QUESTIONNAIRE: Evaluation of Flood Early Warning Systems

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Dear Sir/Madam,

United Nations University Institute for Water, Environment and Health (UNU-INWEH) is conducting a global analysis of the effectiveness and developmental impact of flood early warning systems (FEWS). The survey below is one part of this Initiative.

We would be grateful if you could kindly fill it up. Your participation in the study will contribute to a better understanding of existing flood early warning systems and their active contribution to flood disaster risk reduction and their real benefits to the community.

You are free to contact me at the below address and phone number if you need more clarifications for the survey questions or the research.

We would be grateful if you could spare approximately 45 minutes to complete this survey.

Many thanks in advance.

Duminda Perera

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Special Notes:
i), FEWS: Flood Early Warning System
ii), USD: United State Dollar
iii), If you do not have answers for the compulsory questions, please write NA.
iv), You can save the survey at the end of each page. One page has seven questions. The restarting link of the survey will be sent to your email. You can restart the survey where you stop, by clicking the link.
v), We request the contact details of the respondent only for further clarifications (if it is needed). We protect the confidentiality of the contact details.vi), 70% of the questions are MCQs.

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1. Please provide the details about the advanced/state-of-the-art Flood Early Warning System (FEWS)* in your Center.

**Please fill separate questionnaire (one questionnaire for each FEWS) if information on more than one FEWS such type is available.*

*** Target area refers to localities/cities/districts for which flood forecasts are being produced. Note: While answering the questions below, if you do not have exact answers to the questions, please provide the most accurate approximations.*

• Year of the establishment of the FEWS	❑
• Institution(s) governing FEWS	❑
• River basin name	❑
• Area of the basin (km2)	❑
• Populated downstream city/cities in the river basin	❑
• Population of downstream/target area (approximately, if available)	❑
• Province	❑
• Country	❑
• Contact information of the respondent Name, Email, TP No.	❑
• URL, Web link related to the Center or FEWS.	❑

2. We have categorized the FWES as Basic, Intermediate and Advanced (Definitions are given below).

[a] *Data collection and transferring are manual (not real time, no information about the status of water level). Based on water level or river flow observations, a qualitative forecast is performed and informed to the target community. Community or local authority is involved (None of the below stated are involved in this type of FEWS: Modern equipment, Data collection, Telemetric data communication, Quantitative prediction, Calculation, Modeling).*

[b] *Real-time data is available from river and rainfall gauges, however there is no capacity for modeling-based forecasting. Based on data obtained and past experiences warnings are issues to the target community.*

[c] *Real-time data collection and transfer to a Center for hydrological modeling and forecasting. Flood early warnings are issued, and continuous monitoring and updates are issued.*

Please select the most appropriate category for your Center`s FEWS.
1. Basic [a]
2. Intermediate [b]
3. Advanced [c]

3. What was/were the main reason(s) to implement a FEWS in this area?
1. Loss of human lives
2. Damages to the houses and household properties of residents
3. Damages to the agriculture in the area
4. Damages to the industries in the area
5. Damages to the natural environment
6. Other, please specify _____

4. Please mention Published Reports, Journal papers or any other publications related to the FEWS.

1)
2)
3)
4)
5)

5. In case of floods, how many residents will be at risk in the downstream/FEWS`s target area?

1. Less than 1000
2. 1000 – 10,000
3. 10,000 – 100,000
4. More than 100,000 – 1 million
5. Other (specify):___ _____

6. What is the nature of the downstream/FEWS` target area communities?

1. Urban
2. Semi-urban
3. Rural
4. Other (specify): _____

7. If there is a quantitative evaluation of the assets in downstream/FEWS` target area communities, please mention the value in USD?

Please mention the year of evaluation.

8. What are the components of the hydrological observation system used in the river basin (Please select all possible answers)?

1. Rainfall gauges
2. Water level gauges
3. Stream-flow gauges

9. What is the nature of the components of hydrological observation system? Please choose from the following and fill in the blank.

