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South African Regional Technical Meeting and User
CONOPS Workshop
October 26-30, 2015
Pretoria, South Africa

Integrating SWFDP and SARFFG to produce
effective warnings for the last Kilometer

Building an End-to End Forecast and Warning System





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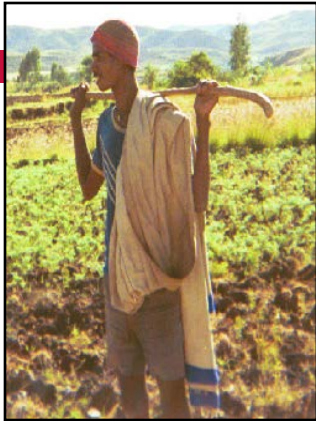
What does OFDA do?

- Responds to all types of Disasters
- Provides assistance when lives are threatened by accidental or human-caused catastrophes
- Coordinates U.S. Government response to international disasters
- Promotes preparedness and mitigation activities

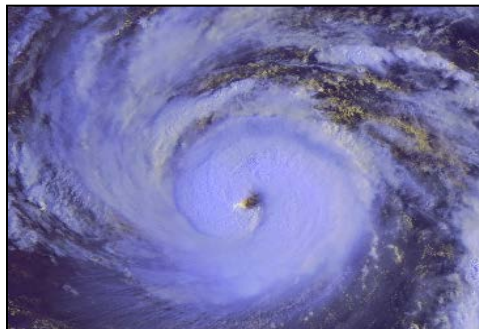


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Office of US Foreign Disaster Assistance



**Save lives,
alleviate human suffering, and
reduce the economic and social impacts of
humanitarian emergencies**





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WARNINGS

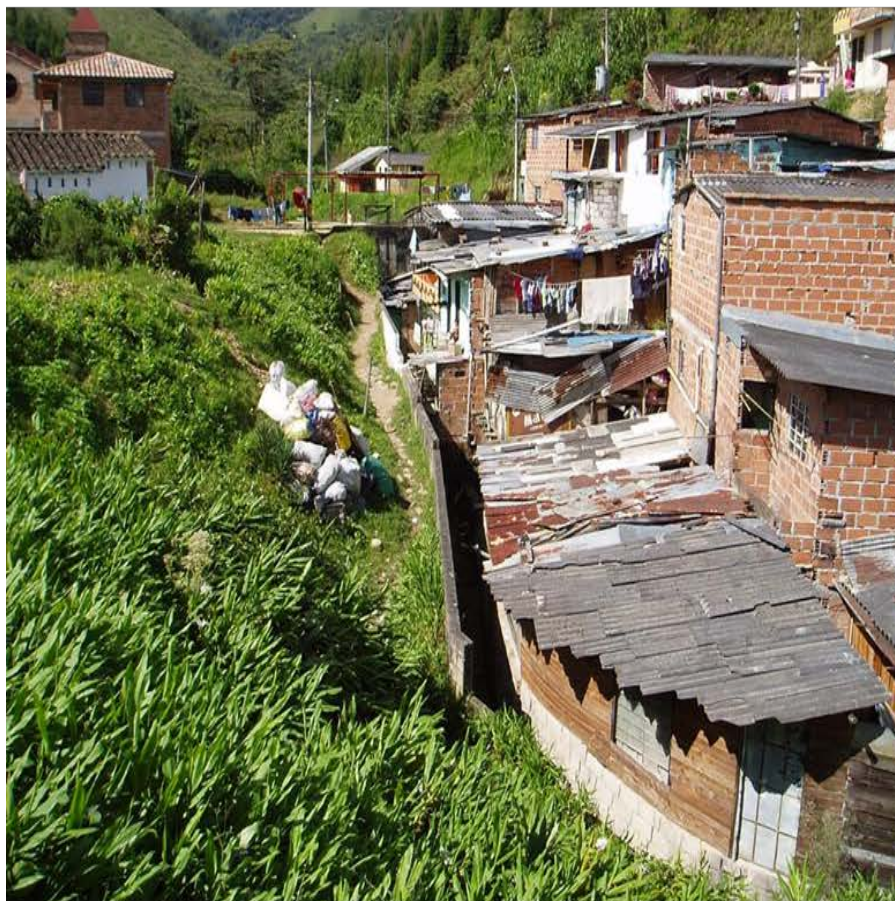
- **What is an End-to-end EW System?**
- **What are the Components of an end-to-end Hydromet EWS**
- **How does SARFFG and SWFDP fit with the end-to-end System ?**



