN Member States**

- a. The National Disaster Management Agency (NADMA) Malaysia, together with Royal Malaysian Air Force (RMAF), provided logistical support in transporting relief items from the DELSA regional stockpile in Subang, Malaysia to Vientiane, Lao PDR.





**Figure 6:** DELSA relief items loaded onto Royal Malaysian Air Force (RMAF) aircraft for transport to Vientiane, Lao PDR. Source: UNHRD

### Response by the AHA Centre

- a. The AHA Centre has expressed condolences to Lao PDR and offered support from regional resources, including mobilising ASEAN Emergency Response and Assessment Team (ASEAN-ERAT), providing relief items from the Disaster Emergency Logistics System for ASEAN (DELSA) regional stockpile, and facilitating the deployment of capacities available in the region, such as from the ASEAN Standby Arrangements.
- b. The AHA Centre Emergency Operations Centre (EOC) alert level was raised to Orange (Response Preparation) on 08 September (Sunday) 2019, and is still on Red (Active Response).
- c. The AHA Centre mobilised its ICLT, which met with the NFP of NDMO Lao PDR in Vientiane on 10 September (Tuesday) 2019 and participated in the coordination meeting at the Local Emergency Management Authority in Pakse on 11 September (Wednesday) 2019. ICLT facilitated the handover of the DELSA relief items in Vientiane today (12 September 2019) in support of the emergency response, while continuing to provide technical assistance to NDMO Lao PDR on designing coordination structures and needs assessment during emergency response.
- d. **The following relief items have been delivered in a handover ceremony by the AHA Centre Executive Director, received by Mr. Vilayphong Sisomvang, Acting Director-General, Social Welfare Department, MLSW of Lao PDR, and witnessed by Ambassadors of ASEAN Member States based in Vientiane today (12 September 2019) in Vientiane, Lao PDR ([Press Release](#)):**
  - 330 Family Kits
  - 2,596 Hygiene Kits
  - 1,144 Kitchen Sets
  - 1,400 Mosquito Nets
  - 1,400 Jerry Cans (10 litres)







**Figure 7:** Delivery and handover of DELSA relief items in Vientiane, Lao PDR. Source: the AHA Centre

- e. The AHA Centre is on standby for further deployment of relief items from the DELSA regional stockpile if necessary, based on the result of the ongoing rapid needs assessment and gap analysis.
- f. The AHA Centre is deploying its Information Management specialist in Vientiane tomorrow (13 September 2019) to reinforce the efforts of NDMO Lao PDR in planning and implementing a national joint rapid needs assessment. Data and assessment information gathered will feed back into the AHA Centre EOC for further analysis – specifically on gap analysis (for which the AHA Centre EOC has the support of one rapid needs assessment specialist member of ASEAN-ERAT affiliated with Arbeiter-Samariter-Bund (ASB) Indonesia and the Philippines), GIS and mapping. The analysis and maps will be given to NDMO Lao PDR in order to come up with maps and information products in the local language.



**Response by Other Humanitarian Partners**

- a. Pacific Disaster Center (PDC) produced a hazard brief on flood impact and exposure estimates on 08 September (Sunday) 2019, in collaboration with the AHA Centre.
- b. UNITAR-UNOSAT provided map data on the likely flood extent as of 06 September (Friday) 2019, and updated maps of 3 provinces based on imagery as of 10 September (Tuesday) 2019.
- c. MapAction provided a map for internal analysis in the AHA Centre EOC, and has been engaged in the AHA Centre's request for staff support with GIS and geospatial analysis expertise in the AHA Centre EOC within this week.
- d. The United Nations Humanitarian Response Depot (UNHRD) supported the logistical operations for the loading of relief items from the DELSA regional stockpile in Subang, Malaysia.

