MALAREO – EO in malaria vector control

GMES Global Land workshop

12-13 December 2011, Lisbon (Portugal)

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GMES
Observing our planet for a safer world

EUROSENSE

MRC SOUTH AFRICA

NMCP NATIONAL MALARIA CONTROL PROGRAMME

RSS Remote Sensing Solutions GmbH

UNIVERSITY OF KWAZULU-NATAL
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Swiss TPH

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1. Environment – EO - Health
2. Vector-borne diseases (malaria)
3. MALAREO
4. Link with GLOB-LAND products
5. Will it be GM(H)ES?

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Environment – EO - Health

- WHO: ““An estimated 24% of the global burden of disease and 23% of all deaths can be attributed to environmental factors“

- UN Climate conference 2011: Health is becoming a key goal of climate policies and a priority in climate mitigation and adaptation actions.

Environment – EO - Health

- **EO can support policy makers to <u>control</u>, <u>respond</u> and <u>prevent</u> disease**
  - Use EO sensors to **monitor key environmental** events
  - Incorporate EO information into spatial models, to help **detect**, **monitor** or **predict** disease
  - Use EO data to **prepare** disease control measures

Environment – EO - Health

- Domains where EO can support public health
  - Air quality
  - Water quantity and quality
  - Infectuous and Vector-borne diseases (VBD)
  - Temperature (e.g.: UHI)
- Users: WHO, Public health instances, regional/national/local policy makers,…

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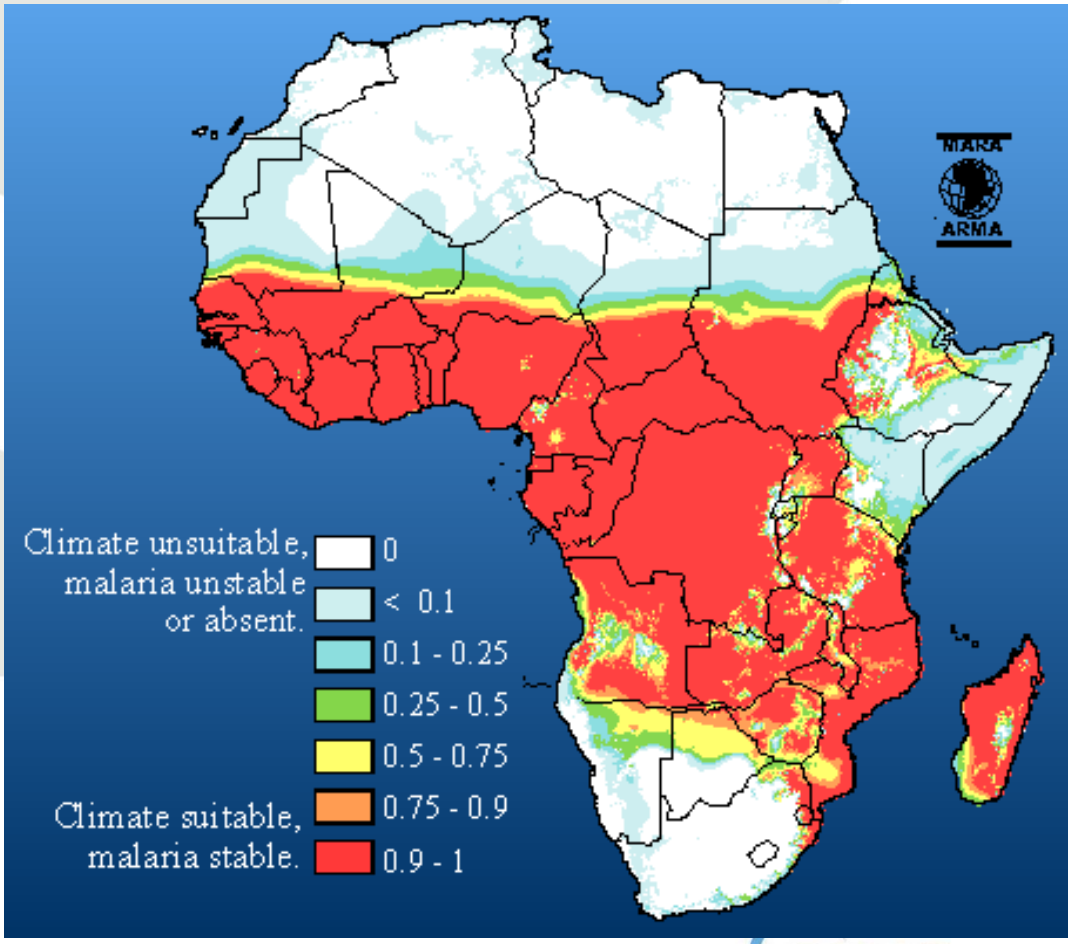
VBD

