FINAL MEETING REPORT

Strengthening National Climate Data and Information for Malaria Decision-Making in Africa

An Executive Briefing and Consultation with National Collaborators from Ethiopia and Tanzania

Dar es Salaam, Tanzania

August 4-5, 2014
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# Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACPC</td>
<td>African Climate Policy Center</td>
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<tr>
<td>AGRHYMET</td>
<td>Centre Régional de Formation et d’Application en Agrométéorologie et Hydrologie Opérationnelle</td>
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<td>ALMA</td>
<td>African Leaders Malaria Alliance</td>
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<td>CDC</td>
<td>Centers for Disease Control and Prevention, USA</td>
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<td>CARN</td>
<td>Central African Regional Network</td>
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<td>CCAFS</td>
<td>Climate Change, Agriculture and Food Security</td>
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<td>CGC</td>
<td>Africa</td>
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<td>CGIAR</td>
<td>Formerly: Consultative Group on International Agricultural Research</td>
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<td>CILSS</td>
<td>Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel</td>
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<td>DFID</td>
<td>Department for International Development, United Kingdom</td>
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<td>EFMoH</td>
<td>Ethiopia Federal Ministry of Health</td>
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<td>ENACTS</td>
<td>Enhancing National Climate Services</td>
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<td>EPHI</td>
<td>Ethiopian Public Health Institute</td>
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<td>ENSO</td>
<td>El Niño Southern Oscillation</td>
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<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<td>GFCS</td>
<td>Global Framework for Climate Services</td>
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<td>HCF</td>
<td>Health and Climate Foundation</td>
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<td>IFRC</td>
<td>International Federation of Red Cross and Red Crescent Societies</td>
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<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>IRI</td>
<td>International Research Institute for Climate and Society, Columbia University</td>
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<td>KEMRI</td>
<td>Kenya Medical Research Institute</td>
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<td>LLIN</td>
<td>Long-Lasting Insecticidal Nets</td>
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<td>LST</td>
<td>Satellite Land Surface Temperature</td>
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<td>MARA</td>
<td>Mapping Malaria Risk in Africa</td>
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<td>MDG</td>
<td>Millennium Development Goals</td>
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<td>MERG</td>
<td>Monitoring and Evaluation Reference Group</td>
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<td>MODIS</td>
<td>Moderate Resolution Imaging Spectroradiometer</td>
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<td>MoH</td>
<td>Ministry of Health</td>
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<td>MoU</td>
<td>Memorandum of Understanding</td>
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<td>NASA-SERVIR</td>
<td>National Aeronautics and Space Administration- Regional Visualization and Monitoring System, USA</td>
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<td>NIH</td>
<td>National Institutes of Health, USA</td>
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<td>NMA</td>
<td>National Meteorological Agency</td>
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<td>NMCP</td>
<td>National Malaria Control Programme</td>
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<td>Acronym</td>
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<tr>
<td>PMI</td>
<td>President’s Malaria Initiative</td>
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<td>RBM</td>
<td>Roll Back Malaria Partnership</td>
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<td>RTI</td>
<td>Research Triangle Institute</td>
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<td>SDG</td>
<td>Sustainable Development Goals</td>
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<td>Swiss TPH</td>
<td>Swiss Tropical and Public Health Institute</td>
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<td>TMoHSW</td>
<td>Tanzania Ministry of Health and Social Welfare</td>
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<td>TMA</td>
<td>Tanzania Meteorological Agency</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>VBD</td>
<td>Vector-Borne Disease</td>
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<td>WCARO</td>
<td>West and Central Africa Regional Office</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WMO</td>
<td>World Meteorological Organization</td>
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<td>WMO – ESA</td>
<td>World Meteorological Organization – Eastern and Southern Africa Office</td>
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<td>ZAMEP</td>
<td>Zanzibar Malaria Elimination Programme</td>
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Executive Summary

Background

For more than a decade, the Roll Back Malaria (RBM) Partnership has coordinated the efforts of countries and organizations to reduce morbidity and mortality rates caused by malaria. To consolidate progress to date and improve the targeting of future interventions, the UK Department for International Development (DfID), through the RBM Partnership, has launched an initiative called “Strengthening the Use of Data in Malaria Decision Making and Action in the African Region”. Acknowledging existing information gaps and the operational challenges of using climate data in particular, this meeting was organized with national collaborators in Ethiopia and Tanzania to present the latest scientific research on the impact of climate on malaria interventions and to demonstrate how climate information can be used to improve health and broader development outcomes.

The meeting was convened by the RBM Secretariat with additional funding and technical support from the United States National Institutes of Health (NIH); the International Research Institute for Climate and Society (IRI), a WHO Collaborating Center on Early Warning Systems for Malaria and other Climate Sensitive Diseases; and the Columbia Global Centers |Africa (CGC|Africa).

This executive briefing and national stakeholder consultation was one of the key outputs of a pilot activity supported by RBM on “Strengthening National Climate Data and Information for Malaria Decision-Making in Africa”. The pilot project, being implemented by IRI and partners from June to December 2014, has three major objectives:

1. To strengthen dialogue and engagement between meteorological services and health officials in Ethiopia and Tanzania;
2. To use climate information regarding the emerging El Niño and undertake risk mapping and develop advisories; and
3. To report lessons learnt to guide DfID’s broader interest in using climate data for improved national decision-making as well as the Roll-Back Malaria Partnership.

The briefing also provided an opportunity to share the outcome of research and research capacity building activities funded by NIH under the IRI-led project on “Climate Variability and Change: Implications for Malaria Control in East Africa” with key regional stakeholders and policymakers.

Meeting Overview

The meeting was envisioned to provide an overview of existing programmes and research using climate science and information, in operational malaria research and practical decision-making in East Africa, and to identify opportunities for further collaboration and investment. Thirty-three participants, including policy makers, practitioners and researchers, discussed current malaria and climate initiatives, the data, methodologies and tools needed by meteorological and
health professionals to improve decision-making, and the role of climate science and information in improving malaria control and elimination. The format of the meeting was designed to emphasize discussion between participants to explore common issues and identify gaps in policy, practice, climate services and data including research and capacity needs. It also provided an opportunity to develop actionable recommendations for improving the use of climate information in health decision-making.

Specific components of the meeting included:

- The identification of opportunities in existing programmes and collaborations to control and eliminate malaria, where climate information may be useful;
- The application of climate science and information (and uncertainty) to decision-making for malaria interventions;
- The scientific basis of the climate context of East Africa—past, present and future and the implications for decision-making;
- The use of climate data within national policy planning applying the Enhancing National Climate Services (ENACTS) approach; and

**Meeting Objectives**

The overall objective of the meeting was to provide evidence on how to improve health outcomes through the use of climate information in routine malaria decision-making at the national level in Tanzania and Ethiopia. The meeting included discussions of the scientific basis for understanding climate variability and change in Eastern Africa, highlighting the policy implications of an improved understanding of the global drivers of climate. The meeting also sought to highlight that investment to improve national climate data and information, dialogue and policy can benefit a wide range of sectors beyond health (including agriculture, hydrological services, disaster risk management) through both mid- to longer term development planning.

By the end of the meeting participants were expected to have a greater understanding of the main drivers of climate in East Africa and its potential predictability over multiple timescales. Participants were also asked to consider new areas to incorporate quality-assured climate data in malaria interventions and the broader implications for decision-making in the health sector, as well the risks and opportunities of the emerging 2014 El Niño.

Specific expected outputs of the meeting included:

1. Support to existing and emerging partnerships on the use of climate data in national malaria decision-making.
2. Draft recommendations to be incorporated into the RBM four-year plan.
3. Plan for a brief commentary on the role of climate information in malaria control and elimination for publication in a relevant peer review journal.
**Recommendations**

Focussing on climate knowledge, climate data and the emerging 2014 El Niño, participants were asked to draft key recommendations from the meeting to the malaria control and elimination community, taking into account three priority areas of concern:

1. **Alignment** – to remain relevant and be considered a key component of national development strategies, malaria control and elimination interventions must be aligned with multi-sectoral policies and processes (reinforced through institutional arrangements), leveraging climate as a cross-cutting opportunity.
2. **Reputational Risk** – to be identified as a trusted national player and funding priority, malaria programmes must maintain and enhance their reputations for effective delivery in the context of climate uncertainty.
3. **Maximising Impact** – to be prioritised as a recipient of government and donor funding, malaria programmes must be seen as operationally efficient and capable of reducing costs, while improving outcomes.