**Response by Other Partners**

- a. The AHA Centre, in lieu of NDMO Lao PDR, requested activation of Sentinel Asia's Emergency Observation Request (EOR) through the Asian Disaster Reduction Center (ADRC) on 06 September (Friday) 2019. We received first map data on likely flood extent from the ARIA-SG team at the Earth Observatory of Singapore based on satellite data as of 06 September (Friday) 2019.





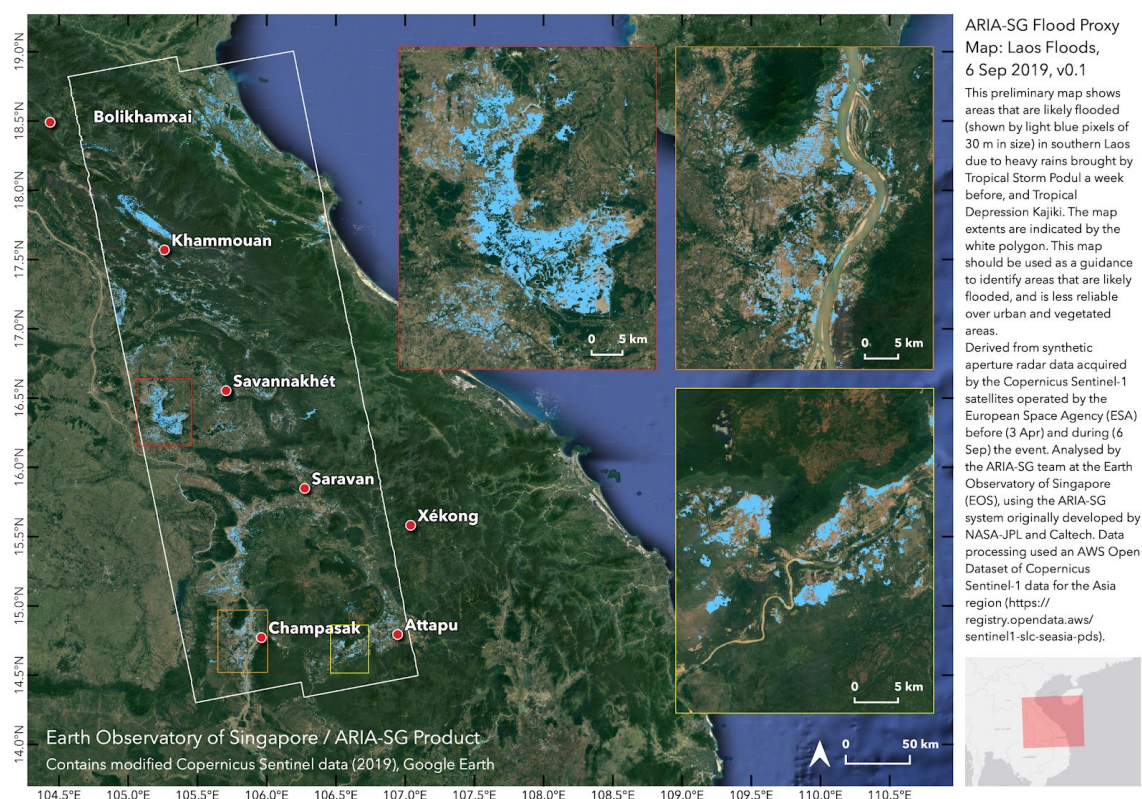
## 5. RECOMMENDATIONS AND PLAN OF ACTIONS

### The AHA Centre's plans

- a. The AHA Centre has expressed condolences to Lao PDR and offered support in facilitating regional resources. Based on the acceptance of NDMO Lao PDR, the AHA Centre has already deployed ICLT to actively support the emergency response and provide technical assistance, and has handed over relief items from the DELSA regional stockpile.
- b. The AHA Centre is on standby for further deployment of relief items from the DELSA regional stockpile if necessary, based on the result of the ongoing rapid needs assessment and gap analysis.
- c. The AHA Centre is deploying its Information Management specialist in Vientiane tomorrow (13 September 2019) to reinforce the efforts of NDMO Lao PDR in planning and implementing a national joint rapid needs assessment. Data and assessment information gathered will feed back into the AHA Centre EOC for further analysis – specifically on gap analysis, GIS and mapping.
- d. The AHA Centre will provide further situation updates once information becomes available.