- Vector-borne diseases
  - Epidemiological remote sensing applications looks at parameters that are suitable to predict the environmental conditions for the vectors (e.g. land cover, temperature, precipitation etc.)
  - Spatial analysis for:
    - A better understanding of risk factors
    - Better preparation of intervention/prevention
    - Assessing the effect of interventions/prevention

VBD - malaria

Climate suitability map for Malaria (MARA/ARMA)



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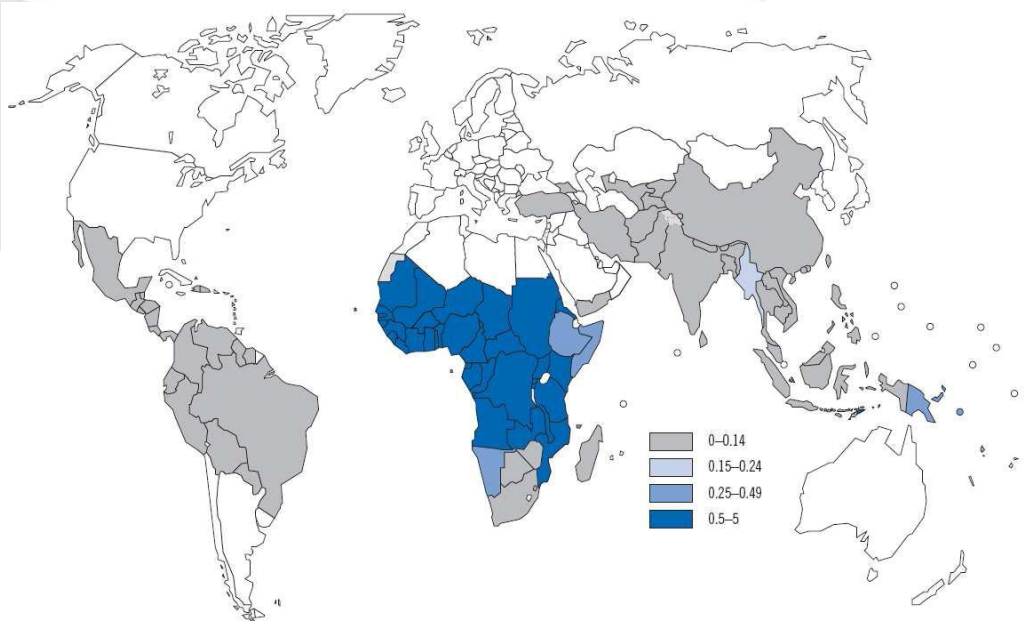
VBD - malaria

- 225 million annual cases worldwide, 212 million in Africa
- Close to 800,000 deaths each year
- 90 % of malaria-related deaths occur in sub-Saharan part of Africa, the majority of deaths are young children



Estimated deaths from malaria per 1000 population, 2006 (source: WHO World Malaria Report 2008).

VBD - malaria

- Global strategy to fight malaria: Global Malaria Action Plan (GMAP)
  - Vision: substantial and sustained reduction in the burden of malaria in the near and mid-term, and the eventual global eradication of malaria in the long term
  - Concrete targets:
    - Achieve universal coverage
    - Reduce global malaria cases from 2000 levels by 75% in 2015
    - Reduce global malaria deaths to near zero preventable deaths in 2015
    - Eliminate malaria in 8 – 10 countries by 2015
    - In the long term, *eradicate* malaria world-wide by reducing the global incidence to zero through progressive elimination in countries.

