Drought management in Vietnam

DMIAT: Drought Monitoring and Impact Assessment Toolbox

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Research and consultancy for a sustainable future of our water resources

2009-2010 drought event Vietnam

- Approx 100 million USD in crop damage; 1.3 million people did not have access to clean water
- Salinity intrusion Mekong River Delta

- Drought Management Programme (DMP)
- Priorities (among others):
  - drought monitoring
  - impact assessment

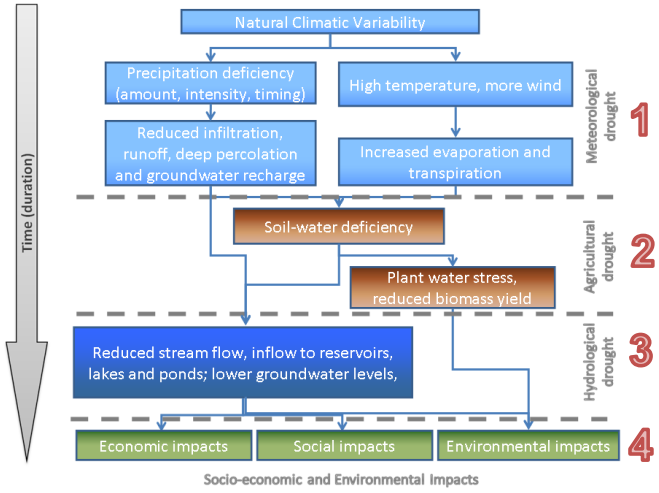
Vietnam Feels the Heat of a 100-Year Drought

By MARTHA ANN OVERLAND / HANOI Thursday, Mar. 04, 2010

The dried-up bed of the Red River, near Long Bien Bridge in Hanoi on Dec. 1, 2009
Nguyen Huy Kham / Reuters

Drought Monitoring and Impact Assessment Toolbox (DMIAT)

1. **Meteorological** drought: degree of "dryness" in terms of accumulated rainfall deficit
2. **Agricultural** drought: impacts upon crop production through insufficient soil moisture
3. **Hydrological** drought: shortages in surface water and groundwater
4. **Socio-economic** drought: last phase where people and the environment experience the negative impact of drought



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Drought Monitoring and Impact Assessment Toolbox (DMIAT)

- FutureWater has developed the DMIAT over the last years
- DMIAT integrates the four types in drought progression
- DMIAT mainly uses open-access data sources
- DMIAT combines three main types of tools to support policy making:
  - Remote sensing
  - Models
  - Decision trees
- DMIAT is based on a generalized framework, local specific refinements are always necessary
- DMIAT was applied for the Greater Mekong area to characterize the 2009/2010 drought period and construct general drought risk maps

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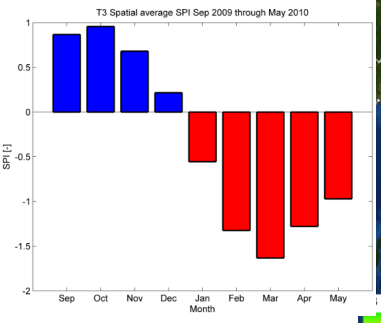
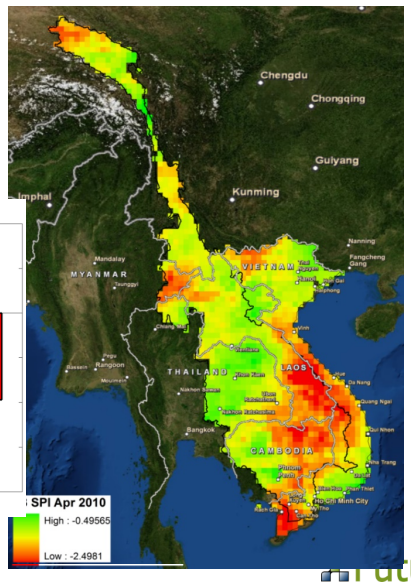
1. Meteorological drought monitoring

- Meteorological drought indices:
  - Precipitation anomaly (TRMM)
  - Standardized precipitation index

SPI value	Drought category
0 to –0.99	Mild drought
-1.00 to –1.49	Moderate drought
-1.50 to –1.99	Severe drought
< -2.00	Extreme drought





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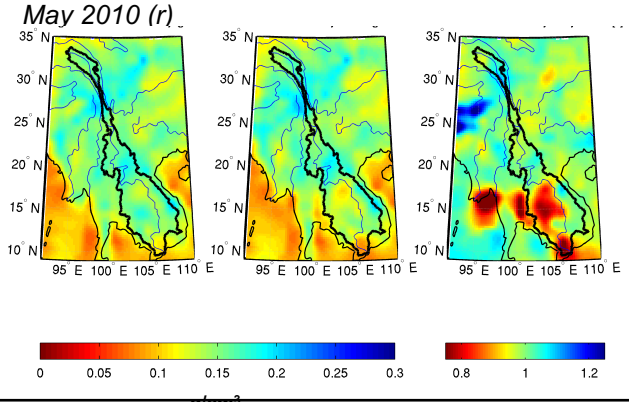
2. Agricultural drought monitoring:

- Agricultural drought indices:
  - Normalized Difference Vegetation Index (NDVI - MODIS)
  - Soil moisture deficit (ASCAT)

Average soil moisture for May (l), soil moisture in May 2010 (m), and soil moisture anomaly for May 2010 (r)



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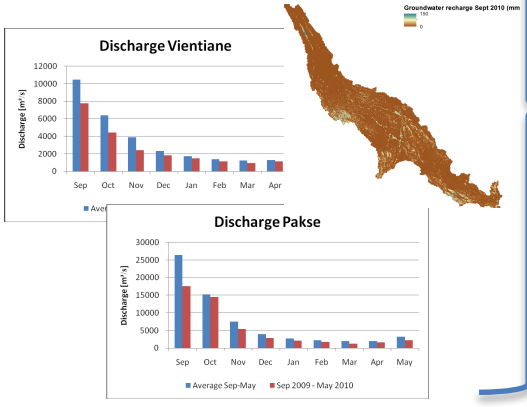
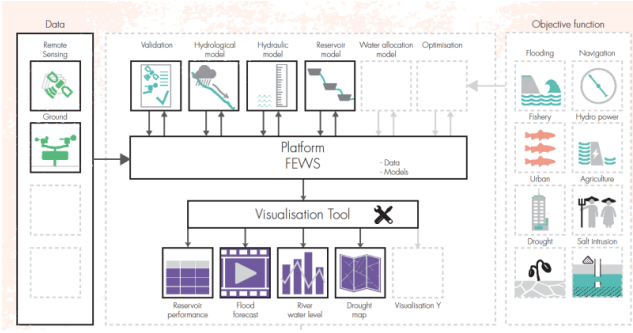
3. Hydrological drought monitoring

- Hydrological drought indices:
  - Changes in river discharge
  - Changes in reservoir storage
  - Declining groundwater levels



Follow-up for Red River Basin. Demonstration Project: Operational system integrating DMIAT, but focus on hydrological flows and water available in reservoirs.



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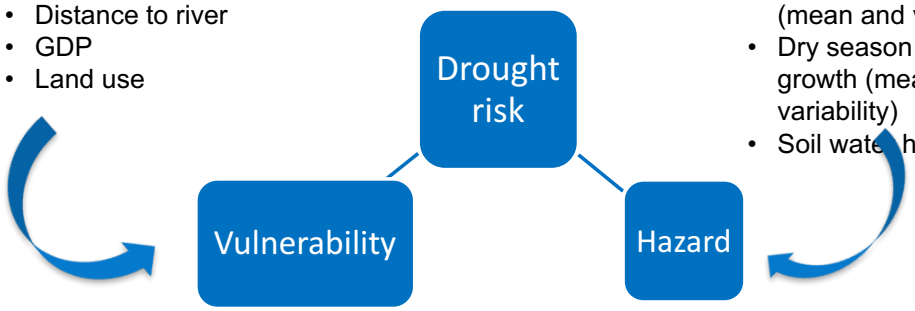
4. Drought risk = Vulnerability x Hazard

- Population density
- Distance to river
- GDP
- Land use



- Dry season precipitation (mean and variability)
- Dry season vegetation growth (mean and variability)
- Soil water holding capacity