## 6. IMAGERY



**Figure 8:** Map of affected areas in Lao PDR showing the likely flooded areas (light blue pixels), based on synthetic aperture radar satellite data before (03 April 2019) and during (06 September 2019) the flood event. Analysis was done by the ARIA-SG team at the Earth Observatory of Singapore (EOS) for Sentinel Asia.

### Prepared by:

The AHA Centre - Emergency Operations Centre (EOC)

### ABOUT THE AHA CENTRE

The AHA Centre - ASEAN Coordinating Centre for Humanitarian Assistance on disaster management - is an inter-governmental organisation established by 10 ASEAN Member States – Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam - to facilitate the cooperation and coordination among ASEAN Member States and with the United Nations and international organisations for disaster management and emergency response in the region.

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- 3) Justin Chin, Disaster Monitoring & Analysis Intern







### Satellite detected waters extents, as of 6 September 2019 over southern provinces of Lao PDR

This map illustrates satellite-detected surface water in southern provinces of Lao PDR as observed from Sentinel-1 Imagery acquired on 6 September 2019. Within the analysed extent of about 60,000 km<sup>2</sup>, a total about 1,000 km<sup>2</sup> of land appear to be flooded as of 6 September 2019. This is a preliminary analysis and has not yet been validated in the field. Please send ground feedback to UNITAR - UNOSAT.

**Important Note:** Flood analysis from Sentinel-1 Imagery acquired on 6 September 2019 may seriously underestimate presence of standing flood water in built up areas due to backscattering of the radar signal

#### Legend

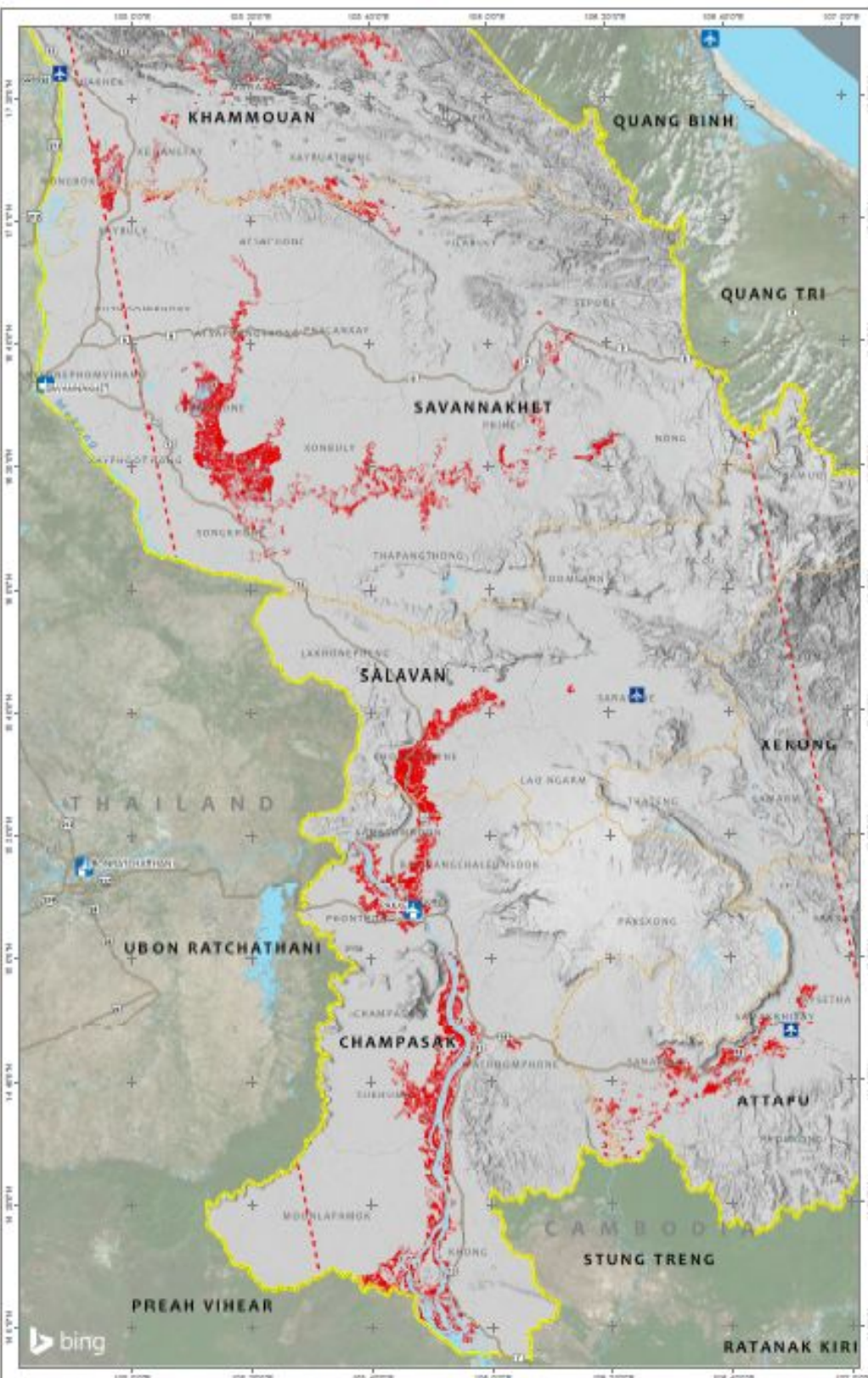
-  City / Town
-  Airport
-  Road
-  District boundary
-  Province boundary
-  International boundary
-  Analysis extent
-  Reference water
-  Satellite detected water (6 September 2019)

