



**12<sup>th</sup> REGIONAL  
STAKEHOLDER FORUM**

29 June 2022, Bangkok, Thailand

# Challenges of Forecasting Floods and Droughts in Lao PDR

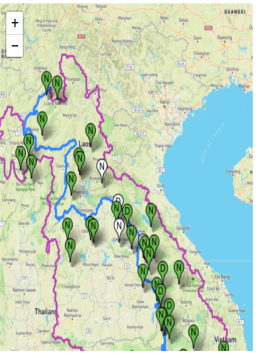
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Hydrology Division, DMH, Lao PDR

# Data use for Flood Forecasting

## Input data

Near Real-time Hydrometeorological Monitoring

Click on station name on the map or on the list to see water level charts.



| No. | Station         | River         | Code   | Country | Project | Status |
|-----|-----------------|---------------|--------|---------|---------|--------|
| 1   | Jinghong        | Mekong        | 02500  | China   | China   | Normal |
| 2   | Mulan           | Mekong        | 02500  | China   | China   | Normal |
| 3   | Xiang Kok       | Mekong        | 01402  | Lao PDR | HYCOS   | Normal |
| 4   | Luang Prabang   | Mekong        | 01101  | Lao PDR | HYCOS   | Normal |
| 5   | Ban Pathoum     | Mekong        | 011501 | Lao PDR | JEM     | Normal |
| 6   | Vientiane MUM   | Mekong        | 011901 | Lao PDR | HYCOS   | Normal |
| 7   | Paksane         | Mekong        | 012703 | Lao PDR | HYCOS   | Normal |
| 8   | Thakhek         | Mekong        | 013102 | Lao PDR | HYCOS   | Normal |
| 9   | Ban Mui         | Singkhobun    | 013806 | Lao PDR | HYCOS   | Normal |
| 10  | Paksane         | Mekong        | 013901 | Lao PDR | HYCOS   | Normal |
| 11  | Muang Ngoy      | Nam Ou        | 100102 | Lao PDR | HYCOS   | Normal |
| 12  | Ban Mui         | Nam Khan      | 120101 | Lao PDR | HYCOS   | Normal |
| 13  | Phongsavang     | Nam Ngum      | 120101 | Lao PDR | HYCOS   | N/A    |
| 14  | Muang Khab      | Nam Sane      | 260101 | Lao PDR | Drought | N/A    |
| 15  | Phonsey         | Nam Ou        | 270101 | Lao PDR | Drought | Normal |
| 16  | Ban Nape        | Nam Phao      | 270502 | Lao PDR | HYCOS   | Normal |
| 17  | Mahaxai         | Se Bang Fai   | 320101 | Lao PDR | HYCOS   | Normal |
| 18  | Se Bangkhai     | Se Bang Fai   | 320101 | Lao PDR | HYCOS   | Normal |
| 19  | Phalane         | Se Sangkay    | 350102 | Lao PDR | Drought | Normal |
| 20  | Ban Kengdome    | Se Bang Hieng | 350101 | Lao PDR | HYCOS   | Normal |
| 21  | Sigam           | Se Bang Hieng | 350105 | Lao PDR | HYCOS   | Normal |
| 22  | Ban Satsavouane | Sebangouane   | 360106 | Lao PDR | Drought | Normal |

**Automatic hydro stations**

## Flood Forecasting Model

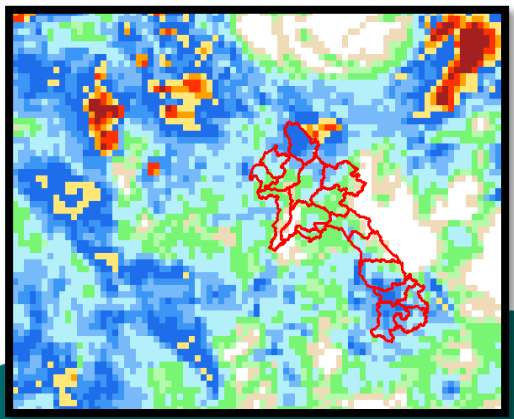
### Regression model (2 days forecast)