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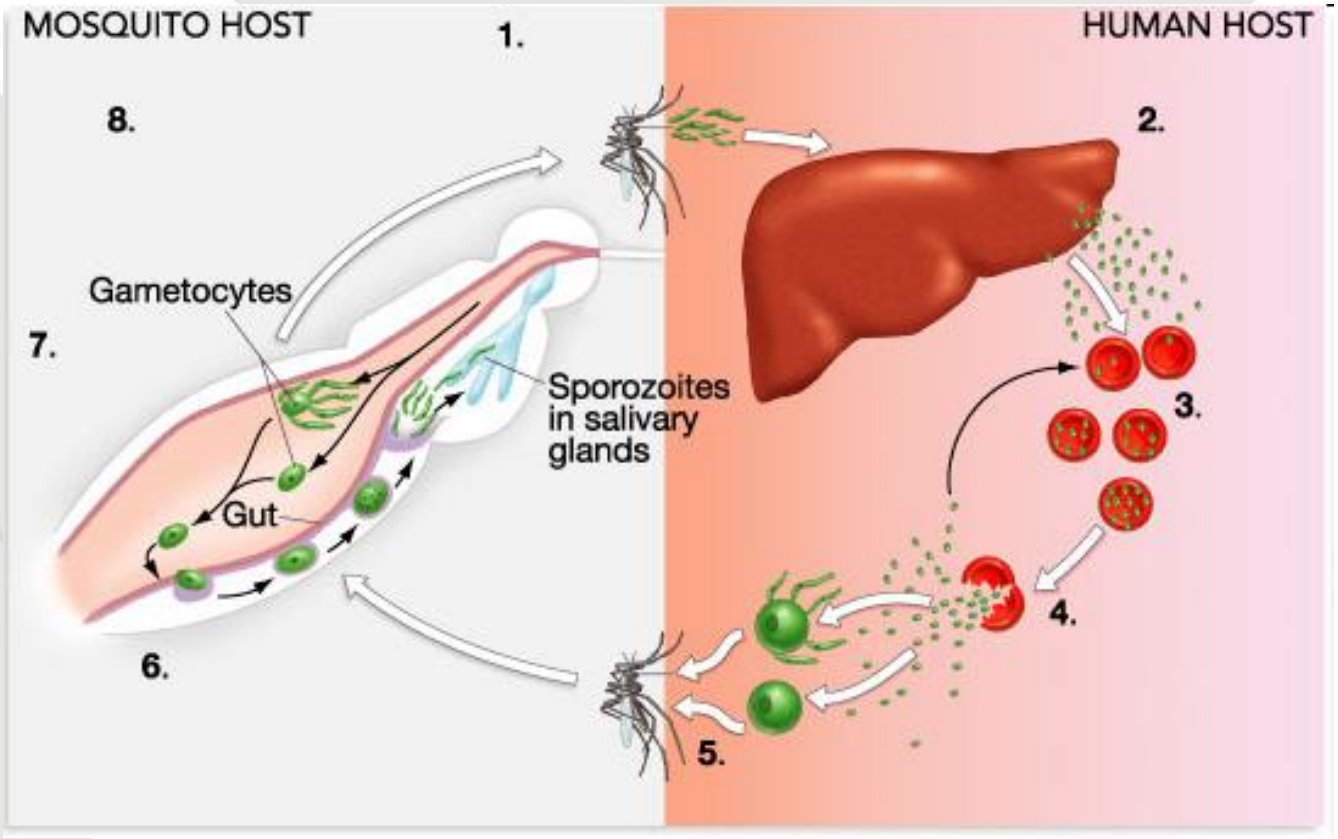
VBD - malaria