Outputs: Hazard Index maps, Vulnerability Index maps, Drought Risk maps

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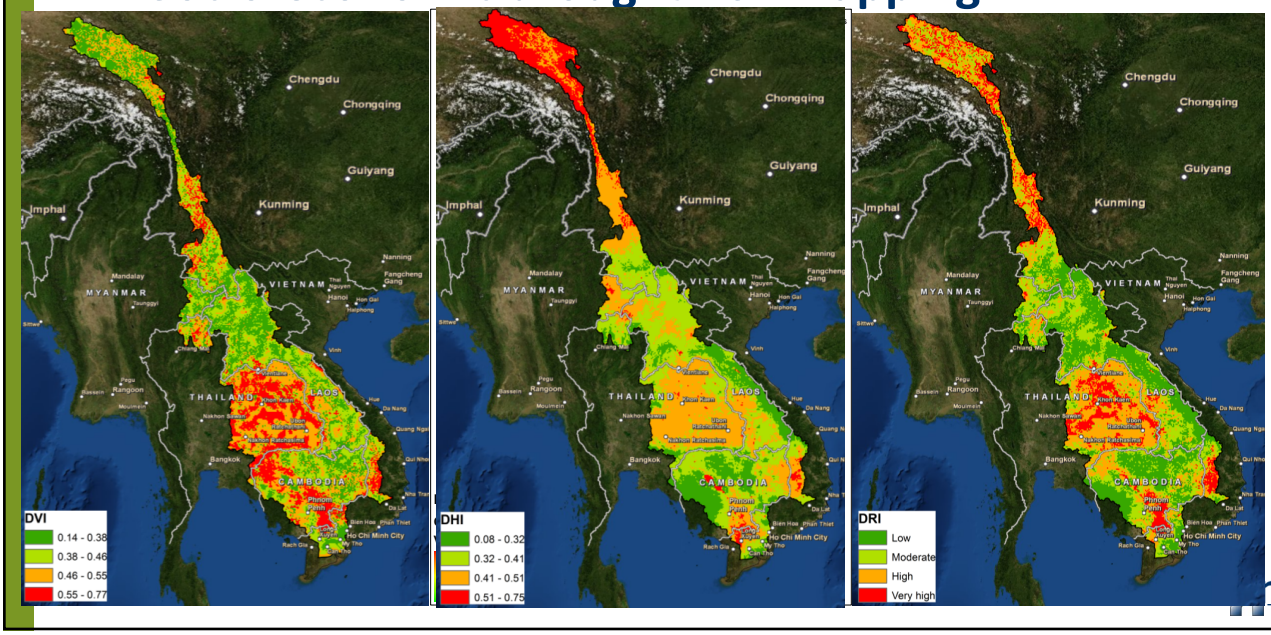
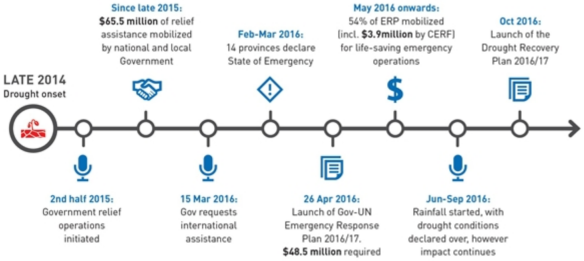
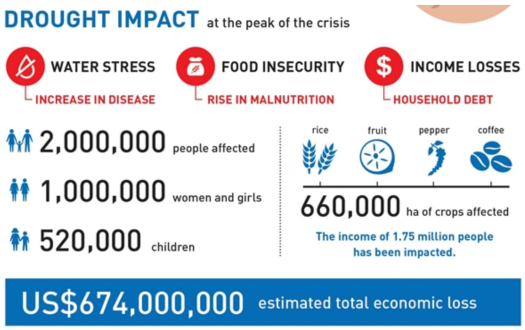
4. Socio-economic drought risk mapping



Current status

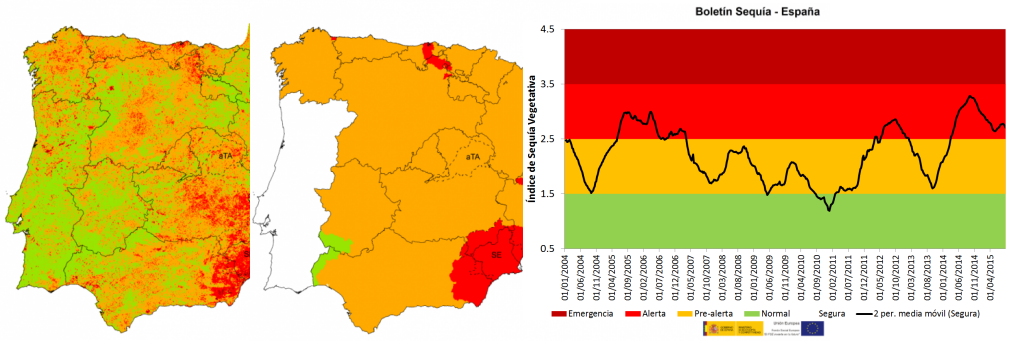
- Infrastructure moved from Ministry of Natural Resources and Environment to NAWAPI (National Center for Water Resources Planning and Investigation)
- Focus more on blue water (large storage reservoirs for irrigation, etc)
- Enhanced monitoring allowed timely response of the 2016 event:
- But still a major impact:





A few recommendations towards 2030

- Focus on agricultural drought monitoring, including salinity
- Post-event drought evaluation of 2016 event
- Drought mitigation action plan
- In-depth analysis on drought risk, impact and vulnerabilities – identifying hotspots and most vulnerable communities



Thank you

Questions?

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Socio-economic drought risk mapping

- *DRI = DHI * DVI*
- *DHI = (HI_1 + HI_2 + HI_3 + HI_4) / 4*

  in which:

  HI_1 = Mean total dry season rainfall (2000-2013)

  HI_2 = CV of total dry season rainfall (2000-2013)

  HI_3 = Mean dry season NDVI (2000-2013)

  HI_4 = CV of dry season NDVI (2000-2013)
- In each of the indices, scaling is applied between 0 (minimum of values, no hazard/vulnerability) and 1 (maximum of values, full hazard/vulnerability)

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