| Station   | STATISTICAL METHODE FORECAST |       |         |      |      |      |       |      |       |      |         |      |        |      |       |       |        |       | NAM NGUMI |        | LPRB  |       |
|-----------|------------------------------|-------|---------|------|------|------|-------|------|-------|------|---------|------|--------|------|-------|-------|--------|-------|-----------|--------|-------|-------|
|           | LB-Pb                        |       | LB-Xkok |      | Kni4 |      | Pnane |      | Thkek |      | SVNkhet |      | Paksae |      | Mhxai |       | Bridge |       | Tonehene  |        |       |       |
| Date      | Day1                         | Day2  | Day1    | Day1 | Day2 | Day1 | Day2  | Day1 | Day2  | Day1 | Day2    | Day1 | Day2   | Day1 | Day2  | Day1  | Day2   | Day1  | Day2      | Day1   | Day2  |       |
| 30-May-21 | 9.44                         | 8.78  | 10.91   | 6.68 | 5.53 | 9.09 | 9.76  | 9.62 | 11.58 | 6.29 | 8.17    | 6.67 | 8.30   | 5.87 | 9.84  | 9.89  | -1.36  | -1.02 | 203.39    | 206.38 | ##### | ##### |
| 31-May-21 | 9.37                         | 9.07  | 9.03    | 4.57 | 3.53 | 7.16 | 7.23  | 6.94 | 7.03  | 4.03 | 4.16    | 4.70 | 4.81   | 6.39 | 9.99  | 10.09 | 9.31   | 11.64 | 203.35    | 203.32 | ##### | ##### |
| 01-Jun-21 | 9.49                         | 9.35  | 9.22    | 4.48 | 3.57 | 7.17 | 7.11  | 6.69 | 6.51  | 4.06 | 4.09    | 4.69 | 4.80   | 6.72 | 10.25 | 10.35 | 5.81   | 6.14  | 203.45    | 203.44 | 9.85  | 9.85  |
| 02-Jun-21 | 9.94                         | 10.02 | 9.55    | 4.49 | 3.72 | 6.90 | 6.82  | 6.65 | 6.42  | 4.00 | 3.96    | 4.69 | 4.76   | 6.08 | 9.80  | 9.69  | 4.99   | 5.27  | 203.35    | 203.27 | 9.58  | 9.58  |
| 03-Jun-21 | 10.21                        | 10.56 | 9.45    | 4.25 | 3.64 | 6.47 | 6.38  | 6.45 | 6.16  | 3.96 | 3.89    | 4.65 | 4.70   | 5.85 | 9.93  | 9.97  | -2.46  | -2.68 | 203.22    | 203.10 | 9.85  | 9.85  |
| 04-Jun-21 | 10.35                        | 10.48 | 9.90    | 4.19 | 3.65 | 6.17 | 6.14  | 6.27 | 6.01  | 3.91 | 3.91    | 4.66 | 4.71   | 5.63 | 10.23 | 10.28 | 1.07   | 2.80  | 203.16    | 203.03 | 10.68 | 10.68 |
| 05-Jun-21 | 10.61                        | 10.79 | 10.03   | 4.57 | 4.02 | 6.21 | 6.45  | 6.29 | 6.20  | 3.80 | 3.75    | 4.75 | 4.74   | 5.96 | 10.10 | 10.18 | 9.67   | 12.13 | 203.07    | 202.95 | 10.20 | 10.20 |
| 06-Jun-21 | 10.14                        | 9.72  | 9.97    | 4.63 | 3.87 | 6.13 | 6.22  | 6.15 | 5.93  | 3.60 | 3.51    | 4.66 | 4.39   | 5.64 | 9.59  | 9.51  | 4.72   | 4.96  | 202.89    | 202.87 | 10.70 | 10.70 |
| 07-Jun-21 | 9.71                         | 9.13  | 9.57    | 4.74 | 3.81 | 6.55 | 6.73  | 6.14 | 6.06  | 3.54 | 3.56    | 4.52 | 4.48   | 6.10 | 9.61  | 9.68  | 4.16   | 4.48  | 202.86    | 202.86 | 10.00 | 10.00 |
| 08-Jun-21 | 9.70                         | 9.38  | 9.40    | 4.75 | 3.80 | 6.58 | 6.70  | 6.24 | 6.21  | 3.59 | 3.75    | 4.41 | 4.46   | 5.85 | 9.65  | 9.62  | 4.37   | 4.93  | 202.86    | 202.74 | 9.88  | 9.88  |
| 09-Jun-21 | 9.90                         | 9.89  | 9.40    | 4.50 | 3.69 | 6.48 | 6.48  | 6.33 | 6.18  | 3.57 | 3.62    | 4.38 | 4.44   | 7.48 | 10.48 | 10.63 | 4.61   | 5.20  | 202.78    | 202.66 | 10.00 | 10.00 |
| 10-Jun-21 | 10.32                        | 10.65 | 9.60    | 4.35 | 3.73 | 6.30 | 6.31  | 6.33 | 6.14  | 3.71 | 3.70    | 4.43 | 4.54   | 8.20 | 12.17 | 12.23 | 7.90   | 8.89  | 202.66    | 202.54 | 10.21 | 10.21 |
| 11-Jun-21 | 10.86                        | 11.22 | 10.24   | 4.42 | 3.96 | 6.04 | 6.13  | 6.14 | 5.90  | 3.70 | 3.63    | 4.59 | 4.64   | 7.09 | 11.51 | 11.39 | 6.48   | 6.87  | 202.62    | 202.51 | 10.62 | 10.62 |
| 12-Jun-21 | 10.80                        | 10.76 | 10.39   | 4.58 | 4.05 | 5.98 | 6.29  | 5.85 | 5.59  | 3.56 | 3.96    | 4.58 | 4.52   | 5.76 | 9.87  | 9.61  | 5.90   | 6.26  | 202.53    | 202.42 | 10.67 | 10.67 |
| 13-Jun-21 | 10.63                        | 10.33 | 10.33   | 4.73 | 4.12 | 6.08 | 6.43  | 5.61 | 5.39  | 3.10 | 2.97    | 4.28 | 4.10   | 5.76 | 9.65  | 9.33  | 4.40   | 4.59  | 202.45    | 202.34 | 10.64 | 10.64 |
| 14-Jun-21 | 10.51                        | 10.18 | 10.15   | 5.15 | 4.34 | 6.31 | 6.66  | 5.65 | 5.49  | 3.00 | 2.96    | 4.08 | 3.98   | 6.92 | 9.27  | 9.35  | 5.05   | 5.46  | 202.49    | 202.42 | 10.61 | 10.61 |

