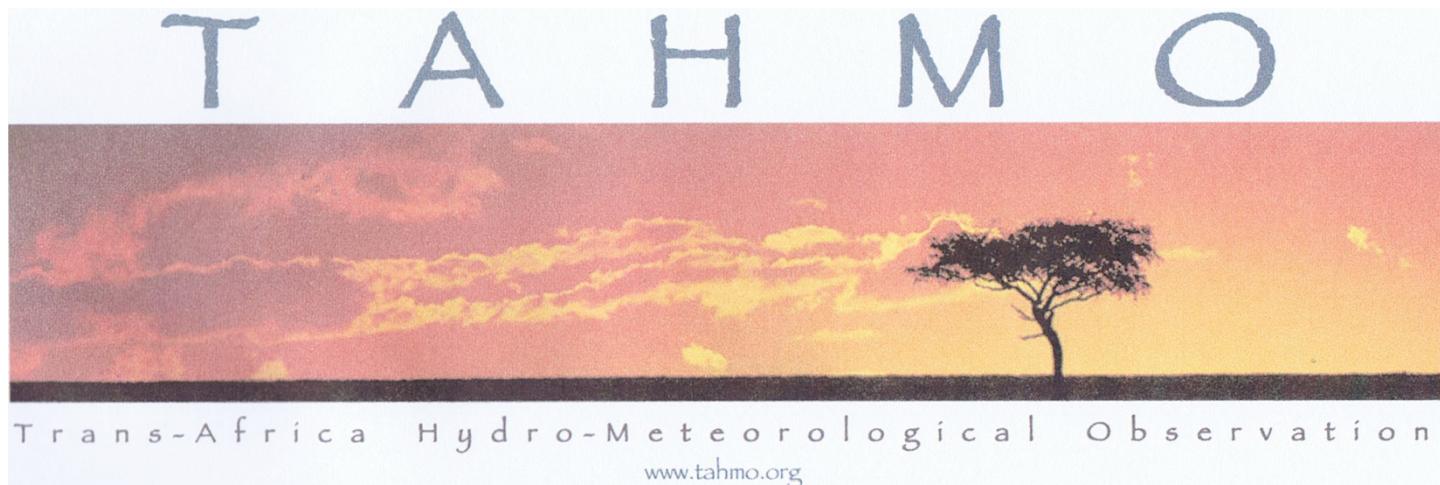


Trans-African Hydro-Meteorological Observatory

Nick van de Giesen

(n.c.vandegiesen@tudelft.nl)



1

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Outline

- Approach
- Design
- Operation
- Education



2



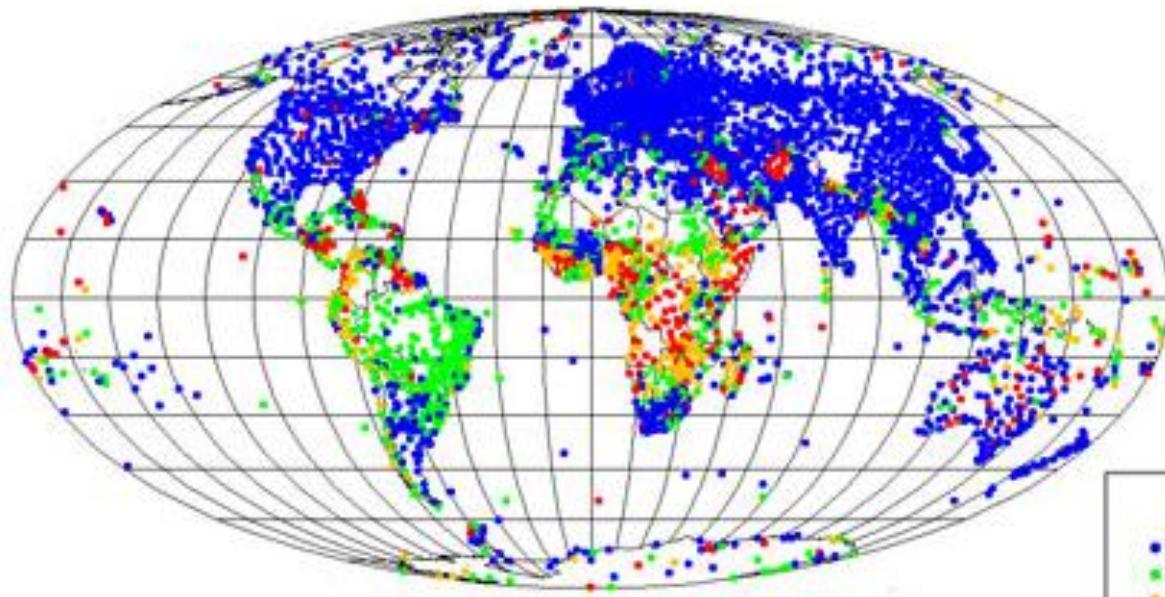
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Background