Following the breakout sessions and a plenary discussion, participants identified the following consensus recommendations:

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**Call upon Ministries of Health in malaria endemic countries to improve climate-sensitive health outcomes by effectively using climate information and services.**

**Call upon National Meteorological Services to provide climate information and services to the Ministries of Health and their responsible constituents for the realization of health objectives.**

This to be achieved through:

1. **Strengthened institutional frameworks** (e.g. the Global Framework for Climate Services, Stakeholder and Technical Working Groups).
2. **Systematic ongoing and informed dialogue** between health and climate communities at national and international levels to better manage climate opportunities and uncertainties.
3. **Identified resource and intermediary institutions, channels and mechanisms** for data interpretation, co-production, actionable knowledge and tools.
4. **Review and updating, as appropriate, of data and information sharing policies and resourcing.**
5. **Quality assured climate information** to be made available at relevant spatial scales (for historical analysis, monitoring and forecasting) and tailored for health and other sectors.
6. **Capacity building on use/applications of climate data and services** for the health community.
7. **Research on multiple spatial and temporal scales** (incl. district level) for the creation of policy relevant evidence for the use of climate information in malaria control and elimination, as well as other emerging health priorities.
8. **Monitoring 2014 El Niño** and identifying appropriate communication and interpretation channels.
9. **Incorporating climate in national malaria impact assessments of interventions and manage reputational risk to programmes and funding.**
The following concrete next steps were also identified and agreed by participants:

1. Identify international and national forums over the next year to capitalize on current and emerging climate adaptation and health agendas:
   - WHO Climate and Health meeting (Geneva, August 27-28, 2014)
   - UN Climate Summit (New York, September 23, 2014)
   - RBM MERG (Oxford, September 17-19, 2014)
   - African Ministerial Conference on Meteorology (Cabo Verde, October 15-18, 2014)
   - FAO Second International Conference on Nutrition (Rome, November 19-21, 2014)
   - Global Framework for Climate Services Tanzania (TBD)
   - Libreville follow-up (TBD)
2. Submit commentary on meeting outcomes for publication (e.g. to Lancet or Malaria Journal) before the UN Climate Summit building on key messages.
3. Publish meeting summary on WMO and WHO websites.
5. Conduct baseline and/or follow up surveys on the use of climate data in the health community to identify gaps, training needs and facilities that use climate data.
6. Leverage RBM country dialog on operational research.
7. Share meeting outcomes with partner networks, along with RBM and DfID leadership to inform RBM 4 year plan, as well as with NIH.
8. Identify resourcing for malaria control and elimination through broader development funds (SDGs, climate adaptation resourcing, etc).

**Conclusion**

The meeting provided a valuable opportunity to showcase and exchange a wealth of experience at the national level in Ethiopia and Tanzania on the needs, current use and potential for climate information in malaria decision-making. It also reinforced that without explicitly taking climate into account, as a friend or foe to interventions, the malaria community may be underestating or overstating gains made and risks going forward. Participants explicitly acknowledged that regional drought over the last decade has likely contributed to the decline of malaria in Eastern Africa beyond that explained by malaria interventions. Furthermore, they noted that increased rainfall and temperature resulting from short term (e.g. El Niño) or longer term natural and anthropogenic climate change may result in modest increases in malaria which should not be construed as programme failure.

While it was clear from the meeting that climate is only one of many important drivers of malaria (e.g. control measures, education, migration, land use changes), climate data was recognized as a unique opportunity for managing risk through integration into decision tools and information systems for the malaria community, as it is routinely monitored using standardized methodologies.
Nationally rigorous climate data and information therefore, when combined with other relevant data, have the potential to inform a wide range of decisions and improve our understanding specifically on: the use of climate and environmental information in understanding disease drivers, mapping populations at risk, investigating the seasonality and timing of interventions, monitoring and forecasting year-to-year trends and variability (including epidemics) and assessing the contribution of climate as a confounder in the impact assessments of interventions.

In addition to highlighting the ENACTS and nationally owned climate products available in East Africa, which represent a major advantage over previously course globally available satellite estimations, reanalysis or modeled climate information, the meeting underscored the need for evidence-based policy and confidence in the relevance, quality and quantity of data used for analysis and malaria decision-making.

In summary, the meeting provided a critical opportunity to:

- Explore the complexity of climate drivers and impacts (i.e. decadal, El Niño and Indian Dipole climate patterns) in the context of broader factors of malaria transmission.
- Explore the changing fiscal and political global context for malaria control and elimination and opportunities to navigate through this new funding and policy landscape by contextualising the role of malaria control (gains and challenges) in progressing national development plans and improving livelihoods.
- Emphasize the need to report smarter – evidencing the impact of climate on malaria transmission and what this means for the assessment of interventions.
- Highlight the importance of high-level institutional arrangements to enable leadership and actionable policies and partnerships across sectors.
- Strengthen the networks of climate and health practitioners and champions at national and regional levels, leveraging climate as a cross-sectoral opportunity.
- Reinforce the need for nationally rigorous and relevant data for malaria decision-making.
- Advance a climate risk management strategy within the policy-making environment of the Roll Back Malaria Partnership.
Opening Session

Day 1:
Aug 04, 2014 9:00 am -12:30 pm

Chair of Morning: Elizabeth Juma, Kenya Medical Research Institute
Rapporteur of Morning: Shirley McGill, IRI

Welcoming Remarks

Speaker: Thomas Teuscher, Acting Executive Director, Roll Back Malaria Partnership

Dear colleagues from Ethiopia, Tanzania, KEMRI-Welcome Trust Nairobi, IRI New York and Nairobi, the WMO and WHO, as well as RBM affiliated staff from Dakar, Yaounde, Benin and Nairobi.

Over the past decade and a half of the millennium development goals, we have repositioned the need for intensified malaria control squarely onto the international and national development agenda; we have created a Global Fund for AIDS, TB and malaria that invested, jointly with UNITAID, the World Bank the BMGF and bilateral specialised malaria programmes from US and UK, approximately US$ 2bn annually; we have created national high level advocacy in support of control AND elimination through the African Leaders Malaria Alliance ALMA; and we have contributed systematically and widespread progress on MDG 4 and 6 in Africa and elsewhere. The MDG decade and a half has served to provide renewed confidence that intensified malaria control and subnational elimination through a universal coverage approach of populations at risk is possible with current tools. This has helped us to prove to the world that “we can do it!”

However, in the view of the RBM Partnership Board, the biggest threat to-date to sustaining current control achievements and elimination efforts is insufficient sustained external and internal investment.

We have started to identify through the new Global Malaria Action Plan (GMAP2) strategic malaria control options for the period beyond 2015, articulating our malaria agenda with a new set of global development goals. One issue that was already systematically identified through the global consultative process is the need to mainstream financing for malaria control and elimination into the broader national development agenda across sectors. To facilitate future strategy development along these lines, the RBM Partnership under UNDP leadership has developed the Multisectoral Action Framework (MAF) for use by countries. Under leadership by the Tanzania Minister of Housing, with the Lake Victoria Basin Commission, we have launched the Lake Victoria Initiative to test the effectiveness of leveraging financing across a multisectoral partnership in support of sustained malaria control and elimination efforts in East African Community countries.
Last year, knowing that primarily external malaria investments will be finite, we started to promote focus around issues of prioritisation and targeting. We started to facilitate strategic discussions in initially 8 countries (Mali, Ghana, Nigeria, Ethiopia, Uganda, Tanzania, Malawi and DRC). One of the aims of a revised national strategic malaria plan is to ensure sustained external malaria financing through concept notes to the Global Fund. This dialogue on priorities and targeting attempts to provide evidence on how health impact can be maximised within the available financial envelope a country has at hand. We propose that this is done through the smart use of available data in support of making choices. The result of this dialogue is intended to enhance NMCPs effectiveness in delivering on expected results by maximising value for money within the existing resource base. We explored, based on available evidence in each of these 8 countries, means to enhance the economy of purchasing, the efficiency of commodity delivery systems, the effectiveness of providing control interventions to populations at risk as well as attention to ensure equitable access to interventions.