Observed Rainfall was not considered in this method

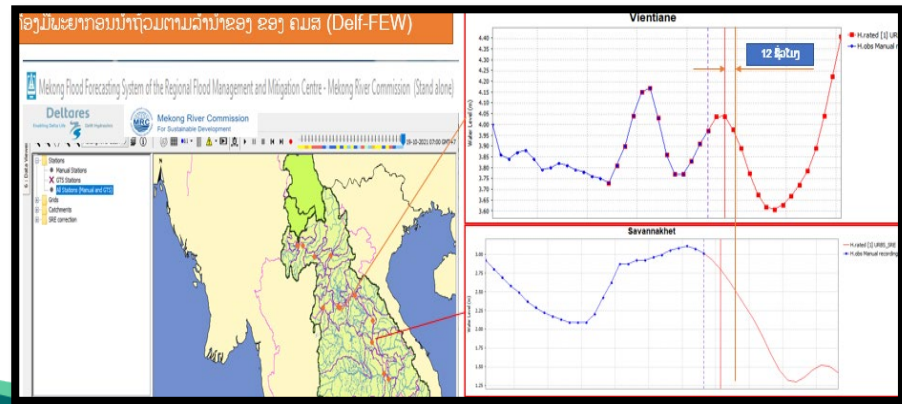
For Cross check only (not the actual input of the model)