WMO Stations



WMO Secretariat

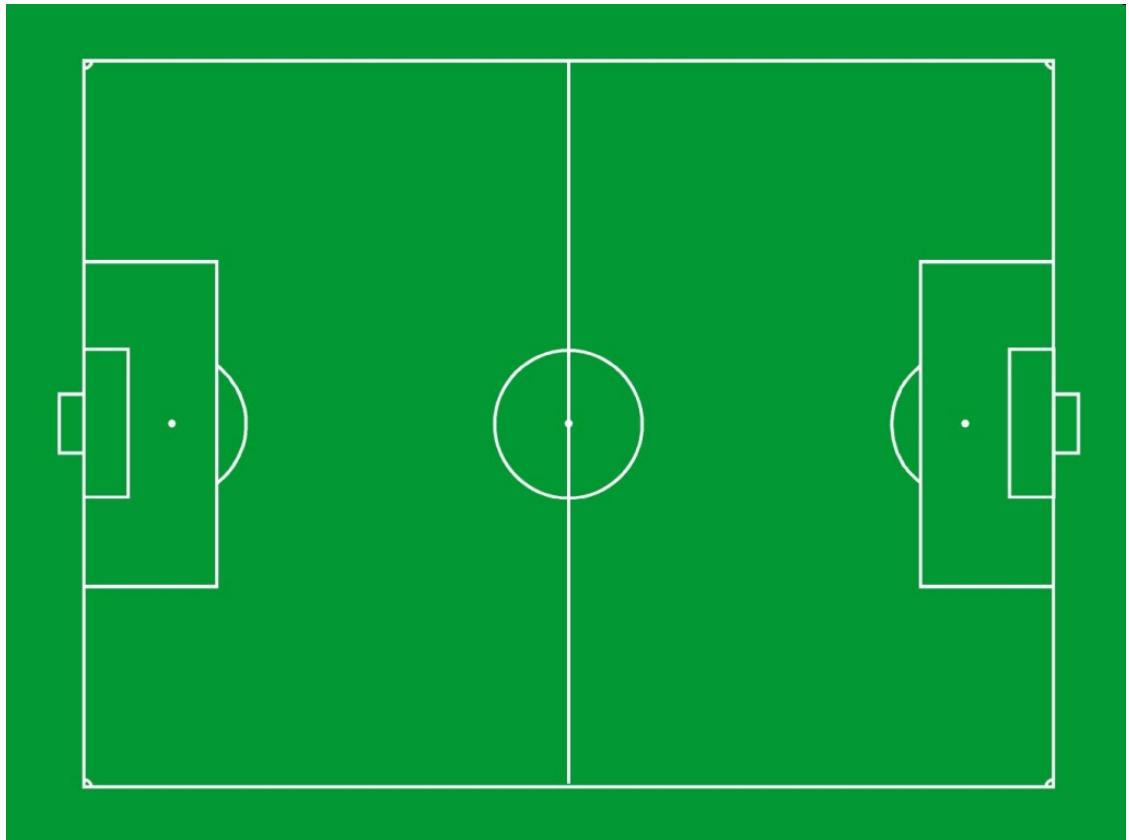
3



Background

WMO Stations

5,000



4



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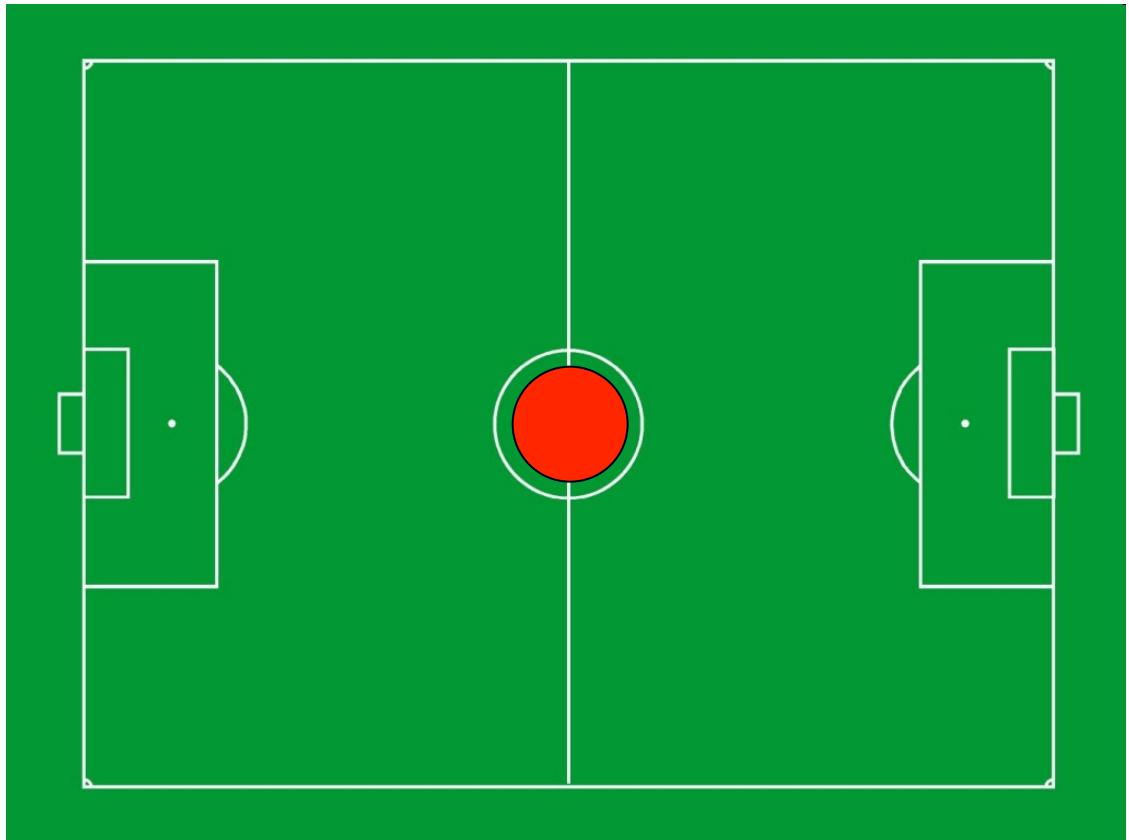
The TU Delft logo, which includes a stylized flame icon above the letters "TU".



Background

WMO Stations

5,000



5



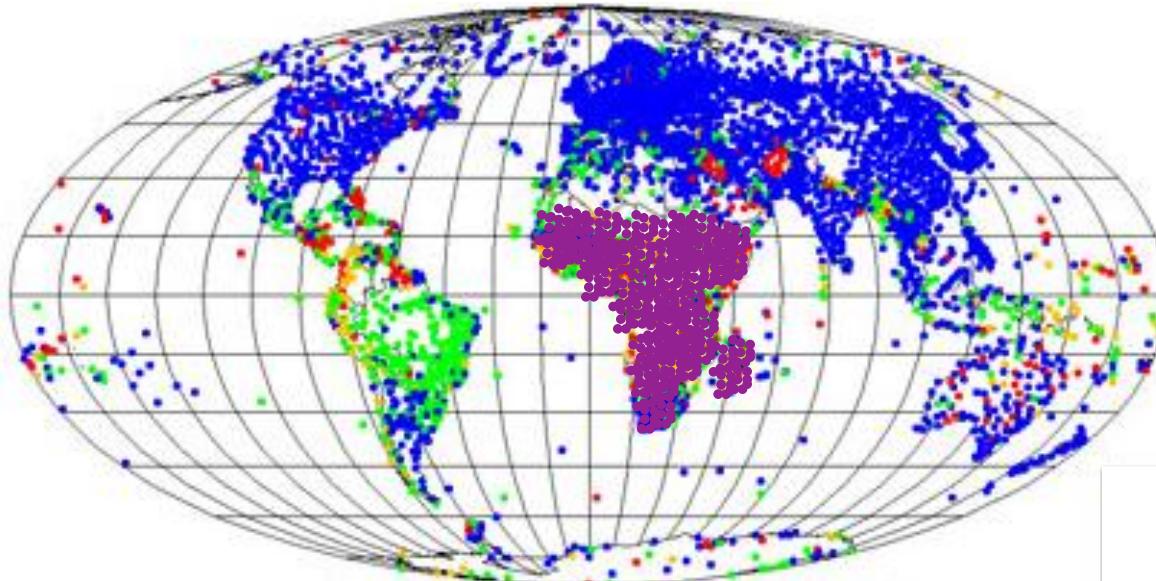
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Background