In a nutshell, we explored with these 8 countries on how to smartly use all available local information relevant to prioritise and target malaria control so that available investments will produce maximum impact on health outcomes such as child survival (MDG4), maternal health (MDG5) and malaria transmission intensity (MDG6). New malaria profiles from 6 out of the 8 countries are now available in draft from. We have brought along some printed examples of these updated malaria profiles for your review, comment and further inspiration.

![Figure 1. RBM Epidemiological Country Profiles for Ethiopia and Tanzania.](image)

A much improved spatial awareness at subnational level of where malaria control results were mostly achieved and where progress has been less systematic over the past decade has help update national strategic plans.
Within the context of national stakeholder dialogue around updating national strategic plans, it became also evident that we occasionally lack certain local knowledge. If knowledge assets were compiled and available on these issues, then we would have the means to enhance our effectiveness in delivering results and sustaining achievements. A structured dialogue between national researchers and NMCPs has potential to enhance value for money of country financing currently available. Such missing knowledge assets in countries could relate to e.g. technical aspects such as durability of LLINs; delivery aspects such engaging private providers at point of care or corporate social responsibility; epidemiological aspects such as geographic vulnerability for epidemics; or strategic aspects such as integration of malaria control into national development strategies.

As initially mentioned, the RBM Board considers the lack of sustained financing the biggest threat to continued malaria control and elimination efforts by countries. Financing through domestic sector budgets financed by tax revenue OR through international malaria “aid” financed by international tax payers, both require confidence that money spent is generating maximum results and represents value for money. High levels of confidence of different malaria financing mechanisms are dependent on evidence based control strategies detailing why malaria investment represents a smart investment. Confidence also depends on how well the risk of loss of control is managed. We need to generate data that informs mitigation strategies of sudden environmental or social changes that affect malaria risk.

This expert consultation will build on, and expand the smart use of national data in support of programme effectiveness. Demonstrated programme effectiveness is required to maintain continued malaria control financing. Over the past 12 months, we have analysed data related to malaria epidemiology and socioeconomic determinants of malaria risk to make smart programme decisions and funding applications.

Over the next two days, we will now expand our scope to include national climate data in support of smart programme decision. The better use of national climate data will also help us manage potential resurgence risks that are unrelated to the quality of your current work in programmes. And lastly, the smart use of climate data will also help us identify priority national
development sectors that are climate dependent e.g. agriculture, where an investment cases can be made for malaria control co-financing as a means of enhancing their own performance.

In a minute, Madeleine Thomson will show us how exactly we will go about doing just that over the next 2 days.

I thank you for your attention.

Speaker: Madeleine Thomson, Senior Research Scientist, International Research Institute for Climate and Society

Good Morning!

I am delighted to be back in Dar es Salaam with my colleagues, Tufa Dinku and Brad Lyon from IRI in New York and Barbara Platzer based in Nairobi at the Columbia Global Center | Africa. We are joined by Shirley McGill, currently interning with the IRI from our Masters Programme in Climate and Society.

We are excited to be able to spend the next two days with you all as we collectively address the challenge of understanding how climate drives malaria in East Africa - especially Ethiopia and Tanzania and how its impact might be felt in the coming months, years and decades. Most importantly we want to consider how this understanding, along with the newly created climate data products and services recently developed by both Ethiopia and Tanzania can be translated into strengthened policies and practices that help prevent, control and even eliminate malaria at the national and regional level. We call these new products and services ENACTS (Enhanced National Climate Services), because they are new services, developed by the national meteorological agencies with their partners, that leverage the best available national data, global products and dissemination capabilities.

A flyer describing the ENACTS products is provided and you will learn more about ENACTS during the course of today.

This particular meeting is convened by the Roll Back Malaria Secretariat with additional funding and technical support from the United States National Institutes of Health (NIH), the International Research Institute for Climate and Society (IRI), a WHO Collaborating Center on Early Warning Systems for Malaria and other Climate Sensitive Diseases, and the Columbia Global Centers | Africa. It leverages research funded by NIH under the IRI-led project on “Climate Variability and Change: Implications for Malaria Control in East Africa” and is a key output of a pilot activity currently being undertaken by IRI which is supported by RBM on “Strengthening National Climate Data and Information for Malaria Decision-Making in Africa.”

Building on prior activities at the country level

Importantly this meeting builds on prior engagement with the malaria and meteorological services in both Ethiopia and Tanzania, including Zanzibar. It provides the opportunity for
knowledge exchange and learning across countries, with a focus on experiences and emerging opportunities from the region.

**Ethiopia**

Ethiopia has been working at the interface of climate and health for some years now. Some of you here today participated in the recent research capacity building workshop held in Addis Ababa on “Climate Variability and Change: Implications for Malaria Control and Elimination in Africa” which took place in April 2014 of this year (Platzer et al. 2014). The workshop was supported by NIH. Its objectives were to:

1. Review the challenge that climate variability and change pose to malaria prevention, control and elimination at multiple time and space scales.
2. Engage in hands-on training and update data and tools available for analysis including the ENACTS climate data products.
3. Explore malaria indices, intervention and socio-economic data for use in local and national malaria models.
4. Discuss implications for policy and decision-makers of the impact of climate variability (ENSO and decadal) and longer-term climate changes for malaria control and elimination.

Amongst the key recommendations from that workshop were the need for:

- more policy-relevant evidence of the malaria-climate linkage;
- regularly updated advisories on El Niño with supporting evidence; and
- additional parameters to be integrated into ENACTS and lengthened time series.

Today we have provided a draft document on the likely impact of El Niño in East Africa as a technical backstopping document for your consideration.

**Tanzania**

In addition, this meeting builds on prior engagement in Tanzania through the training workshop and stakeholder meeting on the “Use of Climate Information in Malaria Stratification/Early Warning Systems/Impact Assessment for Malaria Interventions.” This meeting was supported by NASA-SERVIR and WMO and hosted by the Tanzania Meteorological Agency in Dar es Salaam on the 16-18\textsuperscript{th} October 2013 (Kijazi et al. 2013).

The three-day workshop consisted of four main components:

1. Introduction to TMA’s existing and new data, tools, and information products including ENACTS.
2. Training on the use of the tools for data analysis and visualization including environmental factors monitored using NASA satellite data.
3. Engagement on the use of climate, environmental and epidemiological information to improve malaria stratification, early warning systems and impact assessments taking into account planning and budgeting cycles.
4. Soliciting feedback and needs from participants.

This was the first time that the new ENACTS products and Tanzania Meteorological Agency Maprooms had been presented in Tanzania. The meeting resulted in concrete discussions on how the climate data and information could be leveraged and improved for use by the National Malaria Control Programme.

Following presentations, technical hands-on sessions and open discussions, participants were asked for feedback in five priority areas and a set of recommendations were developed around the following:

- What can be improved in terms of TMA data and products going forward?
- Future needs for climate, environmental and epidemiological information for use in malaria programmes?
- What type of capacity building and what skills are required?
- Recommendations for future research.
- Recommendations for future collaborations.

Of particular importance to this meeting are the recommendations for:

- better standardization of products across the TMA Maproom;
- increasing the spatial resolution from 10km to 5km for the ENACTS products;
- training of health researchers and practitioners in the use of the Maproom and data;
- Protocols for data sharing between the Ministry of Health and Social Welfare and TMA.