### rainfall forecast data (satellite)



No Bias-Correction

### Delft-FEWS (7 days forecast)



Discussion

Flood Forecast Bulletin

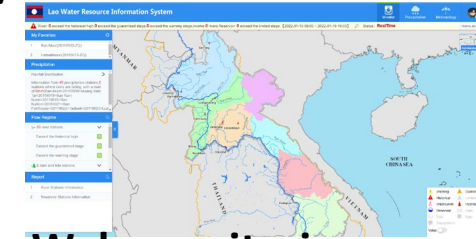
# The Need for data integration of various projects

## Hydro-Meteo Network Projects

Project funded by China

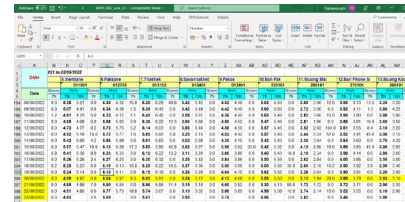


server

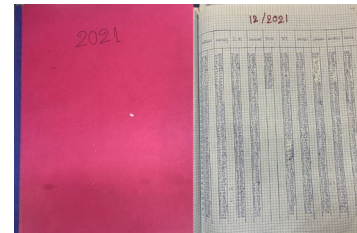


Web-monitoring

Project funded by DMH



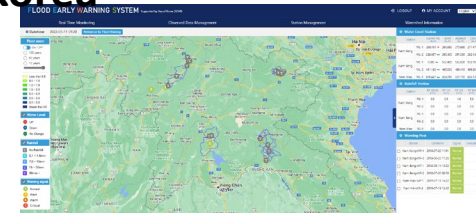
MS. Excel & Books



Project funded by Korea



server

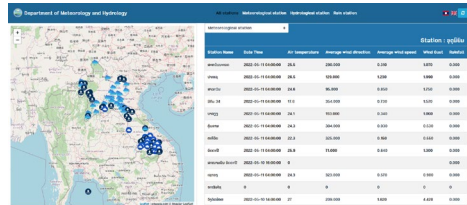


Web-monitoring

Project funded by World Bank



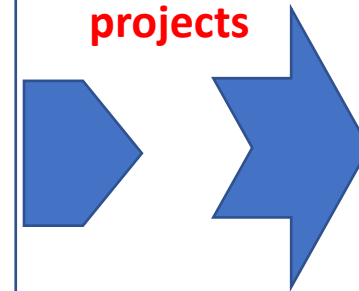
server



Web-monitoring

Line agencies,  
other projects and  
etc.