Leapfrog: 20,000 TAHMO Stations!



6

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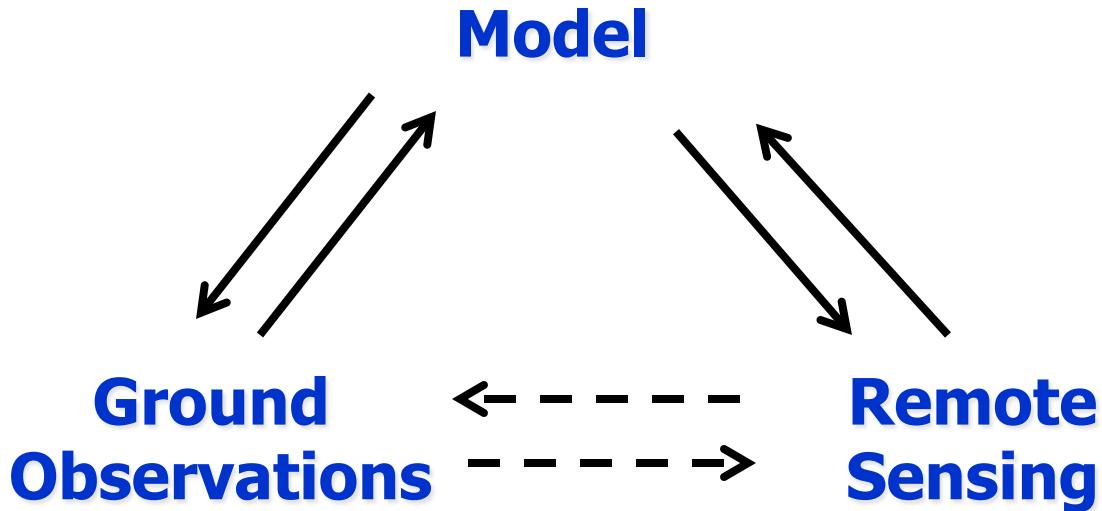