We have provided a short report on the meeting with information on the development of ENACTS in Tanzania and their use in malaria impact assessment that was published online in NASA’s Earthzine online magazine.

While for some of you the matters we are about to discuss are new, I hope you all appreciate that this executive briefing and consultation is not beginning from scratch. A wealth of experience exists in both Ethiopia and Tanzania and active dialogue between the malaria community and the national meteorological agencies in both countries is well established.

**Inter-sectoral collaboration**

Having said that, we all know that inter-sectoral collaboration is not easy. Differences in language, culture, priorities and capacities exist between the climate and the health community and these differences must be overcome through dialogue and good will if we are to succeed in developing climate smart malaria control and elimination strategies. The active presence of so many meteorologists from Ethiopia, Tanzania mainland and Zanzibar is a testament to their interest in providing the best information for decision-makers and indicates the increasing priority that health is playing in the development of climate services for the continent set out in
the recently articulated Global Framework for Climate Services (GFCS) (Guillemot 2014). Please note that Tanzania is a GFCS pilot country.

This meeting provides us with an opportunity to share our experiences with the wider RBM secretariat and colleagues from other interested UN partner agencies including UNEP, WMO, UNICEF, IFRC, and WHO Tanzania as well as the research and implementation partners of the Ministries of Health – including KEMRI, KEMRI-Wellcome Trust, EPHI, Ifakara, PMI-USAID, and RTI. It provides us with an opportunity to chart a way forward for the better management of climate related risks to malaria specifically, and development in general, by advancing policies and strategies for the integration of climate information into the RBM initiative for “Strengthening the Use of Data in Malaria Decision Making and Action in the African Region”.

Specific meeting components will include:

- The identification of opportunities in existing programmes and collaborations to control and eliminate malaria, where climate information may be useful;
- The application of climate information (and uncertainty) to decision-making for malaria interventions;
- The scientific basis of the climate context of East Africa—past, present and future and the implications for decision-making;
- The use of climate data within national policy planning applying the Enhancing National Climate Services (ENACTS) approach; and

By the end of the two-day meeting, it is expected that participants will better understand the main drivers of climate in East Africa and its potential predictability over multiple timescales. It is also anticipated that participants will be able to identify new opportunities for using quality-assured climate data in malaria interventions, as well the risks and opportunities of the emerging 2014 El Niño and broader implications for decision-making in the health sector.

Specific expected outcomes of the meeting include:

- Support to existing and emerging partnerships on the use of climate data in national malaria decision-making.
- Draft recommendations to be incorporated into the RBM four-year plan.
- Plan for a brief commentary on the role of climate information in malaria control and elimination for publication in a relevant peer review journal.

As you can see we have a lot to do, so let’s get started!
Thank you!
Briefing and Overview

Malaria Research and Climate Information for Health Decision Making

Abstract Title: Malaria Research and Climate Information Needs
Speaker: Abdisalan Noor

The clinical epidemiology of malaria, the impact of vector control measures, the cost-effectiveness of treatment and prevention interventions and the timelines to malaria elimination are all dependent on the intrinsic transmission intensity of this vector-borne disease.

The intensity of malaria transmission is commonly measured using prevalence rates (the proportion of randomly selected populations who are infected with the Plasmodium parasite at any specific time). Typically, these populations are sampled through cross-sectional household surveys, which are undertaken at intervals of 3-5 years, at different months of the year irrespective of the transmission season and are based on different sampling designs. Therefore, to accurately quantify the patterns of changing malaria epidemiology over space and time, it is important to adjust the survey results for the seasonal and anomalous effects of the climatic determinants of malaria transmission (especially rainfall and temperature), in addition to other factors such as interventions, socio-economic and policy change. An accurate understanding of the relationship of climatic variations and malaria transmission and case burden is also vital to better define malaria seasonality and epidemic risk to inform the roll out of specific interventions, such as seasonal malaria chemoprevention. Available climate data, however, have limitations in their spatial and temporal resolutions and, where good data are available, their use in malaria prediction is methodologically complex. In this talk, we share our experiences in the use of climate data in mapping transmission and seasonality in Africa.

Abstract Title: Climate Information for Health Action
Speaker: Madeleine Thomson

Understanding climate variability and change and how it is measured is important for malaria control and elimination. Beginning with the MARA maps of the 1990s there are now a plethora of climate driven models which all indicate broadly similar patterns at large scale but which differ substantially at local levels.
Interpolated ground based observations, satellite and reanalysis data are widely used to create such maps (along with epidemiological and other data in some cases) and can all contribute to a better understanding of malaria transmission as long as their particular qualities and limitations are understood. Large-scale climate drivers such as the sea surface temperatures in the Niño 3.4 area of the Pacific or the Indian Ocean Dipole can also show how malaria variability and trends relates to global climate processes.

Thus the strong sensitivity of malaria and the characteristics of climate – its climatology, seasonality, diurnal rhythm and potential predictability at multiple time scales (weather, seasonal, decadal and climate change) make it a relevant source of information for policy makers. The involvement of meteorologists and climate scientists in malaria control research and operations brings additional resources to the malaria community.

The development of high resolution national climate surfaces by National Meteorological Agencies through the ENACTS initiative (Enhanced National Climate Services) brings new, high definition, data to the national malaria control programmes which is designed for use by decision-makers at the local and national scale.

Panel: Country Needs for Climate Information for Malaria Control and Elimination

Moderated by: Jeremiah Ngondi, RTI
Panel Members:

- Hiwot Solomon (Ethiopia Federal Ministry of Health, Disease Prevention and Control)
- Adugna Woyessa (Ethiopian Public Health Institute)
- Abdul-Wahid Al-mafazy (Zanzibar Malaria Elimination Programme)
- Fabrizio Molteni (Tanzania Public Health, National Malaria Control Programme, Swiss Tropical Institute)

Jeremiah Ngondi of RTI introduced the panellists and outlined the format of the panel, beginning with opening remarks before opening up to a discussion.

Abdul-Wahid Al-mafazy of ZAMEP delivered a presentation highlighting that Zanzibar malaria rates were decreasing prior to large-scale interventions. He noted that while the island has not recorded much change in the rate of precipitation since 1999, there is a clear connection between a seasonal peak in precipitation rates and malaria rates. He elaborated though that while there were two rainy seasons per year there was only one major peak in malaria transmission. He also shared that climate data showed that temperature and humidity was not
as influential on Pemba and Unguja, as rainfall levels. On the basis of the climate and malaria data, ZAMEP observed that rainfall is a useful indicator of the start/end of peaks in malaria transmission periods and helped inform when malaria interventions should be implemented, but there was less evidence for a connection between the amount of rainfall and intensity of transmission.

![Photo 3. Panellist Adugna Woyessa (EPHI) responds to a comment with (from left) Fabrizio Molteni (Tanzania NCMP/Swiss TPH), Abdul-Wahid Al-mafazy (ZAMEP) and Hiwot Solomon (EFMoH).](image)

Hiwot Solomon of the Ethiopia FMoH shared in her opening remarks that the Ministry uses climate information to revise malaria stratification information, but currently relies primarily on altitude information, which serves as a proxy for temperature. She indicated there is a need to expand to incorporate more climate factors, including rainfall, greenness (e.g. vegetation indices) and water-body data.

Adugna Woyessa of EPHI provided background information in his opening statement, suggesting that formal collaborations between climate and health practitioners started in 2001 and enabled access to Global Fund financing. He expanded that the collaborations in Ethiopia have included doing research on climate and malaria, taking into account the country’s variable topography. He indicated that the country is currently also combating other climate sensitive diseases such as dengue and yellow fever, which means the health sector now needs climate expertise on these vector diseases, not just malaria, to share with government planners and ministers. He also highlighted the need for multi-sectoral collaborations, identifying the impact of large infrastructure projects that provide clean water to communities but that can also exacerbate the spread of vector-borne diseases. EPHI noted that now is the time when the health community needs climate data to inform policy, not just in controlling malaria, but also for ensuring broader health and development gains in the context of livelihoods.

