Time and Public Health
Trans-disciplinarity

The Transcube Model & Tele-epidemiology

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Transition: Coping with *new challenges*

+ Translation: *Innovating* beyond benches & bedsides

+ Transformation: *Re-inventing* Health Policies & Management

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Crisis = Hazards + Tipping point
Transition

New Challenges and Crisis

- Rapid Population Increase & Abrupt Climate Change (ACC)
  - Population movement/displacement
- Water Availability & Global Food Security
  - Hygienic & Nosocomial issues

Associated Vector-Borne Diseases Case

- Vectors circulation
- Reservoirs circulation

New and Re-emerging Public Health Concerns

- WNV, Chikungunya, Avian Flu, RVF, Malaria, Dengue…

Trans-disciplinarity
Translation

Innovative

• Thinking out-of-the-box
  • Tool Box & Tox

Conceptual Approach (CA) of Tele-epidemiology

• New Tools: Remote Sensing (Optical + Radar)
  • New High Res. Products

CA Spatio-Temporal Reproduction

• In space: Different countries and latitudes
• In time: Take LF, RCC & CC issues into account
Trans-disciplinarity

Transformation

Re-inventing Public Health Policies

• Agency & Health Institution Networking: National & International Levels
  • New HIS
  • Public Awareness (K & I; FAQ)

Management

• New Guidelines and TOR

• Implementing Early Warning Systems (EWS) within Societal Benefit Areas/GEOSS

• Effective Real-time Risk Mapping
Transition

European Winter Temperatures during the 20th Century
The Rift Valley Fever ‘TransCube Case’

With Murielle Lafaye & Cécile Vignolles (CNES)
Fully Integrated Conceptual Approach

Weather and Climate

In-Situ Measurements

High Res. Remote Sensing
TRMM (4-5 km)
Optical: Spot-5 Image (10 m)
Radar: TerraSarX (3 m)
Quickbird (60 cm)

High Res. Remote Sensing

Entomology
Hydrology
Serology
Raising Cattle

Trans-disciplinarity
The Brand-new Normalized Difference Pond Index

NDPI

NDPI from MIR (1.58-1.75 µm) and Green (0.50-0.59µm) channels. using SPOT-5 digital counts (DCs or reflectance proxies)

\[
NDPI = \frac{DC4 - DC1}{DC4 + DC1}
\]

Where DC4 = digital count from MIR channel and DC1 = digital count from Green channel

DC4 is a function of water content
DC1 is a function of biological structures of the target itself.
DCs include radiometric and geometric corrections
The Brand-new Normalized Difference Turbidity Index

NDTI

Clean water has a specific radiometric response (weak for green wavelength and weaker for red wavelength), thus:

NDTI is defined from Red (0.61-0.68 µm) and Green (0.5-0.59 µm) channels, using SPOT-5 DCs

\[
\text{NDTI} = \frac{(DC2-DC1)}{(DC2 + DC1)}
\]

DC2 = Red channel and DC1 = Green channel

Turbid water → High NDTI values
Translation: Thinking out of the box (3)

New Tools: Optical SPOT-5 + Radar TerraSar-X
Transformation: from Teledetection to Risk Mapping

Risks = Hazards + Vulnerability
Transformation: New Products

Dynamical ZPOM and associated risks

July 1st, 2003
July 28th, 2003
August 26th, 2003
September 6th, 2003
October 9th, 2003

Scale
- ON
- OFF

Ponds
- ON
- OFF

Cattle Parks
- ON
- OFF

Productive rainfall events
- ON
- OFF

HAZARD:
- very unlikely
- very low
- low
- moderate
- high
- very high
Transition

Hazard + Vulnerability + Tipping Point = Crisis

Three Levels of Intervention/Prevention from Effective ‘Risks Mapping’

- Moving parked animals around
- Vaccinating Animals
- Larvaciding (Bti) + Light & Thermal Traps
  +
Continued Distribution of impregnated bed-nets
The Clock is Ticking