 **TU Delft**



Background

Data assimilation



7

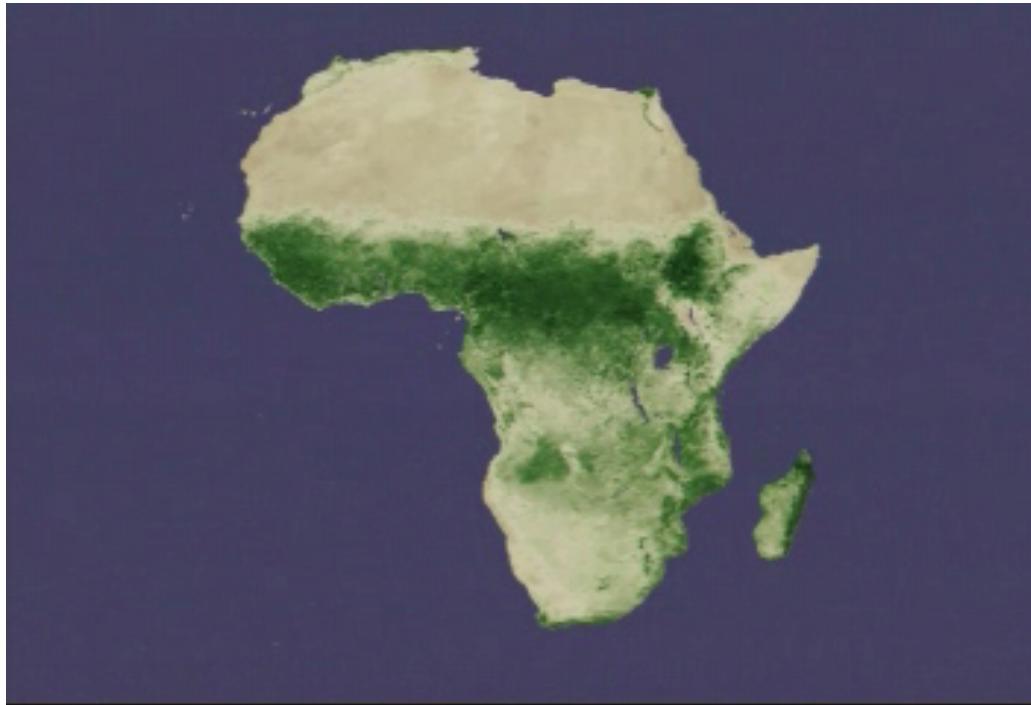




Trans-Africa Hydro-Meteorological Observation
www.tahmo.org

Background

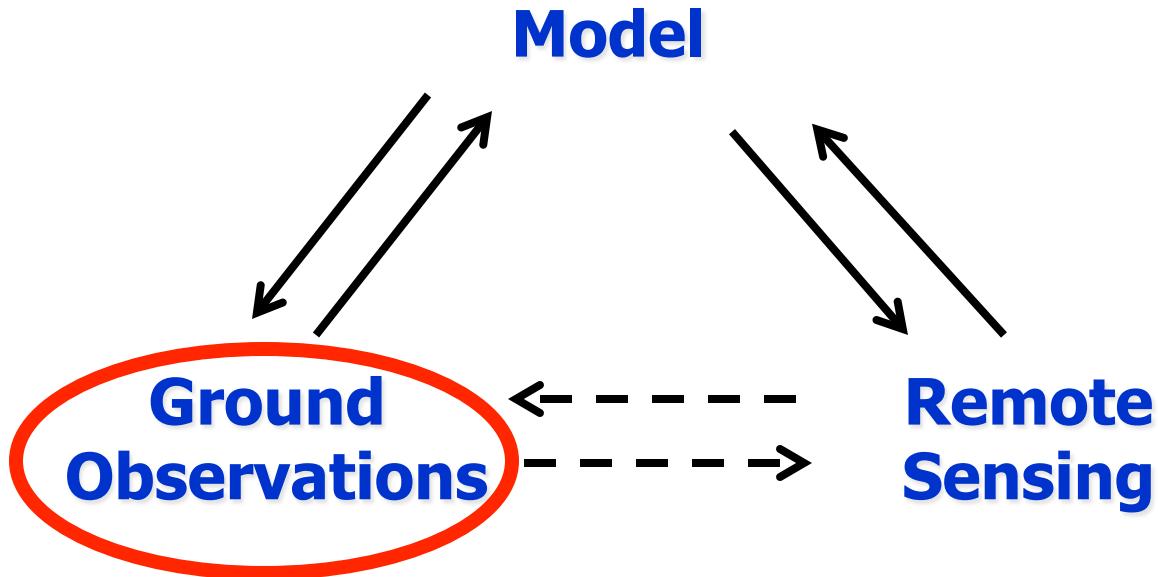
Data assimilation



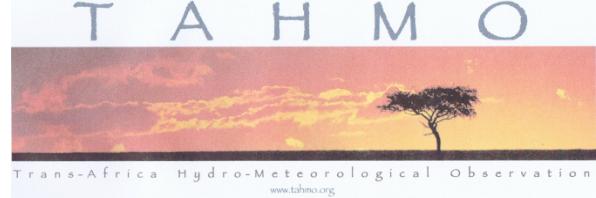


Background

Data assimilation



Approach



- Design
- Operation
- Education

10



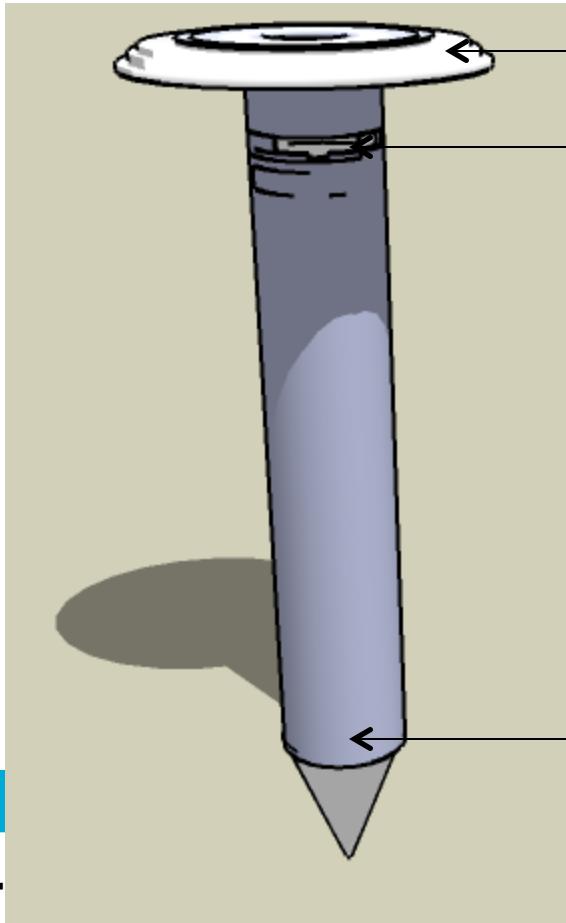
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Approach