Manual :- Both the data collection and data recording are manual i.e., a person in the upstream manually read the data with an instrument and provides the data to the Center.*

*Semi-automated** :- Data has recorded automatically but data must be collected and transferred manually by physically going to the Center.*

*Automated*** :- Both the data recording and collection are automatic/telemetric i.e., data recorded from the data logger is directly transferred to the Center.*

	Manual*	Semi-automated **	Automated***
• Rainfall gauges	❑	❑	❑
• Water level gauges	❑	❑	❑
• Stream-flow gauges	❑	❑	❑

10. How many hydrological-observation units are installed in the river basin? Please mention the numbers.

• Rainfall gauges	❑
• Water level gauges	❑
• Stream-flow gauges	❑

11. What is the hydrological observation data transferring frequency to the Centre?
Please specify whether Real-time (RT), Near real-time (NRT), Hourly (H), Daily (D), Weekly (W) or Other regular intervals (O).

• Rainfall gauges	❑
• Water level gauges	❑
• Stream-flow gauges	❑

12. What are the ways implemented to monitor floods in the target area (Please select all possible answers)?

1. Drones
2. CCTV Cameras
3. Direct ground observations
4. Use MODIS images to identify the flooded area (if available)
5. Others (specify): _____

13. What are the dominating factors leading to floods (Please select all possible answers)?

1. Monsoon
2. Typhoon/Hurricane/Tropical cyclone
3. Spring snow-melt
4. Others (please specify): _____

14. What are the common types of floods occurring in the FEWS operating area (Please select all possible answers)?

1. Fluvial floods/River floods
2. Pluvial floods/Surface flood
3. Flash floods
4. Ice jam floods
5. Floods due to upstream dam operations
6. Other (please specify): _____

15. What is the type of the hydrological model being used in the flood forecasting Center?

1. Open-source model
2. Commercial model
3. The model is specifically developed for the flood forecasting Center

16. What are the lead times of the forecasting system? Please provide both short and long-term lead times if available.
Short-term lead time - Hourly to daily
Long-term lead time - Daily to monthly

• Short-term (Mention with time units)	❑
• Long-term (Mention with time units)	❑

17. What is the frequency of the flood forecasts produced?

1. Event-based
2. Continuous
3. Seasonal
4. If continuous, please specify (Daily, Weekly, Monthly): _____

18. What are the outputs of forecasting system or hydrological model (Please select all possible answers)?

1. Water level
2. Stream-flow
3. Inundation

19. Who are the main end receivers of flood warnings (cities, towns, villages, security forces, government agencies, etc.)? Please list them below?

20. Are the Flood Hazard Maps available in the Center?

1. Yes
2. No

21. Are the Flood Hazard Maps distributed to the local community under flood risk?

1. Yes
2. No

22. Are the Flood Hazard Maps updated in a timely manner?

1. Annually
2. Every two-years time
3. Every three-years time
4. No updates
5. Or, specify: _____

23. What are the return periods of the floods for which the flood hazard maps were developed?

1. 25-years
2. 50-years
3. 100-years
4. 200 years
5. Other (specify) _____

24. What are the ways to disseminate warnings to the community (Please select all available options utilized to convey warnings)?

1. Siren
2. Volunteers
3. Speakers
4. SMS
5. Radio
6. Television
7. Social Media
8. Official webpage
9. Other: _____

25. What is the average delay between the flood forecast and flood warning delivery(Please specify with the unit in the blank provided)?

1. Minutes
2. Hours
3. Days
4. Specify the time: _____

26. Does the Center require permission from the local political authority before issuing the flood warning?

1. Yes
2. No

27. If continuous updates about the flood are provided after the warnings are issued, what is the frequency of such updates?

1. Continuous updates are not available
2. Minutes
3. Hours
4. Days
5. Please specify the time _____

28. Based on past experiences what percentage of people respond to the flood early warnings? Please choose an approximate option and fill in the blank.