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Flash Floods

Avenida torrencial La Chuscala (Mpio de Caldas)



Antes



Despues



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Large River Flooding





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Urban Floods

- Urban streams often need to hold 2-3X pre-urban volume
- Many urban streams are not permitted to become wider/deeper
 - Flash floods at lower precipitation threshold
 - More frequent flash floods



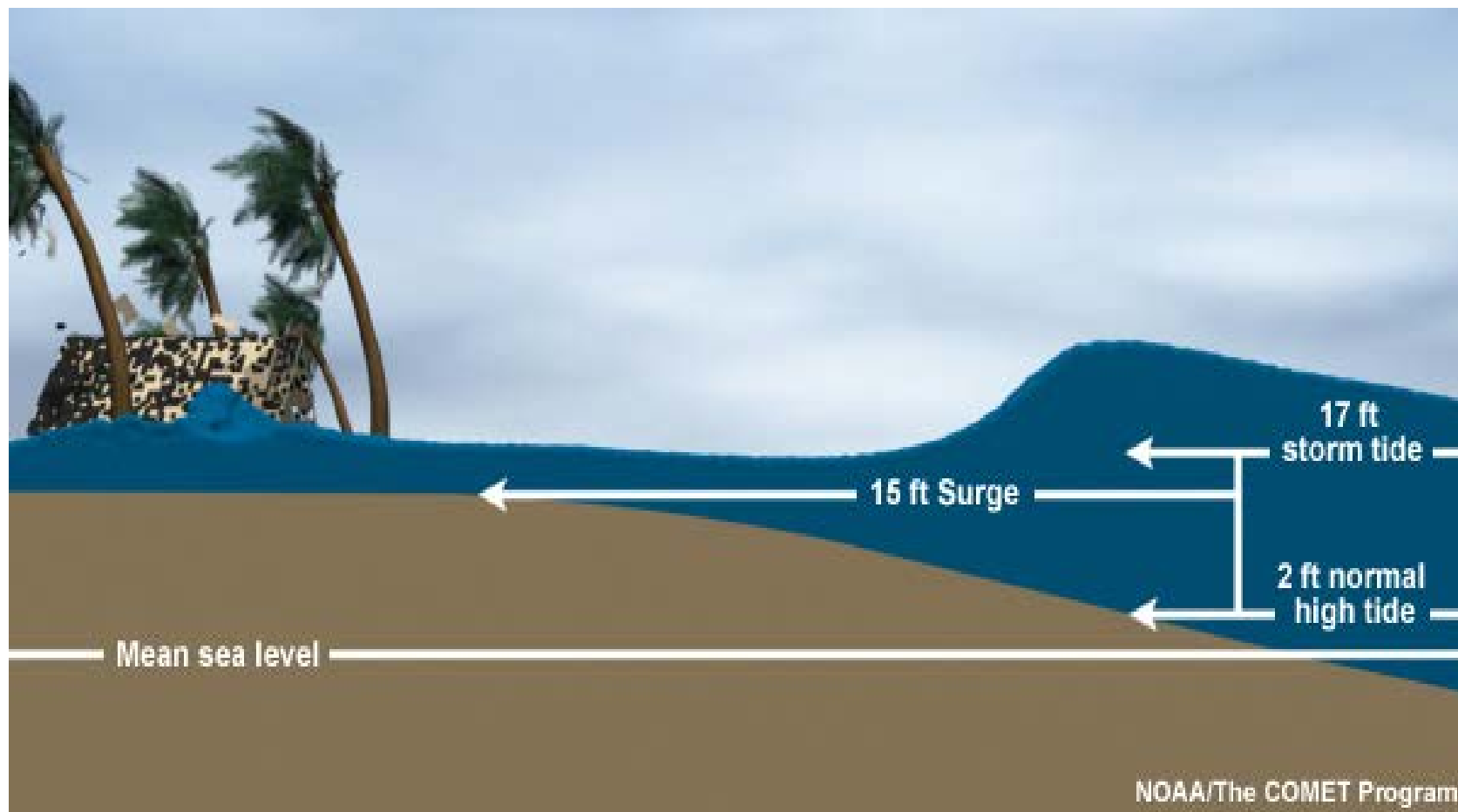
*Photo by Bob Davis,
Pittsburgh*



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Coastal Floods

Storm Surge



How does an End to End Hydro meteorological Early Warning System Work?

An end to end early warning system consists of a warning and response system made up of many interconnected components. When successful, an end to end hydrometeorological early warning system reduces the impact of hydrometeorological events by providing timely, accurate information that gives sufficient lead-time to prepare for and efficiently respond to extreme events. Investment in user knowledge, capacity of forecasters, and close coordination of all sectors and levels of government are essential to the success of early warning systems.



1 Monitoring and Collection of Data