Design



P, R_{sd}, R_{ld}, u

T, RH

GPS, GPRS
camera, mic

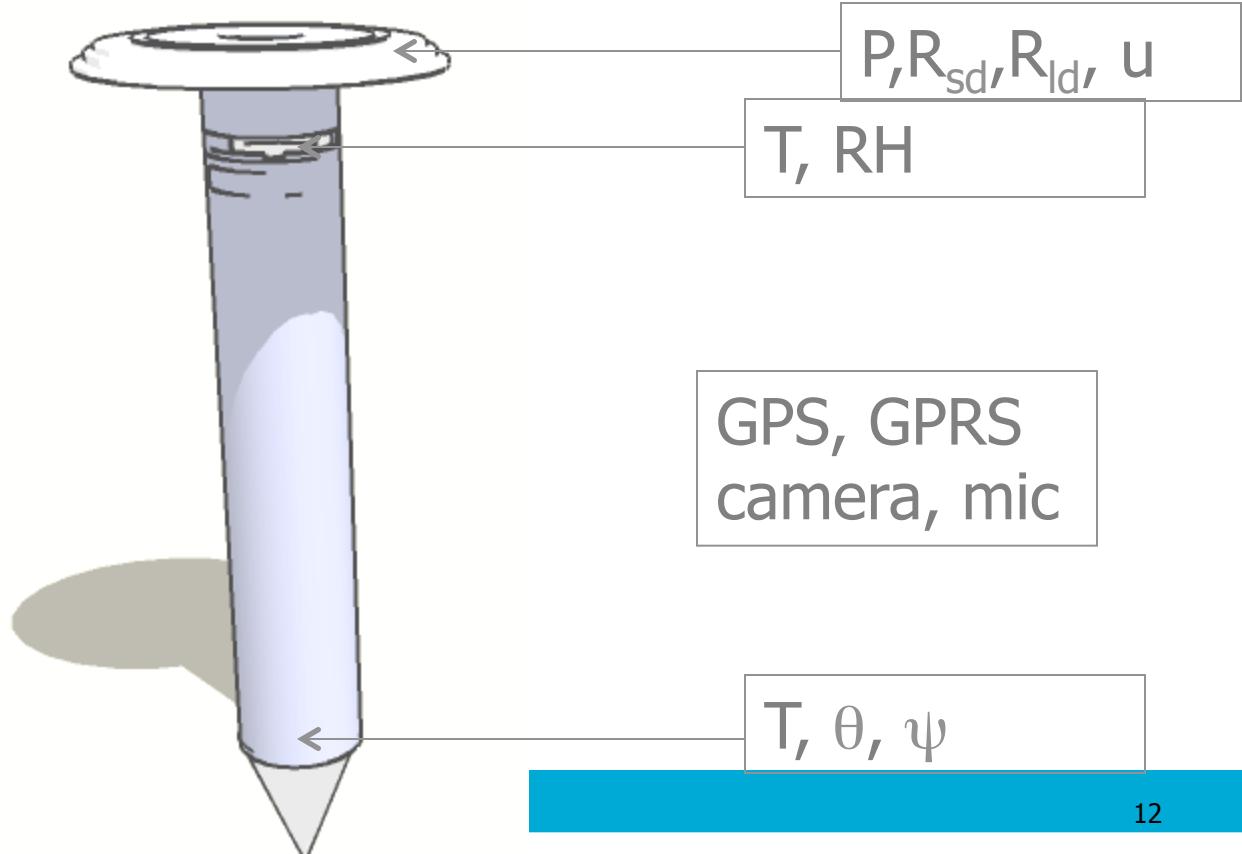
T, θ, ψ



Approach

Design

\$200
20,000
(35 km)



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Design

Use existing sensors

- Automotive
- Household

ZyTemp TN9



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Design

Principles

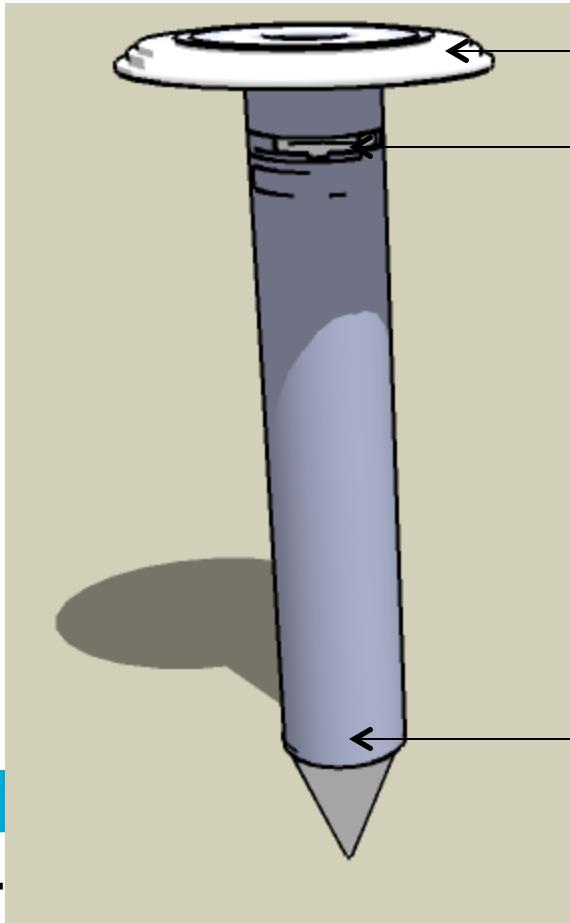
- **Robust**
- **No moving parts**
- **No cavities**
- **Cheap (<€300)**
- **Self calibrating**
- **Cross calibrating**





Design

Precipitation



P, R_{sd}, R_{ld}, u
 T, RH

GPS, GPRS
camera, mic

T, θ, ψ

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Design

Precipitation

Video disdrometer



Microwave disdrometer



Laser disdrometer



Joss-Waldvogel
(acoustic)



>10,000 Euros

TAHMO



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Design

Precipitation

Coen Degen

Piezo ceramic element
(+ other)