1. No information
2. Less than 10%
3. Between 10% and 30%
4. Above 30% and below 50%
5. Between 50% and 70%
6. Above 70% and below 90%

7. Above 90%
8. Other (%) _____

29. Does the community follow the Flood Hazard Maps during a flood event to safeguard their lives and properties?

1. Yes
2. No
3. Don't know

30. Is there any community support network or a team available for women, children, elderly and disabled people in an evacuation?

1. Yes
2. No
3. Don't know

31. Are the people provided with sandbags or alike materials to combat floods?

1. Yes
2. No
3. Don't know

32. Has downstream community undertaken self-protection measures? E.g. Building houses on pillars, build huge walls?

1. Yes
2. No
3. Don't know

33. Is the community informed a list of things to be carried during an evacuation?

1. Yes
2. No
3. Don't know

34. Are there frequent programs such as training, seminars, drills to make people aware of flood risk and evacuation procedure during emergencies?

1. Yes
2. No
3. Don't know

35. Is there any security given (e.g. Police) to unattended property (e.g. houses, farms, shops, furniture, other valuables) which are left as is by people during emergencies?

1. Yes
2. No
3. Don't know

36. Is there a community-led flood rescue group in the downstream/FEWS` target area communities?

1. Yes
2. No
3. Don't know

37. What is the source of investment in the FEWS (Please select all funded sources)?

1. Loans from international donors
2. International donations
3. Bi-lateral funding agencies
4. Central Government investments
5. Local Government investment
6. Private sector investment
7. Public-Private Partnerships
8. Research-based project funding (National Fund)
9. Research-based project funding (International Fund)
10. Others, please specify: _____

38. What are the names of funding sources (if it is not from the government)?

• Banks providing loans	❑
• Donors	❑
• Funding agencies	❑
• Government	❑
• Projects	❑
• Private Company	❑
• Other, specify	❑

39. What was the total budget received to implement the FEWS (lump-sum amount in USD)?

Please mention the year of the budget received.

40. If the previous answer about the budget is unknown, then what was the approximate value (USD) of total investments (including loans, donations, funds, government investments) received to implement the FEWS?

Please mention the year of the budget received.

41. Please mention the sources of information for this investment/funding or loan (Reports, new paper articles, web link etc.)

42. According to the current funding commitments from all sources and availability of resources, what would be the projected life-span of the FEWS in years?

43. What is the total annual operating cost of FEWS (USD)?

44. After the receipt of funding of finance, how long did it take for the FEWS to be operational??

1. 3 months
2. 6 months
3. 1 year
4. Other, specify: _____

45. What were the estimated flood losses in the area before and after the establishment of FEWS (Please mention of information available)?

46. Was the system evaluated technically to check its efficiency and the effectiveness as a flood early warning system?

1. Yes
2. No
3. Don`t know
4. If Yes, describe the outputs of the evaluation (Please provide report name, journal paper etc.) _____

47. Based on the flood forecasts produced during the flood events, what is the success rate of the FEWS?

Please assess the success rate in terms of the numbers of Hits [m], Misses [n] and False alarms [o] were recorded.

[m] *Both the forecast and observation show a flood,*
[n] *Flood is not forecasted but observation shows the occurrence of a flood,*
[o] *the forecast shows a flood, but observation does not*

• Hits	❑
• Misses	❑
• False alarms	❑

48. According to the flood forecast record up to date, what is the accuracy (%) of the system in the prediction of floods?

49. What is the financial cost (USD) of a false alarm (Please mention if the information is available)?

50. After the establishment of the FEWS are the flood damages to the physical properties reduced? If Yes, please select an approximate %.

1. **Yes**
2. No
3. Don't know
4. Less than of equal 10%
5. 10% - 25%
6. 25% - 50%
7. 50% - 75%
8. 75% - 100%
9. If you know the exact % please mention _____

51. Due to the operational FEWS in the watershed, is there a reduction in causalities?

If Yes, how many lives (estimated) have been saved (as a %) as compared to non-existent FEWS in the target area?