Satellite, radar, and ground observation networks are used to monitor and collect data on extreme hydrometeorological events.



2 Center

Collected data is then sent to a central location for quality control, archiving, and analysis.



3 Meteorological and Hydrological Forecast

From this data, forecasts are produced that detail rainfall, temperature, snowfall, and streamflow.



4 Warning Generation and Dissemination

Forecasts are then used to disseminate warnings to public and at-risk populations. Warnings must be provided in a format users can easily understand.



5 Action

Decision makers and the public must monitor hazards, develop protocols for warning, plan for extreme events, and develop policies for disaster management.



6 Feedback

User feedback is encouraged to periodically improve and address the needs of decision makers.



LEAD TIME:

An early warning system should provide timely, accurate information to give sufficient lead time to prepare for and respond to hydrometeorological events



INTERCONNECTIVITY IS KEY:

Each component in this process is essential and failure of any of these components will lead to failure of the entire system.



400%

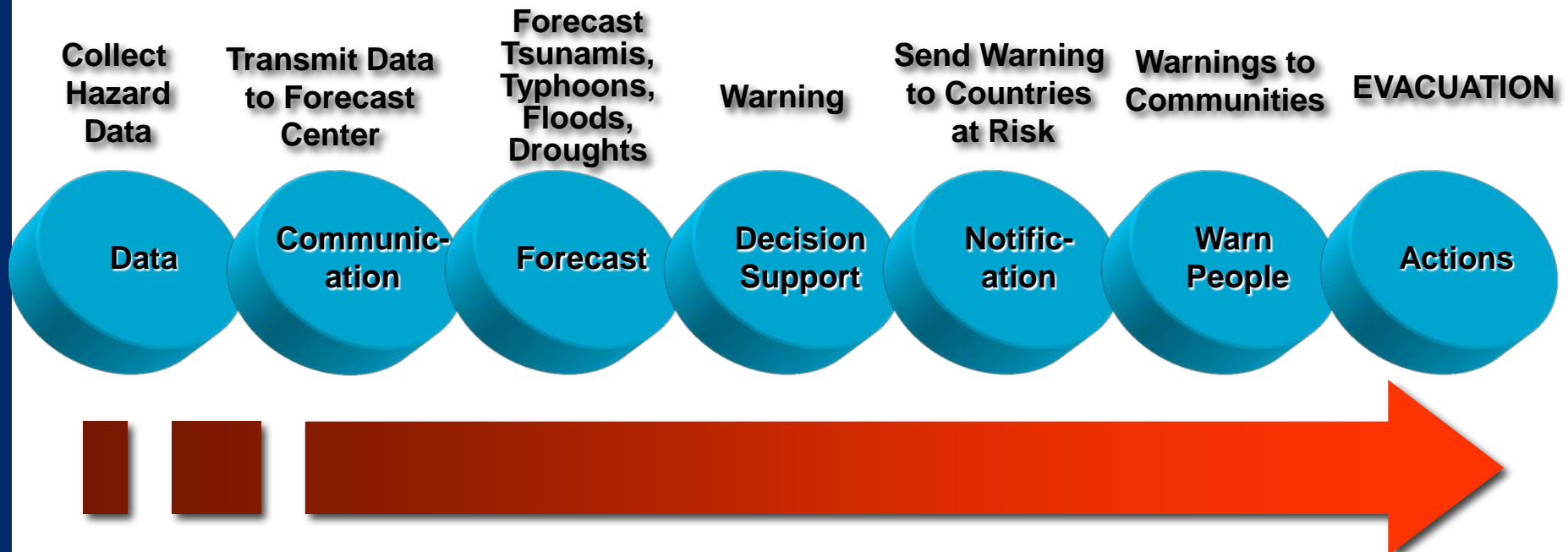
increase in the number of weather, water and climate disasters over the past 25 years.



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E2E Early Warnings

End to End All Hazards Forecast and Warning



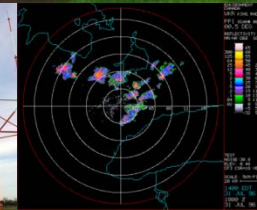
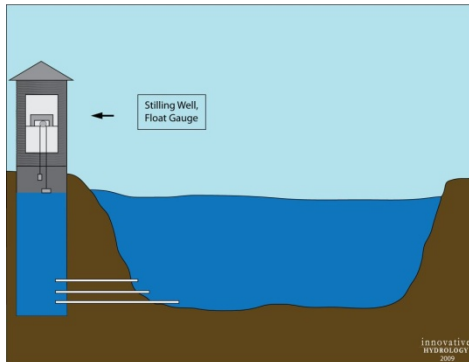
Integrated All Hazard forecasting, warning and response with Flash Flood Warning system



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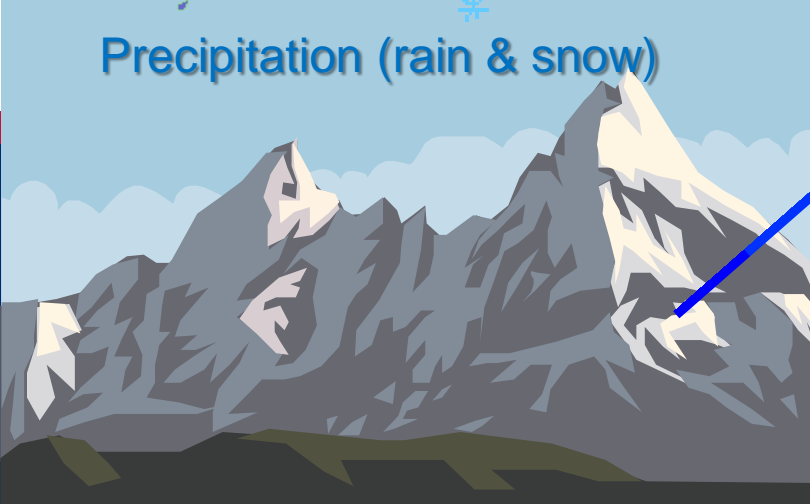
Real Time Hydromet Measurements



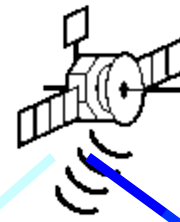


Modern Real-time Hydromet Systems

Precipitation (rain & snow)