VBD - malaria

- Malaria is essentially an **environmental disease**
  - The vector requires specific habitats with surface water for reproduction
  - Humidity is required for adult mosquito survival
  - The development rates of both the vector and parasite populations are influenced by temperature
- The **continued existence** of malaria in an area requires a combination of
  - high human population density
  - high mosquito population density
  - high rates of transmission from humans to mosquitoes and from mosquitoes to humans

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MALARE

SEVENTH FRAMEWORK PROGRAMME

- FP7 collaborative project
- Work programme topic addressed:
  - *SPA.2010.3.2-03 EU-South Africa Cooperation in GMES (SICA)*
- Project duration: **2 years**
- Project start: **01/02/2011**
- Total Cost: **580 279 €**
- EU contribution: **497 326 €**

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Malareo - Partners

Partners (3)	Partner/Users (3)	Users
• Remote Sensing Solutions (Germany) • University of Kwazulu-Natal (South-Africa) • Eurosense (Belgium)	• Medical Research Council (South-Africa) • National Malaria Control Program Swaziland • Swiss Tropical and Health Institute	• National and local Malaria Control Programs of Mozambique and South-Africa

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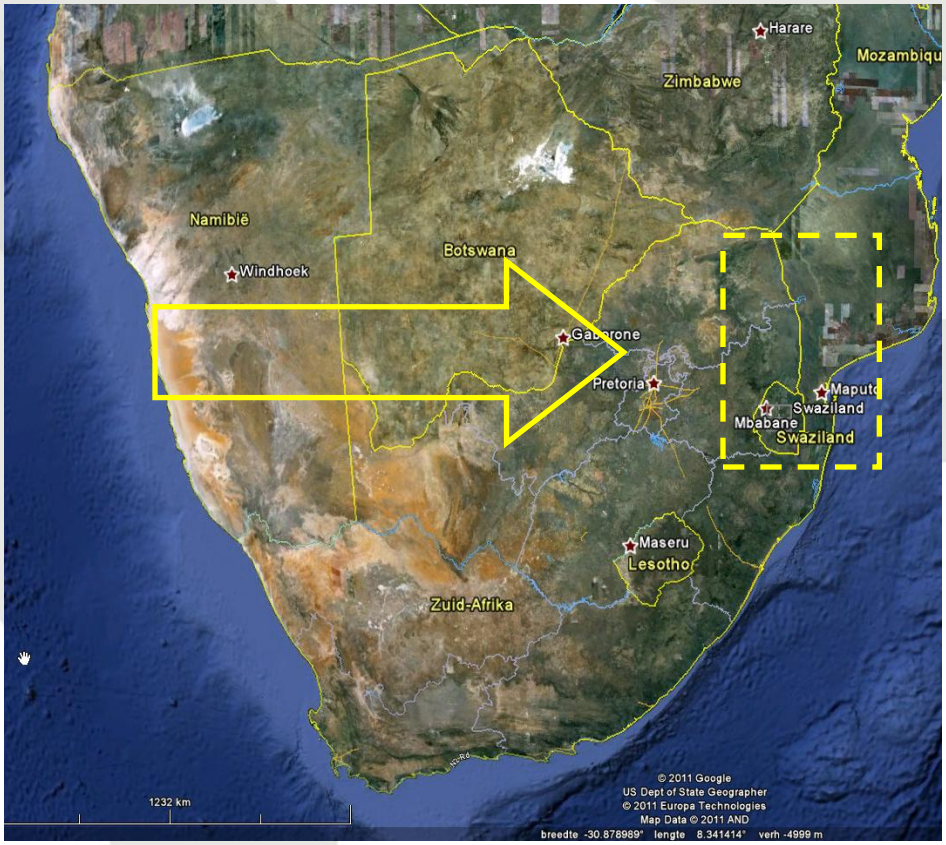
Malareo - AOI