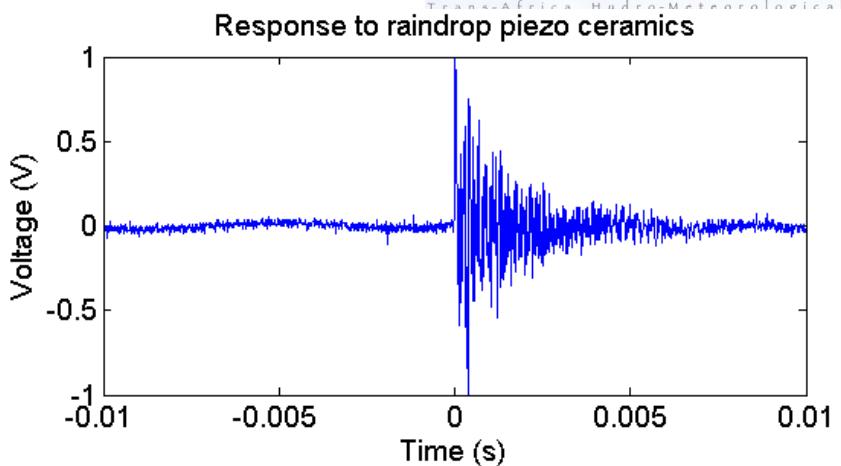


Design

Precipitation

Coen Degen

Piezo ceramic element



18

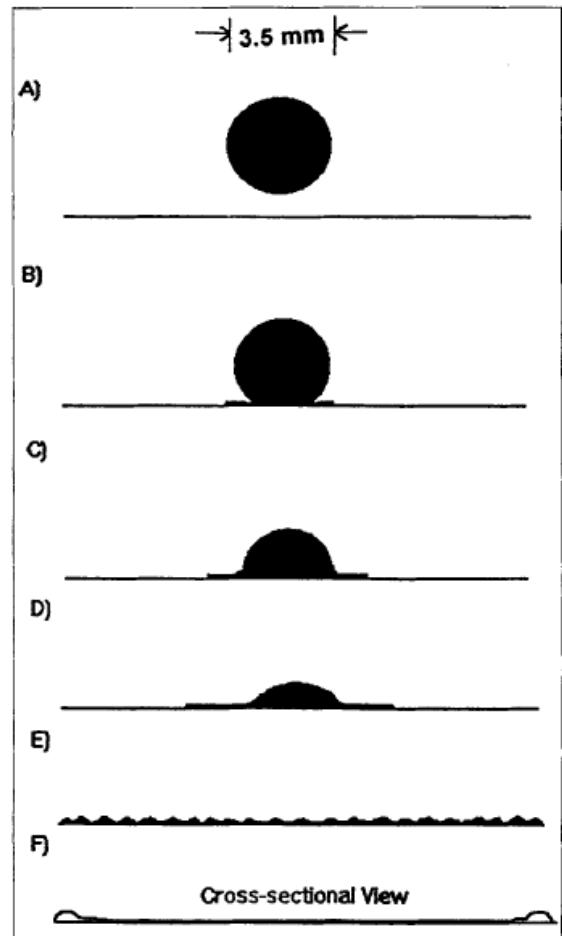
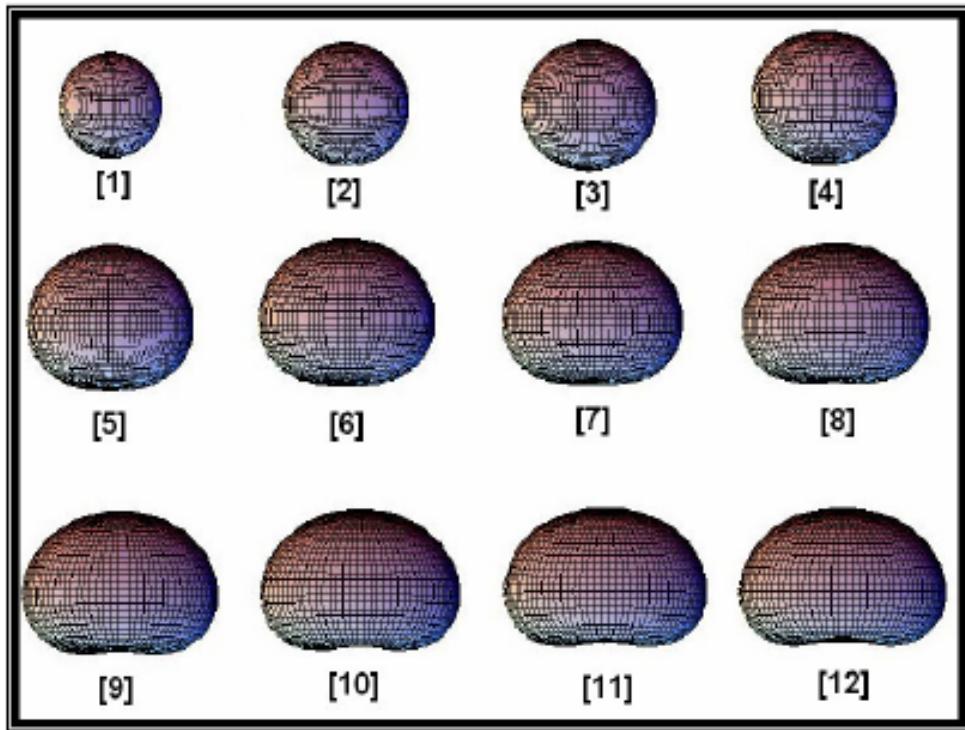


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Design

Precipitation



Sources: "Tropical raindrop anatomy," S.K. Shariah *et al.* & "Newtonian drop impact with a solid surface", B.L. Scheller and D.W. Bousfield

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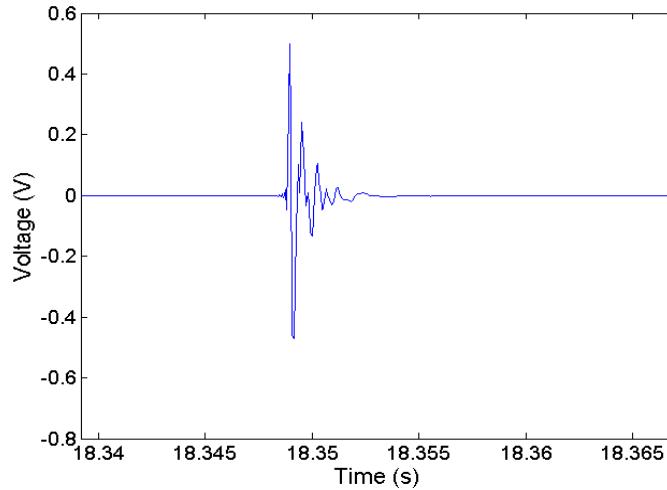
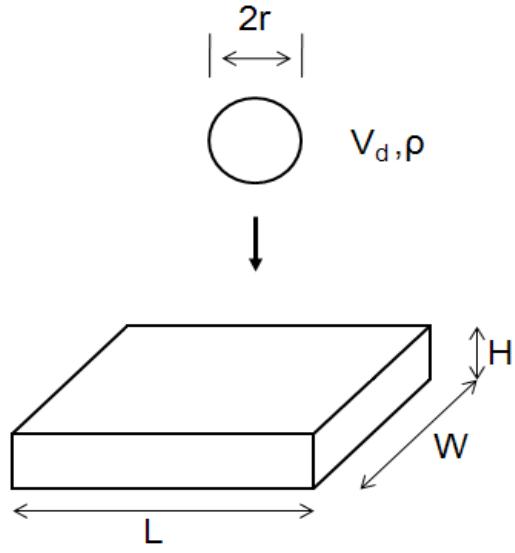
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Design