1. Yes
2. No
3. Don`t know
4. Less than or equal 10%
5. 10% - 25%
6. 25% - 50%
7. 50% - 75%
8. 75% - 100%
9. If you know the exact % _____

52. After the implementation of FEWS in the watershed, how much (estimated roughly) total economic loss (USD) has been avoided?

53. What are the benefits to the downstream community due to the implementation of FEWS?

54. What are the benefits to the Center due to the implementation of FEWS?

55. Has the implementation of FEWS resulted in an increase in property value of the target area?

1. Yes
2. No
3. Don't know

56. As the community feels safe due to operational FEWS, has it led to new investments in the downstream or target area?

1. Yes
2. No
3. Don't know

57. After the implementation of the FEWS, have the existing residents, industries etc. added more investments to their existing properties?

1. Yes
2. No
3. Don't know

58. Owing to the FEWS in place, is there any improvement in the overall quality of life of the downstream or target area population?

1. Yes
2. No
3. Don't know

59. Has the operation of the FEWS made people and decision makers attitude and awareness to flood risk change?

1. Yes
2. No
3. Don't know

60. Are there any improvements in the water or communication infrastructure due to the presence of the FEWS?

1. Yes
2. No
3. Don't know

61. Did your Center receive new equipment (e.g. for observations, modeling, communication etc.) due to the FEWS` establishment?

1. Yes
2. No

62. Did your staff receive an advanced training due to the establishment of FEWS?

1. Yes
2. No

63. Are the number of monitoring stations sufficient to produce accurate forecasts?

1. Yes
2. No
3. Don't know

64. Are the measuring equipment, gauges and instruments technologically advanced enough for the purpose?

1. Yes
2. No
3. Don't know

65. Is the existing staff sufficient for the efficient operation of the FEWS?

1. Yes
2. No
3. Don't know

66. Are there any backup measurement unit(s) available in the event of break down of operational measurement units?

1. Yes
2. No
3. Don't know

67. Are the forecasters provided with appropriate, timely training to use advanced models or components of the FEWS?

1. Yes
2. No
3. Don't know

68. Does the Center consist of sufficiently skilled and well-informed staff to perform forecasts?

1. Yes
2. No
3. Don't know

69. Are the models used for flood forecasting advanced enough to produce accurate estimates?

1. Yes
2. No
3. Don't know

70. Is the communication system reliable for flood warning dissemination?

1. Yes
2. No
3. Don't know

71. Does the community have sufficient infrastructure, equipment or mechanism to receive the warnings?

1. Yes
2. No
3. Don't know

72. Does the hydrological observation system provide reliable data to be input into the forecasting model?

1. Yes
2. No
3. Don't know

73. Is the funding consistent for continuous operation of the FEWS?

1. Yes
2. No
3. Don't know

74. Is the funding sufficient to operate the FEWS?

1. Yes
2. No
3. Don't know

75. Is there a budget for improving or updating the system?

1. Yes
2. No
3. Don't know

76. Is the budget adequate to train the needed human resource to operate the FEWS?

1. Yes
2. No
3. Don't know

77. Do the people respond promptly to the flood warnings?

1. Yes
2. No
3. Don't know

78. Do the people find the forecasts credible?

If Yes, what is the level of acceptance as a percentage (approximately)?

1. Yes
2. No

3. Don't know
4. If Yes, what is the approximate acceptance %? _____

79. Are there social barriers to the assimilation and utilization of warning information?

1. Yes
2. No
3. Don't know

80. If Yes, what are they?

81. Are there flood insurances available in the area?

1. Yes
2. No
3. Don't know

82. If Yes, what percentage of the community can afford the flood insurance?

83. How do you assess the support provided by local political authorities for the efficient operation of FEWS?

1. Highly supportive
2. Moderately supportive
3. Less supportive
4. No support
5. Don't know

84. Do the policymakers take necessary actions to minimize the flood risk in the downstream target area?

1. Yes
2. No
3. Don't know

Thank you very much for completing the Questionnaire. Will you be available for further inquiry regarding the Flood Early Warning Systems in your Center?

1, Yes
2, No

If yes, please provide your email address:
