



# project news

[www.healthyfutures.eu](http://www.healthyfutures.eu)

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## Welcome to the fourth HEALTHY FUTURES newsletter

The previous (third) and current issues of the newsletter bracket a period of heightened activity in the HEALTHY FUTURES project as the focus of attention moves from basic research to providing decision support to human and veterinary health specialists in eastern Africa. This is happening against a background of the late 2012 release in The Lancet of The Global Burden of Disease Study 2010 that showed a massive (>500%) increase globally in the burden of environment-related diseases since 1970 (see link to the report below).

Heightened activity and a gradual switch in focus in the research are evident from the nature of discussions that have recently taken place among partners and stakeholders at various meetings, via basecamp (the online project management system) and through email and telephone conversations. Indeed plans are already underway to engage more with stakeholders in the research in coming months. For example, the next partners' and External Review Panel (ERP) meetings, scheduled for Nairobi, Kenya in early 2014, will likely precede a training workshop during which decision support tools (DSTs) of particular relevance to the three target diseases (malaria, schistosomiasis and Rift Valley fever), which are currently in the process of being developed in consultation with interested parties, will be introduced in a preliminary form. The intention is to develop further the DSTs through consultation with stakeholders, prior to their implementation.

Despite the last several months being a busy period for all involved with the HEALTHY FUTURES project, Paul (AQUATT) and I have received a substantial amount of copy for inclusion in the current issue of the newsletter. Of particular note, given the transition in focus of the project that is currently underway, is the piece by Stacey Noel and Richard Taylor (Stockholm Environment Institute (SEI) York and Oxford) on developing DSTs that are suitable for application in the field of climate change and health. This issue of the newsletter also includes articles on a new promotional video that is now available, hosted by the website VIMEO and produced by AQUATT, reports on meetings organised and attended by HEALTHY FUTURES researchers since the beginning of 2013, and information about meetings planned for coming months that may be of interest to stakeholders in the project. Of these, the major international conference targeting climate change and health, hosted by National University of Rwanda (NUR) and scheduled for mid-2014 to coincide with release of the next (fifth) IPCC Climate Change Assessment report, is likely to be of particular interest.

Aside from receiving articles from project members for inclusion in the current issue of the newsletter, over the past few months I have also received copies of newsletters that carry content of relevance to HEALTHY FUTURES. These include:

- The sixth newsletter of the Quantifying Weather and Climate Impacts on Health in Developing Countries (QWeCI) project (available for download at [http://www.liv.ac.uk/media/livacuk/qweci/QWeCI\\_Newsletter\\_Issue\\_06\\_FINAL.pdf](http://www.liv.ac.uk/media/livacuk/qweci/QWeCI_Newsletter_Issue_06_FINAL.pdf))

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- The February and May 2013 issues (second and third) of volume 5 of the News from the Ground series produced by the Climate Information for Public Health Action Network (CIPHAN), available for download via:

<http://ciphan.iri.columbia.edu/>

- The current (July 2013) issue of the Climate Services Partnership (CSP) newsletter, available via:

<http://www.climate-services.org/content/csp-quartly-newsletter>

You will have read about the QWeCI project, which recently held its end of project meeting in Barcelona, in previous newsletters. The current issue of the QWeCI newsletter includes, amongst other items, information on two of the presenters at the recent HEALTHY FUTURES/QWeCI Symposium in Kigali, Rwanda: Francesca Di Giuseppe (European Centre for Medium-Range Weather Forecasts (ECMWF), UK) and James Chirombo (Malawi Ministry of Health).

CIPHAN has been developed to provide public health professionals with knowledge, methodologies, tools, and data to better manage climate sensitive diseases in order to improve health outcomes. The CIPHAN web portal guides users towards potentially useful sources of information, and provides access to learning resources, such as educational modules and exercises.

CSP aims to provide a platform for knowledge sharing and collaboration relating to advancing climate service capabilities worldwide. Members are climate information users, providers, donors, and researchers; though they represent diverse interests, all are actively engaged with climate services through their own programmes and activities.

The current issue of the CSP newsletter alerted me to what appear to be two highly interesting and relevant research projects based in eastern Africa. One is examining urban risk reduction in Nairobi, Kenya. The project has received support from the Red Cross societies in Denmark and Kenya and is investigating ways of reducing climate-related vulnerability in informal settlements in Nairobi. Researchers on the project are adopting a multi-hazard approach to tackling disease, preventing fires, and promoting public health, first-aid training, and structural improvements to homes. The second is investigating climate change adaptation in eastern Uganda (focusing on Soroti District) and is in receipt of support from the Uganda Red Cross, the German Red Cross and Germany's Federal Ministry for Economic Cooperation and Development.