Precipitation

Coen Degen



$$E_s = \int |x(t)|^2 dt = f(r, v_d, \rho, H)$$

20

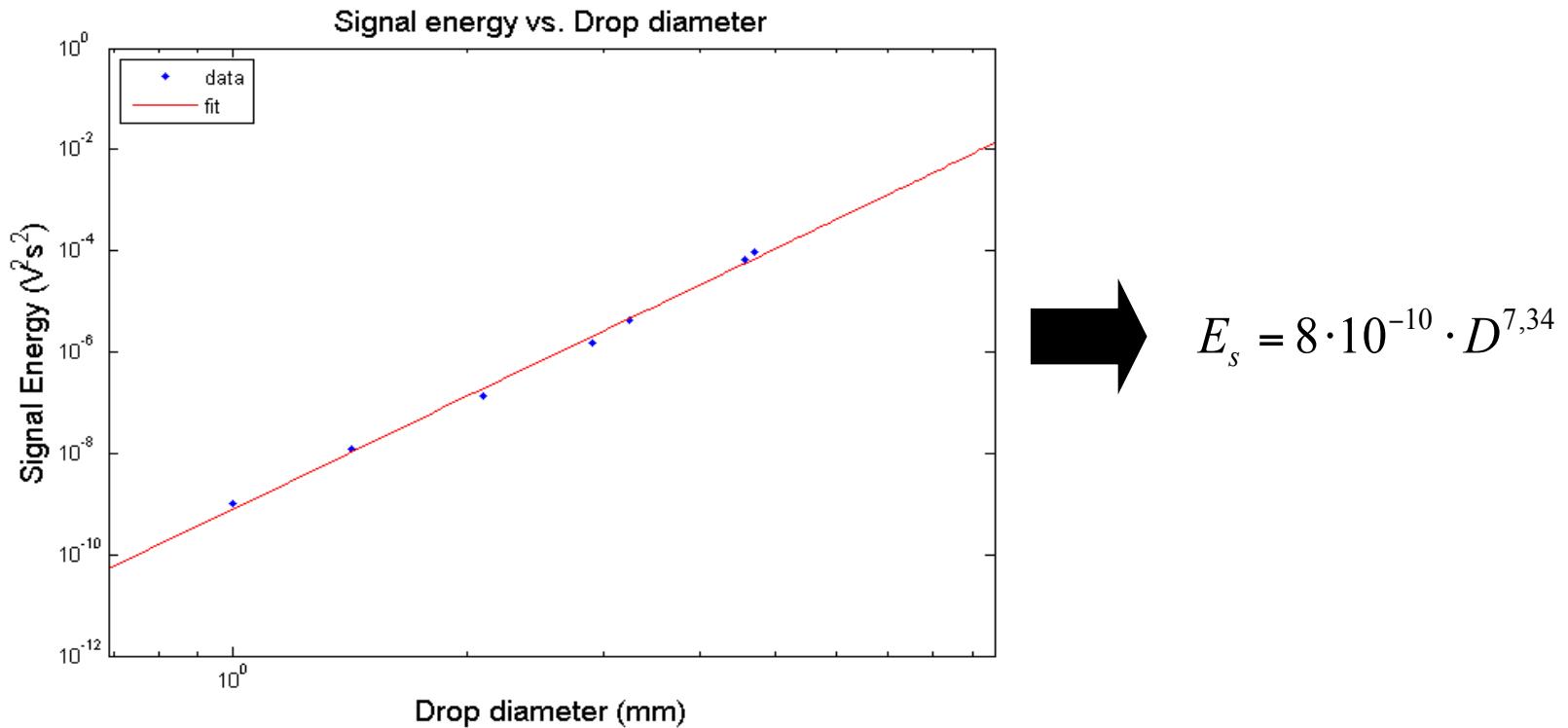


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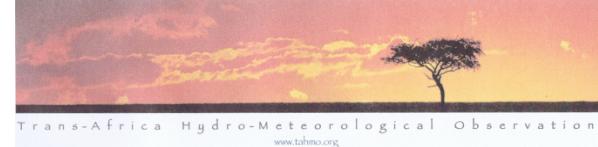


Design

Precipitation

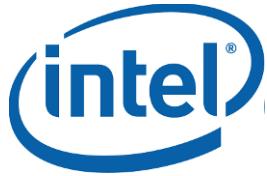


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Design

One sensor down... n to go!



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Business case

Costs (M\$)

• Construction	4
• Design	1
• Educational package	1
• Role out	8
• Computation / RS	4

Total 18 M\$

Running costs 2 M\$/yr

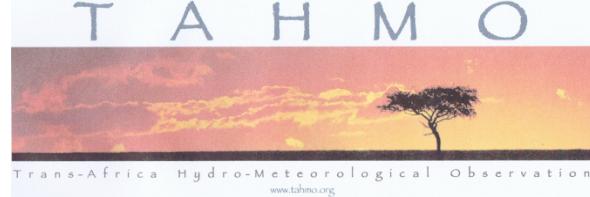
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Operation



Business case

Needed: \$ 2M / yr



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Operation



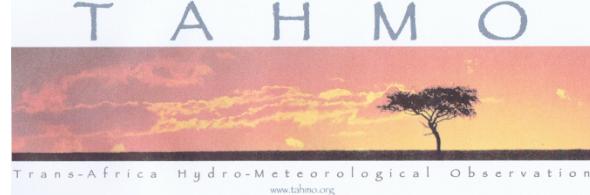
Business case : Where / what?

- Local food aid



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Operation



Business case: Where / what?

- Local food aid
- Bio fuels



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Operation

Business case: Where / what?

- Local food aid
- Bio fuels
- Traditional grains



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Operation

Business case: Commodity hedging

- Cotton
- Coffee
- Tea
- Cacao
- ...



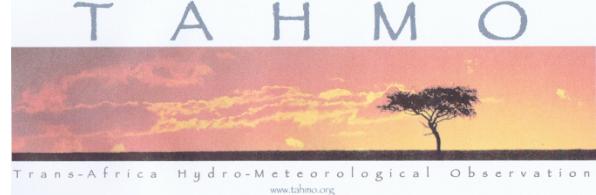
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Operation



Business case: Insurance

- Droughts
- Floods
- Diseases?

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Kilimo Salama Registration Process

1



2

Kilimo Salama REGISTRATION CARD

syngenta

Registration Details for Farmer

Policy Number (received via SMS)	10001
Inputs insured	1 kg Duma 45, 10 kg DAP
Crop and risk insured	Maize, Rainfall (excess & drought)
Contract end date (received via SMS)	31 Dec 2010

Keep this card safe.

3



4



Purchase

Farmers buy inputs and pay 5% extra to insure the inputs at selected stockists.

Registration

Farmers receive a card from the stockist on which they fill their details received by SMS.

Measurement

During the season the weather station measures the rainfall.

Compensation

In case of a payout farmers receive compensation via MPESA.