Province	District	Flood Area (km <sup>2</sup> )	Total Area (km <sup>2</sup> )	Population (thousands)
Attapeu	Savannakhet	12	30,700	300
	Xiengkhouang	7	30,500	200
	Phongsavan	6	14,500	300
	Samnang	10	27,400	2,500
	Phou	10	70,000	4,000
Champasack	Savannakhet	70	20,800	6,000
	Salavan	1	20,800	600
	Phongsavan	23	40,000	4,500
	Champasack	38	47,800	4,000
	Montong	45	30,700	3,000
Khammouan	Salavan	47	41,000	4,000
	Khammouan	55	101,000	8,000
	Khammouan	38	80,000	4,000
	Khammouan	7	20,000	300
	Khammouan	20	30,000	1,500
Salavan	Salavan	7	3,700	800
	Salavan	18	33,000	700
	Salavan	18	25,700	800
	Salavan	18	30,400	2,500
	Salavan	15	71,800	300
Savannakhet	Savannakhet	2	101,000	600
	Savannakhet	27	40,000	3,000
	Savannakhet	30	35,100	10,000
	Savannakhet	11	30,200	1,000
	Savannakhet	30	40,000	1,000
Savannakhet	Savannakhet	5	30,100	800
	Savannakhet	13	30,000	300
	Savannakhet	14	71,000	1,000
	Savannakhet	34	30,000	3,000
	Savannakhet	00	40,000	10,000
Savannakhet	Savannakhet	30	70,700	6,000
	Savannakhet	18	27,400	2,500
	Savannakhet	7	20,000	300
	Savannakhet	8	20,000	300
	Savannakhet	1	20,000	300
<b>Total</b>		<b>1,000</b>	<b>1,000,000</b>	<b>100,000</b>

Map Scale for A3: 1:1,200,000



Analysis conducted with SNAP 7.0 and ArcMap v10.7

 Coordinate System: WGS 1984 UTM Zone 48N  
 Projection: Transverse Mercator  
 Datum: WGS 1984  
 Units: Meter