Project area: Border region South-Africa – Swaziland - Mozambique



Malareo - Objective

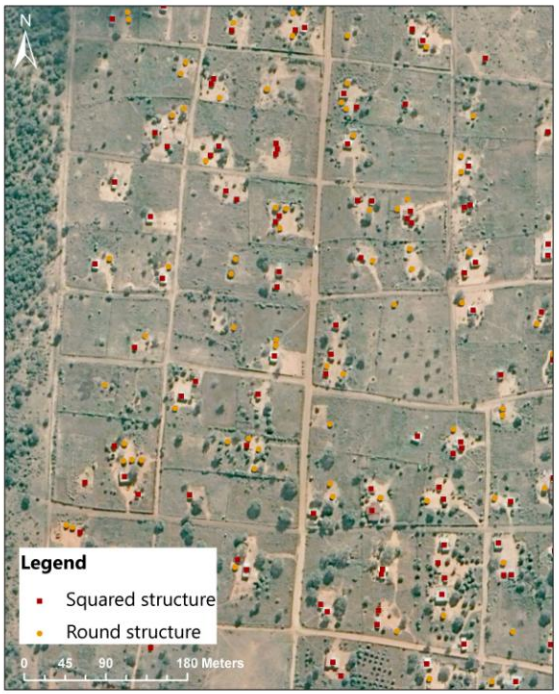
- The **main objective** of MALAREO is to support local malaria vector control and management in Southern Africa by
  - developing HR Earth Observation solutions
  - build local Earth Observation capacity
- User-driven and state-of-the-art

User Requirements

EO Feasibility

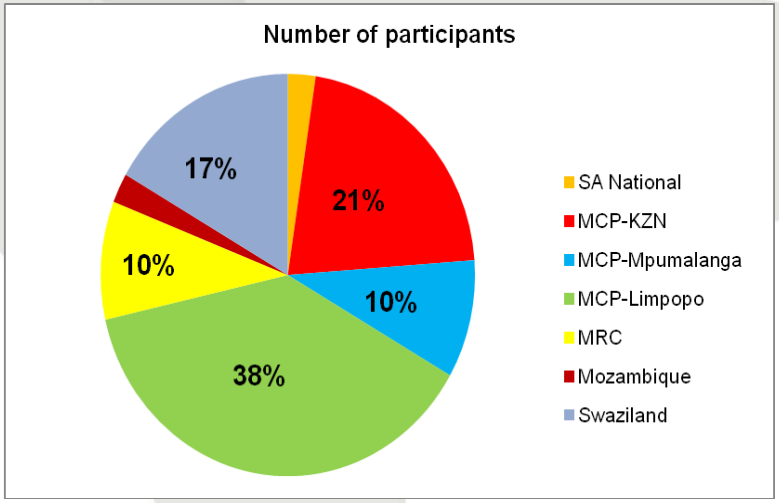
EO Data Requirements	MALAREO Product Definition	Required Methodology	Type of Support
VHR Data	**Household Map**	*On-Top Methodology vs. manual mapping*	*NMCP for improved IRS*
	Water Body Map	*Pixel-based NIR classification*	*NMCP for habitat identification*
HR Data	**Land Cover Map**	*Object-based rule set classification*	*NMCP and STI for Malaria risk modelling*
	Water Body Map	*Pixel-based NIR classification*	*NMCP for habitat identification*
	Distance to Water	*Euclidean Distance*	*STI for Malaria risk modelling*
	Vegetation Indices	*NDVI, NREVI, GNDVI*	*STI for Malaria risk modelling*
	Population Map	*Land cover based disaggregation*	*NMCP and STI for Malaria risk modelling*
Bitemp Data	**Land Cover Change Map**	*Map-to-Image or Image-to-Image*	*Research and STI for Malaria area modelling*
Additional Data	**Malaria Risk**	*Bayesian Modelling*	*NMCP*
	Malaria Area	*Bayesian Modelling*	*NMCP*

VHR image (Bing Maps) of a settlement area in Mpumalanga (SA)