Operation

Business case: Other

- Flood Early Warning
- Mid-term predictions:
 - Hydropower
 - Irrigation
 - Drinking water
 - Ecology / tourism

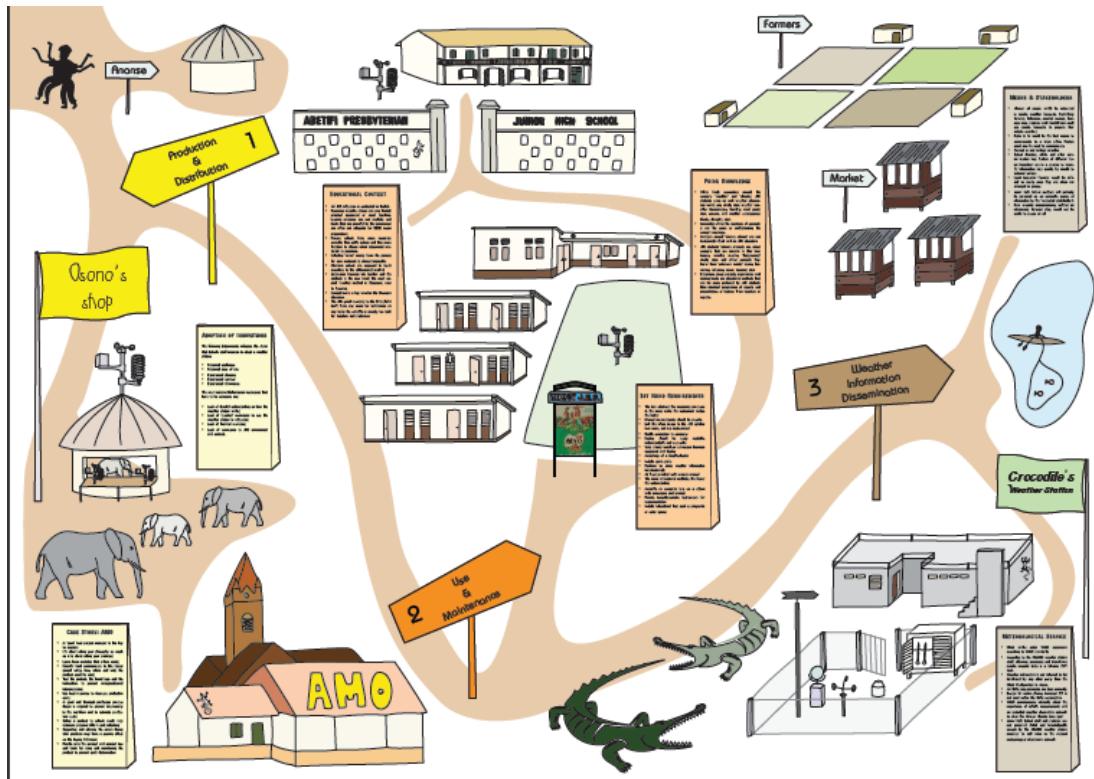




Education

Role out TAHMO

High schools
curriculum

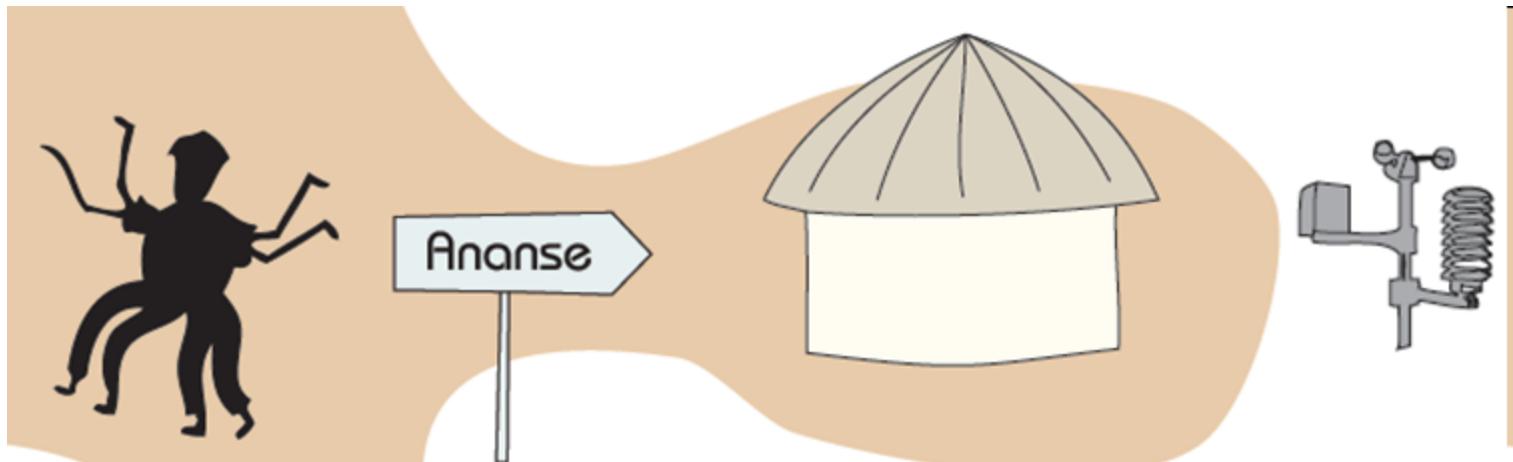


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Education



Role out TAHMO



Ghana pilot

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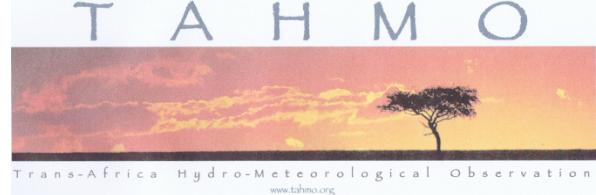


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Education

Role out TAHMO

xO Computer



One Laptop per Child

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Education

- **Associate with schools**
- **Develop environmental education package**
- **Teach children about their environment**
- **Teach children about their environmental connectedness**



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Next step

- Crowd sourcing competition (10+ countries)
- Top 5 teams meet in ..., field tests
- Repeat next year

Friday 13:30-17:00 Room SM5

WWW.TAHMO.ORG

nick@citg.tudelft.nl

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