 Satellite Data: Sentinel-1  
 Imagery Date: 6 September 2019  
 Resolution: 10 m  
 Copyright: Copernicus 2019 / ESA  
 Source: ESA

 Boundary data: OCHA/DP  
 Population data: WorldPop (2013)  
 Reference water: Global Surface Water, JRC  
 Analysis: UNITAR - UNOSAT  
 Production: UNITAR - UNOSAT

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### Satellite detected waters extents, as of 10 September 2019 over Champasak provinces of Lao PDR

This map illustrates satellite-detected surface water in Champasak provinces of Lao PDR as observed from Sentinel-1 imagery acquired on 10 September 2019. Within the analysed extent of about 14,400 km<sup>2</sup>, a total about 53 km<sup>2</sup> of land appear to be flooded as of 10 September 2019. This is a preliminary analysis and has not yet been validated in the field. Please send ground feedback to UNITAR - UNOSAT.

**Important Note:** Flood analysis from Sentinel-1 imagery acquired on 10 September 2019 may seriously underestimate presence of standing flood water in built up areas due to backscattering of the radar signal

#### Legend

-  City / Town
-  Airport
-  Road
-  District boundary
-  Province boundary
-  International boundary
-  Reference water
-  Analysis extent
-  Satellite detected water [10 September 2019]
-  Satellite detected water [5 September 2019]

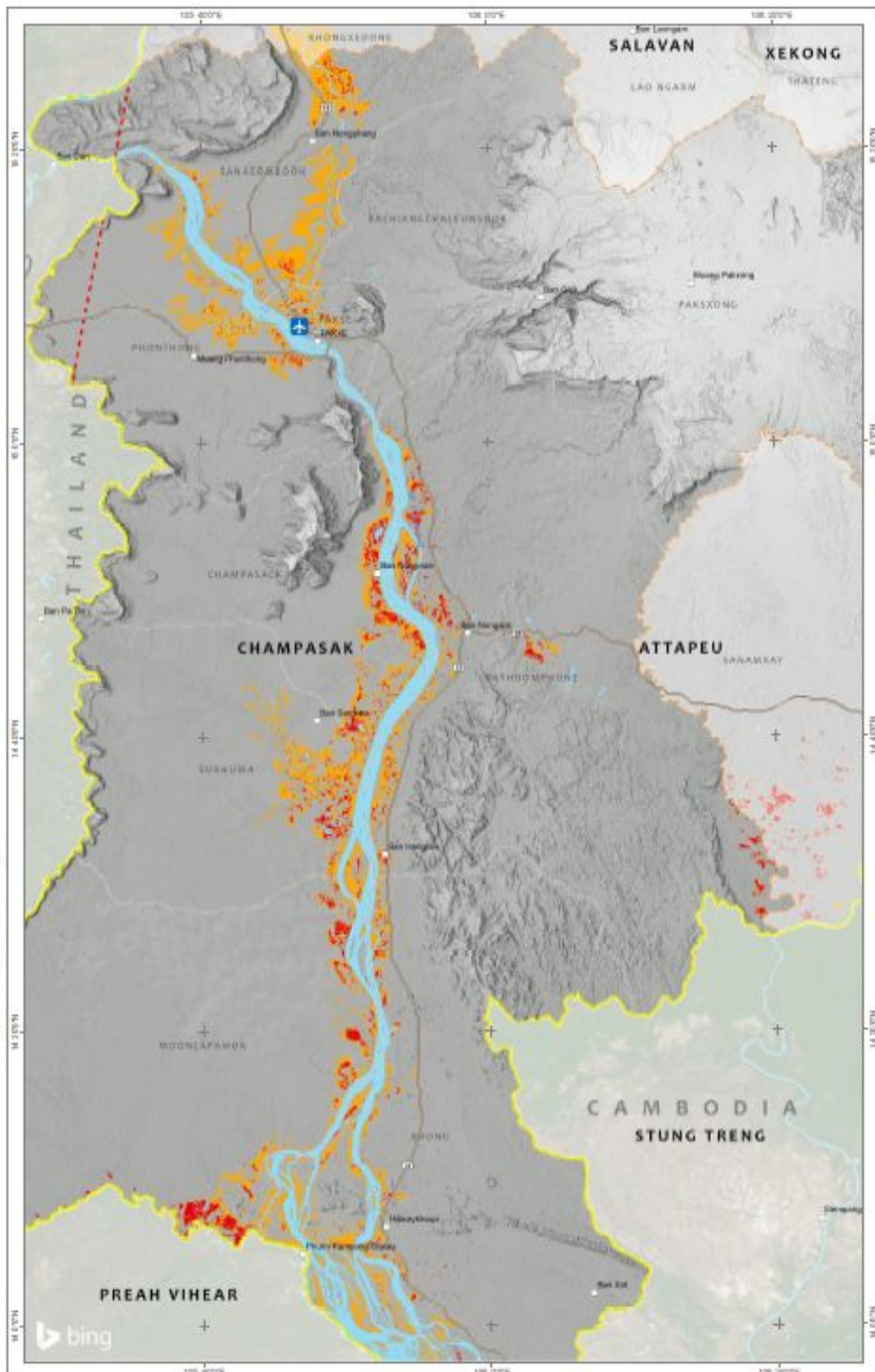
Province	District	Flood Area (km <sup>2</sup> )	Total Population (in 2015)	Population Potentially Exposed
Champasak	Pakseng	1	12,700	100
	Savannakhet	2	14,700	210
	Phongsavan	1	10,800	200
	Champasak	10	11,300	1,400
	Montipha	17	40,000	1,000
	Sulavong	8	44,300	800
	Khang	5	108,700	800
	Phongsavan	11	11,000	1,100
<b>Total</b>		<b>55</b>	<b>242,000</b>	<b>5,300</b>