Data Transmission
(Satellite, Fixed-line/
Cellphone, Radio
Telemetry etc)



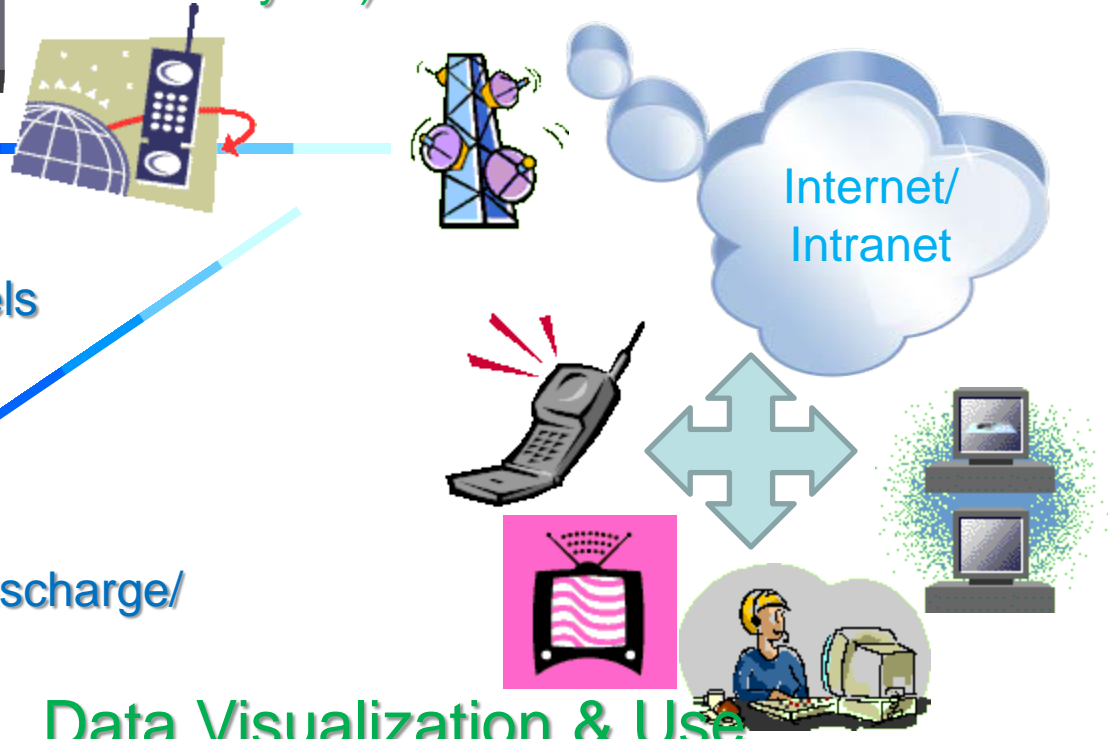
Reservoir Levels



River Stage/Discharge/
Sediment

Data Generation

Data Visualization & Use





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How are Flood Forecasts made ?

- Need Data- Where and how much
 - rain ?
- Communicate data to a Forecast
 - Center
- Forecasters run models using data
- Forecasters use data, forecasts
 - & experience to produce forecast
 - product
- Forecasts sent to users for
 - decision actions





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Disseminating Forecasts to Users

- **Users**

- **Public**
- **Emergency Management**
- **Private Sector**
- **Government Agencies**
- **Academia**

- **Methods**

- **email**
- **Media-Radio/TV**
- **Fax**
- **Internet**
- **SMS-Cell phones**
- **Satellite (RANET)**





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E2E Summary

All components of an End to End Warning and Response System must be fully functional and engaged to save lives

An End to End System is as effective as its weakest Link

An End to End System consists of Science & models, Data and Technology and Forecaster Expertise-- The **Concept of Operations** Defines How the system will function to save lives and property



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WARNINGS SAVE LIVES



**FLOODING AHEAD
TURN AROUND
DON'T DROWN**