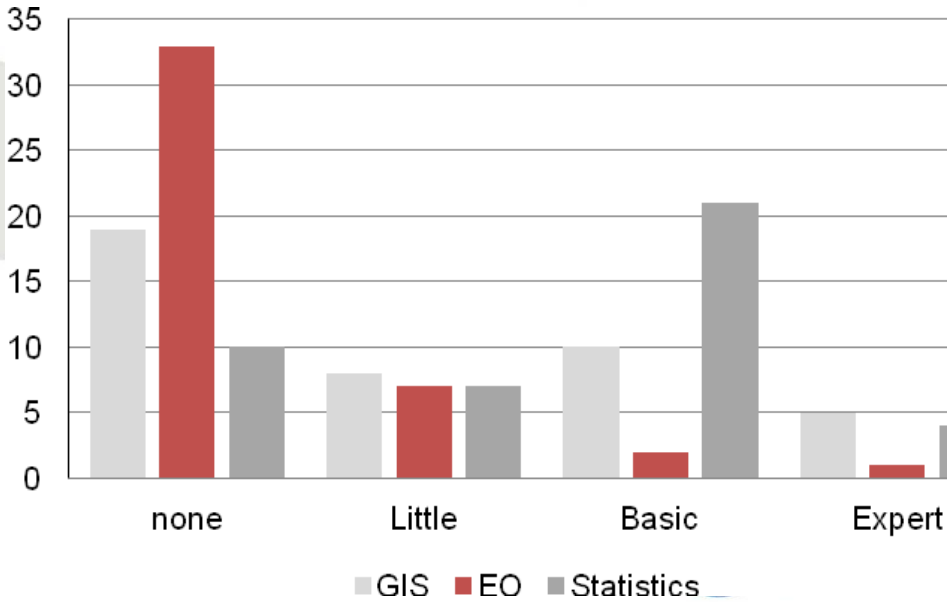


Malareo – Capacity building

- EO and GIS capacity building of MCP staff
  - 1st training will take place in Durban from 6 – 10 February, 2012



Participants of end-user survey (47 in total)



Available skills in GIS, EO and Statistics of all participants of the user survey

Malareo – Expected impact

- Strengthen European/(South-)African collaboration
- Build capacities
- Contribute to (establishing) national EO monitoring centers
- Contribute to GEOSS
- Contribute to a better “Understanding of environmental factors affecting human health and well-being”
- Add value on top of ongoing projects in the region
- Built the basis of sustainable EO support to Malaria control programs (MCP’s)
- Set an example for MCP’s outside the project working area

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Link with GLOB-LAND products?

- Projects like MALAREO could be/are a user of the GLOB-LAND products AND can foster the use of the GLOB-LAND products in other (non-EO) organizations
- Adapt GLOB-LAND products to public health needs?
- MALAREO: focus on the potential contribution of HR Land Cover (*fine-scale land cover maps*) information in spatial modeling of malaria risk <-> LR high temporal resolution products
- NEED to have more detailed (space and time??) information on Temperature, humidity, precipitation

Link with GLOB-LAND products?

- Potential products of interest from the Global Land Portfolio for Health (malaria):

	Name	Horizontal resolution	Frequency of product update	Error	Maturity
Health (Specific fo Malaria)	Fine-scale land cover maps	10-30 m	1-5 years	15%	Pre-op
	Fine-scale land cover change	10-30m	1-5 years	15%	Pre-op
	Lakes maps. Wetlands/flood plains	30-250m	10-30 days	10%	Operational

- Other common needs as input for malaria spatial modeling (early warning models) and GLOB-LAND component (Precipitation, temperature, DEM, socio-economic data,…)

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Will it be GM(H)ES?

- Keep track/link with ongoing research on epidemiology (EDENEXT, HealthyFutures, EPISTIS,…)
- Customize **systematic** global Land products (LR) for locating health risk areas (not necessarily Global coverage!)
- Customize **HR hot spot** Land products 'ready-to-use' as input for spatial modeling done by specialized institutions (e.g. Tropical health institutes)
- Standard **VHR hot spot** products used for direct support of health control (e.g. malaria control actions)
- EO capacity building in Public Health services!

Thank You!

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