Fabrizio Molteni of the Tanzania NCMP/Swiss TPH noted that the use of data related to seasonality stratification is helping with equity, effectiveness and efficacy of malaria interventions and early warning systems. He emphasized however that climate data is not the only data to assess, indicating that MOH staff also need to look at other relevant data (i.e. population), as a number of factors not linked to rainfall can influence malaria and transmission outbreaks. He underscored that the causes are complex and that we cannot immediately say changes in rainfall will result in changes in malaria transmission rates. He elaborated though that the Tanzanian NMCP view climate data as very useful for early warning systems and for assisting decision-makers to decide what to do as well as what NOT to do (i.e. when not to apply larvicides if there is high rainfall, as it will be washed away) and what locations to target interventions. He added that programmes can also use climate data to make malaria profiles for the country, dynamic mapping of impact of malaria interventions, and to accurately assess effectiveness of control and elimination interventions.
Questions and Discussions:

Key questions/items raised during the Panel Discussion included:

• **Panel Facilitator: Is there a demand for climate data from the malaria community? If not, how can we promote the demand?**

  Tanzania NCMP/Swiss TPH responded that there is definitely a demand, especially for setting up appropriate strategies and identifying where and when you do an intervention (or not), indicating climate information can help to design appropriate plans to control malaria and early warning systems. It was also raised that another potential use for climate data may be for assessing impact of interventions (linked with other input data). Tanzania NCMP/Swiss TPH concluded that the malaria community needs to identify the need for climate information and that health professionals need to change status quo to improve engagement with climate sector.

• **Panel Facilitator: There exists a challenge in translating climate information/data into useful information for decision-making. What do we need to do to change that?**

  TMA answered that the relationship of climate and malaria is not one-to-one, indicating malaria programmes also need to consider a number of vectors that influence transmission (i.e. the mosquito, the parasite). Looking solely at climate parameters, each variable also has a different impact (temperature, wind, humidity). TMA underscored that while the links between climate and malaria are known, there is still a challenge to incorporate all these links into decision-making. As an example, in 1997/8, Tanzania had a peak of malaria after the El Niño. The El Niño was predicted, but not the malaria outbreak. TMA added that continued investment in research and in interventions is needed to better understand the multiple variables and links between climate and malaria.

• **Panel Facilitator: What has ZAMEP put in place to share health and climate data?**

  ZAMEP indicated that it established its malaria control programme in 2004 and initially was focused only on malaria data, but has since approached the meteorological agency for climate data to improve its analysis. After working through concerns about the public use of meteorological data, a formal agreement was signed. In 2010/11, it was expanded to increase the frequency of data provision to a weekly distribution.

• **Panel Facilitator: In Ethiopia, are there any policy issues that need to change to establish an agenda and identify gaps?**

  EPHI responded that there is not a policy gap or anything prohibiting climate and malaria practitioners coming together. The issue is to encourage an improved understanding between the communities to successfully inform policy and advocate together. Ethiopia has a taskforce and a Climate and Health Working Group, including multiple institutions, to build capacity of professionals in health and meteorological systems. EPHI acknowledged that while there are experts in both sectors and some collaborations, a more formal inter-departmental government unit may need to be
established. Ethiopia FMoH noted it has an established team, but requires better data to make recommendations to decision makers more credible.

- **Panel Facilitator: Where should a group or taskforce or working group be located? What is preventing Tanzania from establishing a group?**

  TMA noted it has an agreement from 2004 with the MoHSW and is currently working on a new MOU, adding that while there is an existing collaboration, stakeholder awareness of the existing engagement could be improved.

- **Panel Facilitator: What are the new ways we might be able to make use of climate information for decision-making?**

  IRI noted that while being able to predict an epidemic is one thing, having the capacity to effectively respond is another. IRI added that predicting the negative is also often useful, however prediction is inherently difficult and the emphasis the panel has made on planning is a positive place to start as it provides an opportunity to improve targeting of resources.

  Ethiopia FMoH noted that land use changes were an ongoing challenge to malaria control programmes, though the FMoH had a strategy for introducing malaria interventions in areas where projects were implemented.

  EPHI noted that while the Climate and Health Working Group had provided a good forum, there was confusion about institutional arrangements that needed to be addressed and added that baseline studies and further investigations were needed, especially on the effect of land use changes on the spread of vector-borne diseases (including dengue and yellow fever).

  Tanzania NCMP/Swiss TPH noted that to create the right institutional arrangements, they required support from senior levels within government because the issue of climate and health was broader than just malaria. Molteni added that National Malaria Control Programmes lack the ability to sign MOUs and institutional arrangements should be established that are long-lasting and durable versus a time-bound and problem focussed taskforce.
Panel Facilitator: What do practitioners in the malaria community need to be able to utilize climate data?

Tanzania NCMP/Swiss TPH noted that for overall strategy, practitioners need to know what to do and what not to do, and that they require ongoing reliable and practical information for malaria control (different than for systems which require only occasional triggers, such as early warning systems)- emphasizing that information needs to be practical and operational, otherwise there is a risk of having a massive amount of information that is not useful for practitioners.

Panel Facilitator: What are the gaps in data in Ethiopia?

Ethiopia FMoH responded that they currently rely on altitude information, but need rainfall, vegetation and climate information, emphasizing that the country has significant geographic variation and seasonal fluctuations, so using more climate data would assist with managing malaria transmission. EPHI added that the FMoH needed this information at district level for effective malaria control planning.

Panel Facilitator: What would ZAMEP recommend needs to be done to improve collaboration?

ZAMEP noted it recommends collaboration at high levels and that this needs to be prioritised, but that immediate technical collaborations and partnerships should move ahead and leverage momentum.

Panel Facilitator: Finally, what are the research priorities that are needed to operationalize climate data?

EPHI noted that further research is needed into how climate is influencing current interventions and how malaria is affecting regions. For Ethiopia, the shortage of rainfall is very important to food security, malaria outbreaks, indeed everything. EPHI emphasized that research needs to investigate how climate affects not just health, but
affects people’s lives and development. EPHI concluded by warning that focussing on single issues (e.g. malaria) does not provide the whole picture for decisions makers and that research needs to encompass a wide range of issues to better inform policy.

Climate of East Africa
Afternoon Chair: Nicholas Maingi, WMO East and Southern Africa Office
Afternoon Rapporteur: Barbara Platzer, CGC|Africa

Abstract Title: Climate of East Africa: Past, Present and Future
Speaker: Brad Lyon, IRI

Linking climate variations to impacts in the health sector requires an understanding of the nature of climate variability and change in Eastern Africa. The climate of East Africa is influenced by regional and large-scale processes outside the region, which on seasonal to inter-annual timescales, is exemplified by sea surface temperature changes associated with the El Niño-Southern Oscillation (ENSO). However, sea surface temperature changes on longer time scales are also important; an example of decadal scale changes in the tropical Pacific is presented. In the coming decades, natural climate variations operating on various time scales (from seasonal to decadal) will play a role, in addition to longer-term anthropogenic climate change. It is emphasized that any reliable analysis of the climate (and climate-health interactions) hinges on the availability of high quality climate data. This highlights the critical role of researcher collaboration with national meteorological services.

Questions and Discussions:
Key questions/items raised following this presentation included:

• EPHI asked how the health community can understand all the different impacts of climate (greenhouse induced climate change, natural climate variability, El Niño trends) and relate these concretely to immediate health priorities. IRI responded that anthropogenic climate change affects the “background climate” (especially temperature) that has an influence on natural variations, but that overall the nuances of shorter term climate drivers are also critical to investigate as they have varied implications for health decision-making.

• IRI asked about policy implications of decadal climate variability and teasing out where decision-makers might put their resources based on these cycles, versus seasonal forecasts or long term climate projections. IRI reinforced that these natural variations need to be anticipated and built into programmes of activity.