Map Scale for A3: 1:500,000



Analysis conducted with SNAP 7.0 and ArcMap v10.7

Coordinate System: WGS 1984 UTM Zone 48N  
Projection: Transverse Mercator  
Datum: WGS 1984  
Unit: Meter



Satellite Data: Sentinel-1  
Imagery Date: 10 September 2019  
Resolution: 10 m  
Copyright: Copernicus 2019 / ESA  
Source: ESA

Boundary data: OCHA/ICAP  
Populated data: WorldPop  
Reference water: Global Surface Water, JRC  
Analysis: UNITAR - UNOSAT  
Production: UNITAR - UNOSAT

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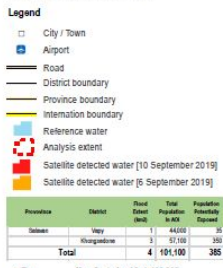




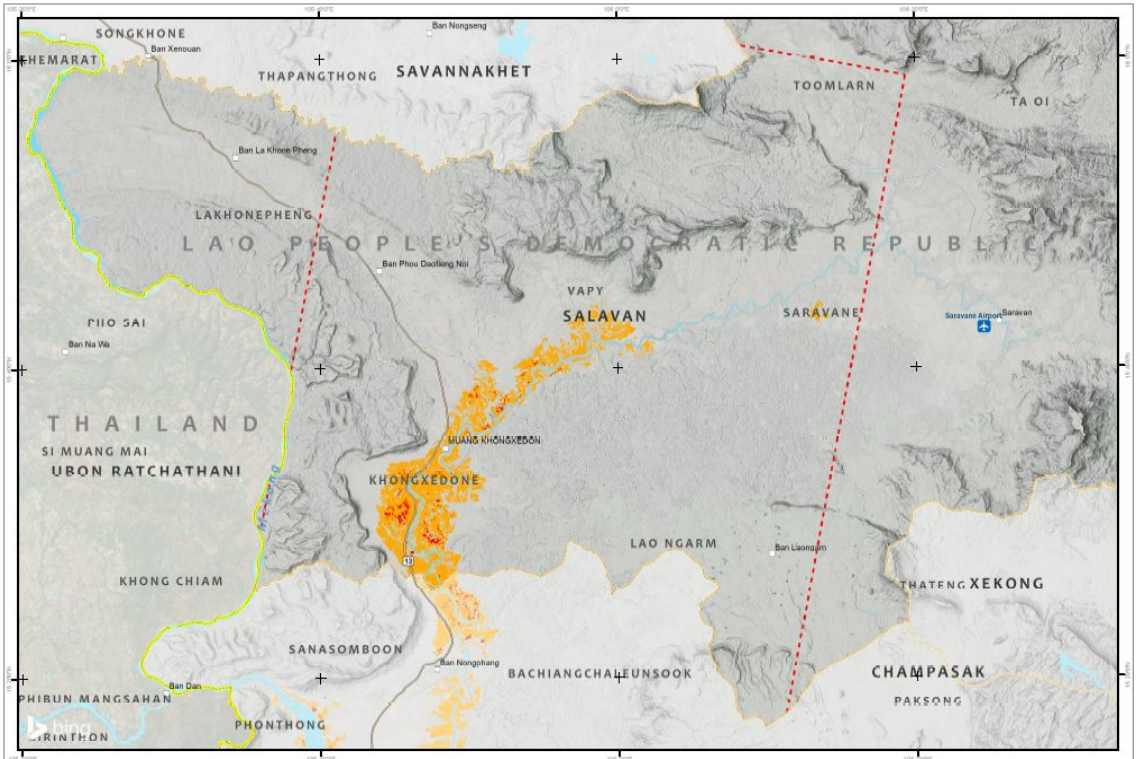
### Satellite detected water extents, as of 10 Sep 2019 over Salavan Province, Lao PDR

This map illustrates satellite-detected surface water in Salavan provinces of Lao PDR as observed from Sentinel-1 imagery acquired on 10 September 2019. Within the analysed extent of about 4,000 km<sup>2</sup>, a total about 4 km<sup>2</sup> of land appear to be flooded as of 10 September 2019. This is a preliminary analysis and has not yet been validated in the field. Please send ground feedback to UNITAR - UNOSAT.

**Important Note:** Flood analysis from Sentinel-1 imagery acquired on 10 September 2019 may seriously underestimate presence of standing flood water in built up areas due to backscattering of the radar signal



Analysis conducted with SNAP v5.0 and ArcGIS v10.7  
Coordinate System: WGS 1984 UTM Zone 48N  
Projection: Transverse Mercator  
Datum: WGS 1984  
Units: Meter



Satellite Date: Sentinel-1  
Imagery Dates: 10 September 2019  
Resolution: 10 m  
Reference water: Global Surface Water, JRC  
Copyright: Copernicus 2019 / ESA  
Source: European Space Agency  
Boundary data: UNOCHA/ROAP  
Population data: WorldPop  
Reference water: Global Surface Water, JRC  
Analysis: UNITAR - UNOSAT  
Production: UNITAR - UNOSAT

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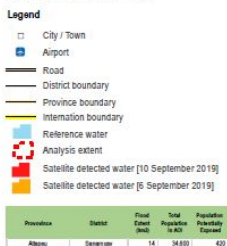
UNITAR - UNOSAT - Palais des Nations CH-1211 Geneva 10, Switzerland - T: +41 22 767 4020 (UNOSAT Operations) - Hotline 24/7: +41 75 411 4998 - unosat@unitar.org - www.unitar.org/unosat