No Link-  
connection  
between  
Various  
projects

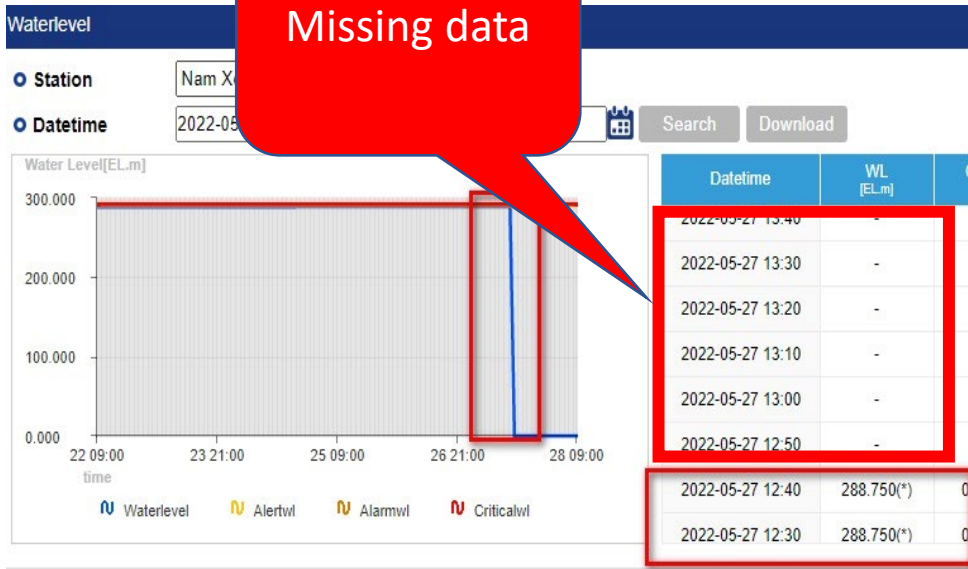


No center  
server

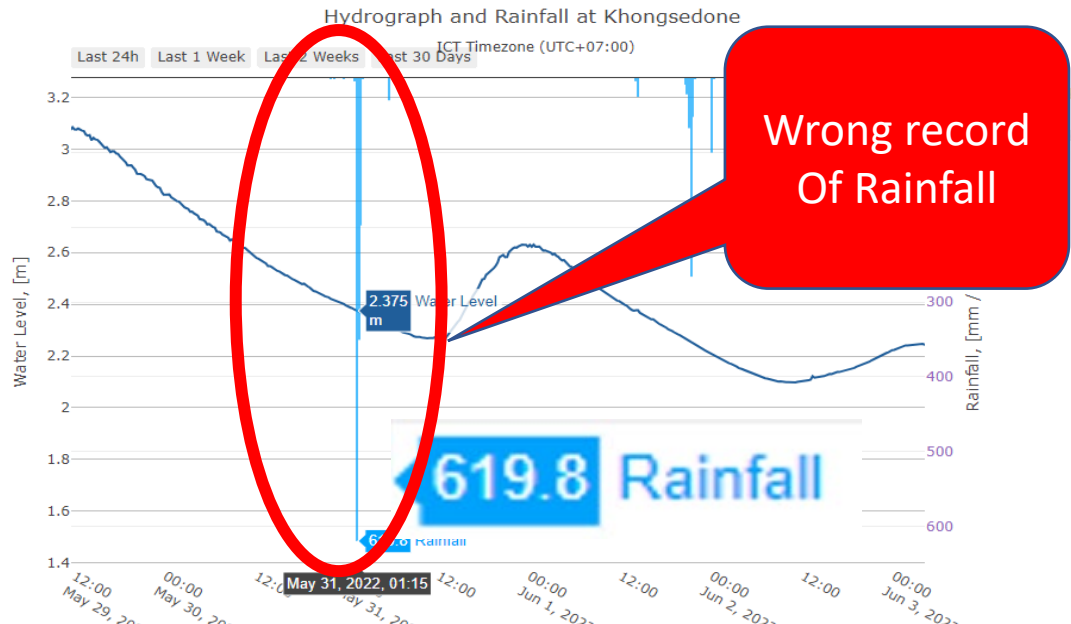
Center  
server/web  
monitoring and  
management



# Operation & Maintenance



❖ Occasionally, the data delivered were **missing, error, nonsensical, etc.** due to equipment failure from natural causes or man-made and mostly because of the lack of routine maintenance operation (**cross-check between manual-auto station is necessary**);



❖ Failure/inactive station need a long period of time to be mended due to the **lack of fund for O&M**, lack of expert staffs in local area;



# 12<sup>th</sup> REGIONAL STAKEHOLDER FORUM

29 June 2022, Bangkok, Thailand

***THANK YOU***