• Tanzania NCMP/Swiss TPH pointed out that the talk could be interpreted as presenting a challenge to the positive story of successful interventions, indicating that periods of decadal drying may also have coincided with periods of intensified malaria control and elimination efforts. The shift to focusing on the parasite versus the vector was also highlighted and the push for a vaccine, new drugs to facilitate mass administrations, etc. These were reinforced as interventions that may depend less on the immediate impacts of climate.
2014 El Niño and Potential Implications

Abstract Title: This Year- An El Niño is on the Horizon
Speaker: Brad Lyon, IRI

Climate variations of immediate concern are associated with the anticipated development of an El Niño in 2014. Through its influence on sea surface temperatures in the Indian Ocean, El Niño is frequently associated with enhanced rainfall in many parts of Eastern Africa, particularly during the short rains season of October to December. Current observations and forecasts suggest the development of a moderate strength El Niño in the coming few months. It is highly unlikely that an El Niño of the strength of 1997-98 will occur. Current indications are that the coming El Niño will enhance the chances for both above average rainfall and temperatures during the short rains season. As with all climate forecasts, the development of the El Niño and its associated effects on seasonal climate should be viewed from a probabilistic perspective.

Climate Data Available at the National Level

Abstract Title: Enhancing National Climate Services in Africa
Speaker: Tufa Dinku, IRI

The IRI, in collaboration with partners including National Meteorological Agencies and Regional Climate Centers, has been leading an effort to simultaneously improve the availability, access and use of climate information at the national level. This effort, named Enhancing National Climate Services (ENACTS), focuses on the creation of reliable climate information that is suitable for national and local decision-making. The ENACTS approach has five major components:

1. Building technical capacity at the National Meteorology Agency to generate and use information;
2. Generating over a 30-year time series of rainfall and temperature data for every 4km grid across each country;
3. Customizing and installing the powerful IRI Data Library at the National Meteorology Agency;
4. Developing an online mapping service providing user-friendly tools for the analysis, visualization, and download of co-produced climate information products and integrating it into the National Meteorological Services’ web pages; and
5. Engaging stakeholders on the use of new products and services, training them on available tools, and incorporating their feedback and requirements into further product development.

The ENACTS approach overcomes traditional barriers in data quality and access. The spatially and temporally continuous datasets allow for characterization of climate risks at a local scale, and offer a low-cost, high impact opportunity with major potential to support climate resilient development. Making this type of climate information available to the user community supports a suite of solutions that can shore up development gains and improve the lives of the most vulnerable in the face of climate variability.
ENACTS has been implemented in Ethiopia, Madagascar, Tanzania and Rwanda at the national level, and for the CILSS (Comité permanent Inter-États de Lutte contre la Sécheresse dans le Sahel) countries in West Africa at the regional level in partnership with AGRHYMET. It is currently being implemented in the Gambia, with Mali expected as the next national effort. In addition to scaling ENACTS to new countries, future plans include additional parameters and extended time series, as well as expanded sectoral applications and decision support tools.

Initially funded by Google.org, the research, operationalization and uptake of ENACTS at the country level has been supported by NASA SERVIR, WMO, USAID through the President’s Malaria Initiative (PMI), the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), NIH, the African Climate Policy Center (ACPC) and DfID.

Questions and Discussions:
Key questions/items raised following the presentation included:

- TMA asked about additional parameters being included in ENACTS, like humidity. IRI underscored these are in development and depend on demand and availability of information.

- NMA asked about access to sector data for decision support tools and sensitivities that might exist with health, water data, etc. IRI responded that map rooms are nationally owned products and country tools will depend on local mandates and interests.

- RBM CARN/IFRC asked about the main causes of incorrect station data. IRI responded that stations move, instruments may not be routinely calibrated, and that staff, observation and typing errors exist - necessitating careful data review and corrections before being merged with satellite estimates.

- RBM followed up on institutional arrangements and optimizing information available for decision-makers and analysis, suggesting there may be others beyond the Met Services and Ministries of Health to consult (e.g. relevance of land use data and partners).
Abstract Title: Improving Availability of Climate Data in Ethiopia
Speakers: Melesse Lemma, NMA

Since the initial piloting of the ENACTS initiative in Ethiopia in 2008, NMA and IRI experts have partnered to produce merged satellite-station data for every 4km grid across the country. The conventional meteorological data observed at stations across Ethiopia have been checked for quality and merged with satellite derived rainfall and temperature data. Derived products have been made available through the Agency’s website and the gridded data are provided to users upon request.

The combined rainfall dataset draws on more than 600 rain gauge stations merged with 30 years of satellite-derived rainfall estimates. For temperature, data from over 300 stations are combined with Moderate Resolution Imaging Spectroradiometer (MODIS) Satellite Land Surface Temperature (LST) estimates. NMA has recently reviewed users that have accessed both the online and offline data/information. The online Maprooms on the NMA website have been visited both within Ethiopia and abroad. The number of direct ENACTS data requests from governmental, academic and other institutions (in person at the Agency’s head office) has reached 52.

Questions and Discussions:
Key questions/items raised following the presentation included:

- Zanzibar Met Office asked about the distribution of rainfall stations in Ethiopia and relative poor distribution specifically in the Eastern part of the country. NMA responded the lowland area is largely inaccessible owed to infrastructure with sparse populations and that it has less resources dedicated to it.

- RBM CARN/IFRC asked about why stations are located only on major roads and also inquired about whether stations could be co-located with epidemiological Sentinel sites. IRI responded that regardless of whether met stations are nearby, you can have high resolution data available through ENACTS, leveraging nearby observational records and satellite data for improved spatial resolution and that the aggregated data is more important than collected data for a single point. However IRI noted that in Ethiopia, meteorological stations had been established at malaria sentinel sites.

Abstract Title: Improving Availability, Access and Use of Climate Information in Tanzania
Speaker: Augustine Kanemba, TMA

Climate observation networks in Tanzania face many challenges that limit the ability to use climate information in development practices. The number of weather stations is insufficient and has been declining. The distribution of existing stations is also uneven, with most stations located in cities and towns along major roads. Thus, lack of coverage tends to be worse in rural areas where livelihoods are the most vulnerable to climate variability. Where station records exist, data quality and access is often lacking and records can suffer from gaps in space and time.

As a result, satellite proxies, particularly for rainfall, are often used. Satellite data sets provide
spatially continuous coverage, but can have limitations in accuracy, temporal in homogeneity and length of time series.

TMA, in collaboration with the IRI, has been making efforts to alleviate these problems, through the application of the ENACTS process. The outcomes of this work include:

- An unprecedented thirty-year time series of ten-daily rainfall and temperature data for every 10km grid across the country;
- An online mapping service installed at TMA providing user-friendly tools for visualization, querying, and accessing information through TMA’s webpage;
- Increased technical capacity at TMA.

Questions and Discussions:

Key questions/items raised following the presentation included:

- EPHI asked about experiences in Tanzania with curriculum development and training opportunities. TMA responded that they are just learning in this area with targeted sector trainings, but that the Global Framework for Climate Services has budgeted for targeted training and this will provide an initial resource and platform for strengthened institutional arrangements. TMA also indicated that a requested training from Ifakara is awaiting a broader MoU agreement between the Met Service and Ministry of Health.

- RBM asked about what might behind a specific district, Ilala, request for met service information and inquired about what drives these types of requests. TMA responded in the case of Ilala, it is because they are heavily impacted by flooding.

Abstract Title: Implementation of ENACTS in Rwanda
Speaker: Tufa Dinku, IRI

The implementation of ENACTS in Rwanda has been different than the approach taken in all other national efforts, in order to tackle the major challenge of a 15-year gap in observations following the 1994 genocide. New techniques needed to be developed and tested, including the use of model reanalysis data for temperature. This new approach was used to reconstruct ten-daily rainfall time series from 1981 to 2014 and temperature data from 1961 to 2013 for every 5km grid across the country. The main strengths of the generated data sets are temporal completeness (not affected by the big data gap), excellent spatial coverage (available for any parts of Rwanda), and ease of use (gridded data that can easily be combined with other georeferenced data sets). The quality of the generated data sets has also been evaluated and shown to be very good, particularly for minimum and maximum temperatures. These data sets, now available with no temporal or spatial gaps, should be very valuable for research and a host of applications including malaria. The new approach developed for Rwanda should also be useful for other countries where climate observations have been interrupted. The new approach is also being used to improve the quality and length of the temperature time series for countries where ENACTS has already been implemented.
Questions and Discussions:
Key questions/items raised following the presentation included:

- NMA asked about whether you can support national reanalysis data with bordering countries (e.g. national data from Uganda and Tanzania, in the case of Rwanda). IRI indicated this would be beneficial but that requests need to come from country itself for this cross-border data sharing.