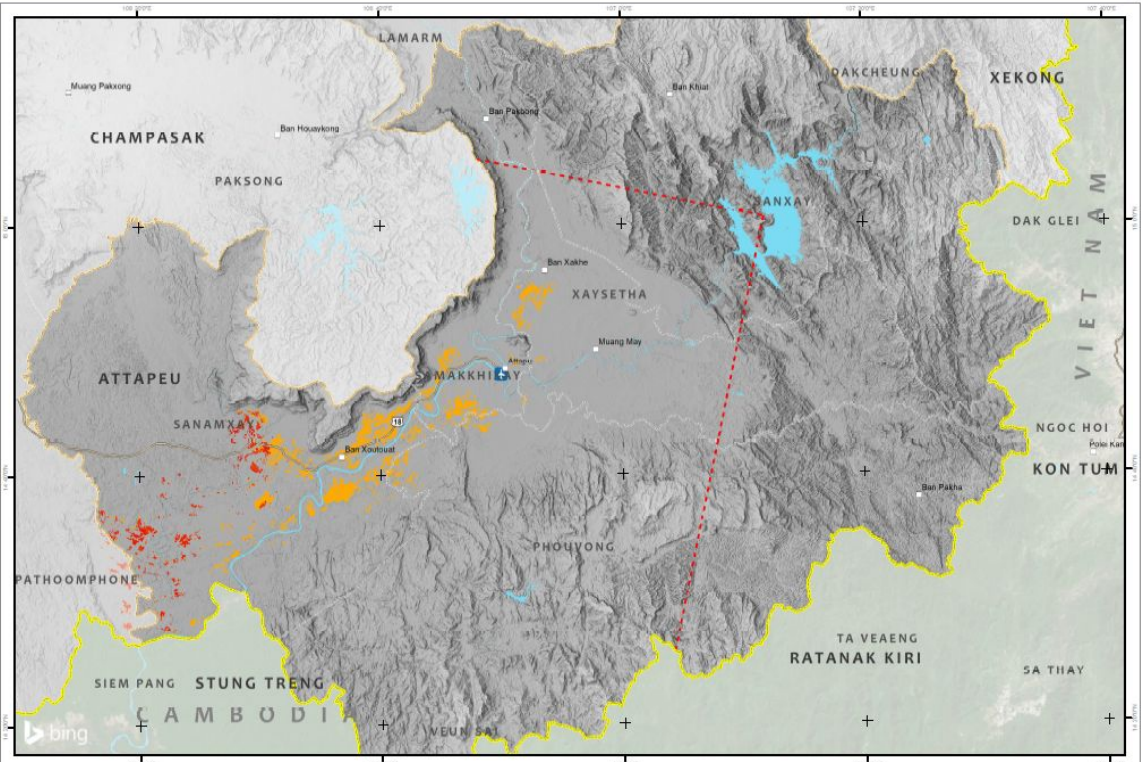
### Satellite detected water extents, as of 10 Sep 2019 over Attapeu Province, Lao PDR

This map illustrates satellite-detected surface water in Attapeu provinces of Lao PDR as observed from Sentinel-1 imagery acquired on 10 September 2019. Within the analysed extent of about 6,000 km<sup>2</sup>, a total about 14 km<sup>2</sup> of land appear to be flooded as of 10 September 2019. This is a preliminary analysis and has not yet been validated in the field. Please send ground feedback to UNITAR - UNOSAT.

**Important Note:** Flood analysis from Sentinel-1 imagery acquired on 10 September 2019 may seriously underestimate presence of standing flood water in built up areas due to backscattering of the radar signal



Analysis conducted with SNAP v5.0 and ArcGIS v10.7  
Coordinate System: WGS 1984 UTM Zone 48N  
Projection: Transverse Mercator  
Datum: WGS 1984  
Units: Meter



Satellite Date: Sentinel-1  
Imagery Dates: 10 September 2019  
Resolution: 10 m  
Reference water: Global Surface Water, JRC  
Copyright: Copernicus 2019 / ESA  
Source: European Space Agency  
Boundary data: UNOCHA/ROAP  
Population data: WorldPop  
Reference water: Global Surface Water, JRC  
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