Day 2:
Aug 05, 2014  9:00 am -12:30 pm

Morning Chair: Adugna Woyessa, Ethiopian Public Health Institute
Morning Rapporteur: Shirley McGill, IRI

Consultation
Discussion on Multi-Sectoral Policy Needs, Planning and Training, and Managing Uncertainty
Facilitated by: Thomas Teuscher, RBM

Thomas Teuscher of RBM opened the discussion summarizing the dialogue between researchers from different disciplines and the challenge of combining information to make informed decisions. RBM expanded on the discussion of the previous day to ask how participants can apply what they have learnt from malaria and meteorological initiatives to intensify the fight against poverty, situating malaria as a component within national development plans and to consider what kind of an institutional body would be needed to take existing knowledge and apply it to decision-making to improve lives and livelihoods. Below is a summary of key discussion points:

- RBM noted that Tanzania needs to manage malaria risk within a context of growing industry and infrastructure projects in Tanzania. Tanzania NMCP said they needed to look to existing organizations and include this issue on their agenda. The potential advantages, working relationships and specific action plans with the various partners were identified as needing elaboration to ensure active and effective engagement.

- RBM noted that a better understanding of climate could assist in the planning of interventions and underscored that given that external financing will not increase, interventions needed to be prioritised within a limited funding landscape. Ethiopia FMoH noted that malaria practitioners have to prioritise based on evidence and the
allocation of funding is closely considered, but operational research and statistics are central to considering how to focus interventions and funding.

• RBM asked participants who they would inform if they received a forecast warning of a significant climate event. EPHI noted that this was a challenging question, as it has a political context and has to be handled carefully given the potential negative impacts on commerce and livelihoods. Ethiopia NMA noted it has a forum to present forecasts to national stakeholders from different sectors and would use this forum to communicate an early warning because it was not the appropriate agency to directly announce an early warning to the public. WHO Tanzania noted that even when a sector received an early warning there was still a challenge turning that information into a response, indicating that a taskforce or group that can influence at the high-level was needed to institutionalize and operationalize a decision-making and response framework.

• RBM asked participants how their respective departments manage the accuracy of climate information, given potential concerns on misinterpretation or misrepresentation by the media directly to the public. TMA replied that an effective early warning center requires multiple agencies to work together, including outreach to the media.

• RBM asked whether there were existing early warning systems in place for malnutrition that could be linked to malaria interventions. KEMRI noted there was potential for this, but was unaware of any specifics. KEMRI noted that short-term climate variability was more important for malaria interventions and early warning, as opposed to long-term climate patterns.

• RBM CARN/IFRC noted that international donors also needed to make use of their access and influence with national decision makers to strengthen expertise and efforts in country.

**Break-Out Session**

Participants were divided into three groups to ensure diverse distribution of expertise and experiences from across the climate and health sectors to discuss opportunities and risks and identify six priority recommendations on the following topics:

1. Climate Knowledge – What are the Research Gaps and Capacity Needs? (Facilitated by IRI – Brad Lyon)
2. El Niño – What are the National Decision-maker/Country Needs? (Facilitated by IRI – Madeleine Thomson)
3. Data Issues – What is Required at the National Level to Ensure Ministries of Health Have Access and Can Use Relevant Climate Information? (Facilitated by IRI – Tufa Dinku)

In addition to the discussion questions, each group was asked to consider three areas of concern:
1. Alignment – in order to remain relevant and be considered a key component of national development strategies, malaria control and elimination interventions must be aligned with multi-sectoral policies and processes (reinforced through institutional arrangements), leveraging climate as a cross-cutting opportunity.

2. Reputational Risk – to be identified as a trusted national player and funding priority, malaria programmes must maintain and enhance their reputations for effective delivery in the context of climate uncertainty.

3. Maximising Impact – to be prioritised as a recipient of government and donor funding, malaria programmes must be seen as operationally efficient and capable of reducing costs, while improving outcomes.

Along with the designated IRI facilitator, groups were asked to nominate a chair to lead discussion and report back to the plenary. The group reconvened to present recommendations, which were synthesised during the lunch break and finalised, with concrete next steps identified during the closing session.

Photo 7. Participants during the Break-Out Session addressing challenges around the use of climate data.
Closing Session
Aug 05, 2014  2:00 pm -4:30 pm

Chair of Afternoon: Madeleine Thomson, IRI
Rapporteur of Afternoon: Barbara Platzer, CGC|Africa

Recommendations and Next Steps

Below is a summary of final recommendations and identified next steps from the meeting, presented by Barbara Platzer (CGC|Africa) and Madeleine Thomson (IRI), that were agreed by consensus with the participants.

Call upon Ministries of Health in malaria endemic countries to improve climate-sensitive health outcomes by effectively using climate information and services.

Call upon National Meteorological Services to provide climate information and services to the Ministries of Health and their responsible constituents for the realization of health objectives.

This to be achieved through:

1. Strengthened institutional frameworks (e.g. the Global Framework for Climate Services, Stakeholder and Technical Working Groups).
2. Systematic ongoing and informed dialogue between health and climate communities at national and international levels to better manage climate opportunities and uncertainties.
3. Identified resource and intermediary institutions, channels and mechanisms for data interpretation, co-production, actionable knowledge and tools.
4. Review and updating, as appropriate, of data and information sharing policies and resourcing.
5. Quality assured climate information to be made available at relevant spatial scales (for historical analysis, monitoring and forecasting) and tailored for health and other sectors.
6. Capacity building on use/applications of climate data and services for the health community.
7. Research on multiple spatial and temporal scales (incl. district level) for the creation of policy relevant evidence for the use of climate information in malaria control and elimination, as well as other emerging health priorities.
9. Incorporating climate in national malaria impact assessments of interventions and manage reputational risk to programmes and funding.
The following concrete next steps were also identified and agreed by participants:

1. Identify international and national forums over the next year to capitalize on current and emerging climate adaptation and health agendas:
   • WHO Climate and Health meeting (Geneva, August 27-28, 2014)
   • UN Climate Summit (New York, September 23, 2014)
   • RBM MERG (Oxford, September 17-19, 2014)
   • African Ministerial Conference on Meteorology (Cabo Verde, October 15-18, 2014)
   • FAO Second International Conference on Nutrition (Rome, November 19-21, 2014)
   • Global Framework for Climate Services Tanzania (TBD)
   • Libreville follow-up (TBD)

2. Submit commentary on meeting outcomes for publication (e.g. to Lancet or Malaria Journal) before the UN Climate Summit building on key messages.
3. Publish meeting summary on WMO and WHO websites.
5. Conduct baseline and/or follow up surveys on the use of climate data in the health community to identify gaps, training needs and facilities that use climate data.
6. Leverage RBM country dialog on operational research.
7. Share meeting outcomes with partner networks, along with RBM and DfID leadership to inform RBM 4 year plan, as well as with NIH.
8. Identify resourcing for malaria control and elimination through broader development funds (SDGs, climate adaptation resourcing, etc).

**Closing Remarks**

_Closing remarks were given by Thomas Teuscher (RBM), Madeleine Thomson (IRI) and Barbara Platzer (CGC/Africa)._  

Thomas Teuscher concluded the meeting by highlighting what he had learnt from the presentations and discussions during the meeting, noting that one of the key messages he had identified was the need to improve reporting to incorporate climate impacts on malaria interventions. He noted malaria practitioners need to identify 3-5 priority messages to promote to external partners and funders on how climate impacts malaria, so national malaria programmes can provide evidence that interventions are not failing. He emphasised that participants from this meeting could make a powerful statement and should continue the dialogue to improve the use of climate data for decision-making.

Madeleine Thomson noted that the climate community can provide valuable products and services to deliver practical information for health decision-making. Thomson thanked the IRI
staff, CGC and meeting support for their contributions and the participants for the active and engaging discussions.

Barbara Platzer provided a concluding vote of thanks to all the participants, including long standing collaborators and new colleagues, to RBM and the Secretariat staff in Geneva for their support, NIH and DfID for their financial support, ProfCats and the hotel staff for their support on logistics, and IRI colleagues on their contributions leading up to the meeting.
Appendix

Appendix 1: Agenda

Strengthening National Climate Data and Information for Malaria Decision-Making in Africa

An Executive Briefing and Consultation with National Collaborators in Tanzania and Ethiopia

04-05 August 2014
Venue: Ledger Plaza Bahari Beach Hotel
Dar es Salaam, Tanzania

AGENDA

Monday 04 August 2014
Day 1
Morning Chair: Elizabeth Juma, Kenya Medical Research Institute
Morning Rapporteur: Shirley McGill, IRI

8:00-9:00am
Registration

Introduction
9:00-9:45am
Welcome, Introductions and Overview of Meeting Objectives (RBM – Thomas Teuscher and IRI – Madeleine Thomson)

Review: Existing Programs and Collaborations
9:45-10:30am
Review of the Science
  • Malaria Research and Climate Information Needs (KEMRI-Wellcome Trust – Abdisalan Noor)
  • Climate Information for Health Action (IRI – Madeleine Thomson)

10:30-11:00am
Group Photo
Tea and Coffee

11:00-12:30pm
Panel Discussion: Country Needs for Climate Information for Malaria Control and Elimination
  • Moderated by Jeremiah Ngondi (RTI)
  • Panelists:
    o Hiwot Solomon (Ethiopia Federal Ministry of Health, Disease Prevention and Control)
    o Adugna Woyessa (Ethiopian Public Health Institute)
Panelists provide opening remarks (3-5min. each), followed by open discussion.

12:30-2:00pm Lunch

Afternoon Chair: Nicholas Maingi, WMO East and Southern Africa
Afternoon Rapporteur: Barbara Platzer, CGC|Africa

Review: Climate Data and Analysis in East Africa
2:00-2:45pm Climate of East Africa: Past, Present and Future (IRI – Brad Lyon)
2:45-3:15pm 2014 El Niño and Potential Implications (IRI – Brad Lyon)
3:15-3:30pm Tea and Coffee
3:30-5:00pm Climate Data Available at the National Level
  - Enhancing National Climate Services (ENACTS) Overview and Methodology (IRI – Tufa Dinku)
  - Ethiopia (NMA Ethiopia – Melesse Lemma)
  - Tanzania (TMA Tanzania – Augustine Kanemba)
  - Rwanda (IRI – Tufa Dinku)
5:00-5:30pm Wrap Up of Day 1 (Day 1 Chairs)
Review and Reading for Day 2 (IRI - Madeleine Thomson)

Tuesday 05 August 2014 Day 2
Morning Chair: Adugna Woyessa, Ethiopian Public Health Institute
Morning Rapporteur: Shirley McGill, IRI

Discussion: Using Climate Information
9:00-10:00am Recap of Key Points from Day 1 (Day 1 Chairs)

Initial Discussion on Multi-Sectoral Policy Needs, Planning and Training, and Managing Uncertainty
  - Facilitated by: Thomas Teuscher (RBM)

Break-out Session Introduced and Groups Assigned (CGC|Africa – Barbara Platzer)
10:00-10:30am Tea and Coffee
Break-Out Session
10:30-11:30am  Break-out Groups Discuss and Draft Recommendations on:
   3. Data Issues – What is Required at the National Level to Ensure Ministries of Health Have Access and Can Use Relevant Climate Information? (*Facilitator: IRI – Tufa Dinku*)

11:30-12:30pm  Break-out Groups Present Recommendations

12:30-2:00pm  Lunch

*Afternoon Chair: Madeleine Thomson, IRI*
*Afternoon Rapporteur: Barbara Platzer, CGC|Africa*

Final Recommendations and Closing
2:00-3:00pm  Draft Meeting Recommendations Presented and Agreed

3:00-3:45pm  Identification of Concrete Next Steps

3:45-4:30pm  Wrap-up and Closing Remarks (*RBM – Thomas Teuscher and IRI – Madeleine Thomson*)
## Appendix 2: Participant List

<table>
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<tr>
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Appendix 3: Meeting Organizing Institutions

Roll Back Malaria Partnership (RBM)
The RBM Partnership is the global framework to implement coordinated action against malaria. It mobilizes for action and resources and forges consensus among partners. The Partnership is comprised of more than 500 partners, including malaria endemic countries, their bilateral and multilateral development partners, the private sector, nongovernmental and community-based organizations, foundations, and research and academic institutions.

RBM’s strength lies in its ability to form effective partnerships both globally and nationally. Partners work together to scale up malaria-control efforts at country level, coordinating their activities to avoid duplication and fragmentation, and to ensure optimal use of resources.

RBM’s overall strategy aims to reduce malaria morbidity and mortality by reaching universal coverage and strengthening health systems. The Global Malaria Action Plan defines two stages of malaria control:

1. *scaling-up for impact (SUFI)* of preventive and therapeutic interventions; and
2. *sustaining control over time.*

The RBM Partnership was launched in 1998 by WHO, UNICEF, UNDP and the World Bank, in an effort to provide a coordinated global response to the disease. The RBM Partnership is led by the Executive Director, and served by a Secretariat that is hosted by the World Health Organization in Geneva, Switzerland. The Secretariat works to facilitate policy coordination at a global level.

International Research Institute for Climate and Society (IRI)
The mission of the IRI is to enhance society’s capability to understand, anticipate and manage the impacts of climate in order to improve human welfare and the environment, especially in developing countries. The IRI conducts this mission through strategic and applied research, education, capacity building, and by providing forecasts and information products with an emphasis on practical and verifiable utility and partnership.

The IRI was founded in 1997 on the belief that scientific breakthroughs in our understanding of climate can help developing countries defeat persistent and often devastating problems. Climate has an impact on health, water, agriculture and most other vital sectors, giving us the opportunity to help societies confront a whole range of hardships—from malaria epidemics to food shortages. The IRI is a WHO Collaborating Center (US 306) for Malaria Early Warning and other Climate Sensitive Diseases.

The IRI is a catalyst for the creation and provision of science that meets the needs of the developing world. We collaborate with partners in Africa, Asia and Latin America, with local institutions that understand local needs and capacity. Our research and tools are “demand-driven” in that they help solve specific development, adaptation and research management issues.
Columbia Global Centers | Africa (CGC Africa)

Columbia Global Centers | Africa (CGC Africa) was launched in January 2012 and is supported by Columbia University in the City of New York. It represents the culmination of the University’s impactful engagement with Africa spanning several years. The MDG Centre, the Earth Institute, the Mailman School of Public Health and the Graduate School of Architecture, Planning and Preservation, as examples, have been active in the region for many years, and close to 1000 Columbia alumni call Africa their home. CGC Africa is fast becoming a preeminent research and development organization in Africa providing thought leadership, cutting edge research, and expansion of scientific knowledge. It is one of eight global centers located in disparate locations around the world – Rio, Santiago, Beijing, Istanbul, Mumbai, Amman, Paris – linking Kenya and Africa to a vast body of knowledge, scholarship and enquiry, and providing an avenue for Africa to influence debates at the highest level. The Centre aims to:

• enable the highest levels of knowledge and learning in and for Africa;
• create a hub for global curriculum and scholarly outreach in Africa; and
• link the academic pursuits of the Global Center to Columbia’s campuses in Morningside Heights and around the world.
Appendix 4: Bibliography