Just before I sign off, the following publications may be of interest:

- Dekens, J., Parry J.-E., Zamudio-Trigo, A.N. and Echeverria, D. (2013). Climate Risk Management for Malaria Control in Kenya: the case of the western highlands. Report prepared by the ISSD for the UNDP. 57 pp. The report is available for download at: [http://www.iisd.org/pdf/2013/crm\\_kenya.pdf](http://www.iisd.org/pdf/2013/crm_kenya.pdf)

- The Global Burden of Disease Study (GBD) 2010: a major systematic description of the global distribution and causes of a wide array of major diseases, injuries, and health risk factors, in fact the largest ever such study! The GBD 2010, published by The Lancet in December 2012, comprises a wealth of data on different aspects of the study (including data for different countries and world regions, men and women, and different age groups). Worryingly the report indicates that environment-related mortality has increased by more than 500% globally when compared with the 1970s, while deaths due to malaria in 2010 were almost 20% higher than in 1990.

The GBD 2010 can be downloaded from:

<http://www.thelancet.com/journals/lancet/issue/vol380no9859/PIIS0140-6736%2812%29X6053-7>

- McMichael, A. (2013). Globalisation, Climate Change and Human Health. *New England Journal of Medicine* 368: 1335-1343

<http://www.nejm.org/doi/pdf/10.1056/NEJMr1109341>

- WHO (2012) Atlas of Health and Climate, available at [http://library.wmo.int/pmb\\_ged/wmo\\_1098\\_en.pdf](http://library.wmo.int/pmb_ged/wmo_1098_en.pdf) The WHO Atlas is likely to be of interest generally to readers of this newsletter, while the section on malaria will no doubt be of particular interest. The latter includes a description of an early warning system for malaria (MEWS), set up as part of the WHO's Global Malaria Programme in the southern African countries of Angola, Botswana, Namibia, Madagascar, Mozambique, South Africa, Swaziland, Zambia and Zimbabwe. The MEWS provides a good example of the practical use of weather and climate information in combating disease and uses the seasonal climate forecasts issued by the Southern African Regional Climate Outlook Forum to predict malaria epidemics several months ahead of time.

Once again, please let me take this opportunity to thank you for your continued interest in HEALTHY FUTURES, and to wish you well in coming months.

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### HEALTHY FUTURES PROMOTIONAL VIDEO

Colleagues at AQUATT have produced a short (c. 90 second) video that summarises the HEALTHY FUTURES project. The video, hosted by VIMEO and aimed at raising awareness of the project, can be viewed via [www.vimeo.com/70318624](http://www.vimeo.com/70318624) or by clicking on the image to the right. The video can also be found on the Promotional Material page of the Media Centre section of the project website.



## RESEARCH REPORTS

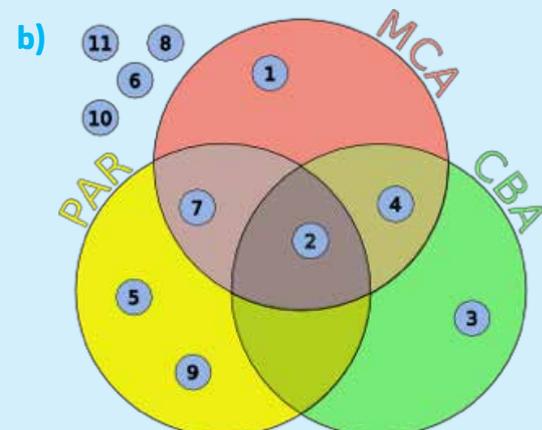
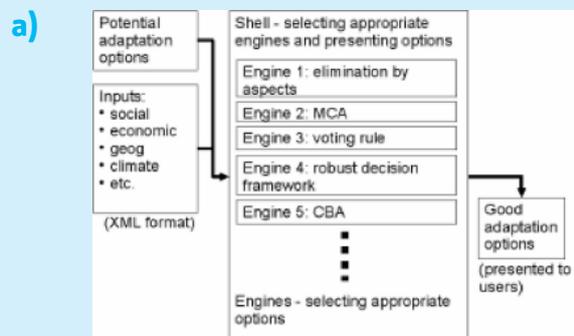
### Introducing Decision Support Tools for Vector-Borne Diseases in Eastern Africa

A major outcome of the HEALTHY FUTURES project will be the introduction of DSTs designed to be useful in health planners' formulation, assessment and comparison of strategies for managing human responses to disease risks. This work will build on the past two and a half years of work undertaken by SEI as part of the project, which has included: identifying and engaging relevant stakeholders in the countries that comprise the East African Community; creating strategic networks maps showing the inter-linkages and information flows between stakeholders; and inventorying relevant strategic plans, including those for health, environmental management, water supply and sanitation, climate change and other related documents. DSTs will also be based on criteria developed in the report, "5.3: Inventory of use of current tools by key stakeholders in their decision processes", prepared by consortium partner Paris Lodron University of Salzburg (PLUS), Austria, with input from SEI and other members of the HEALTHY FUTURES consortium. The criteria were: (i) fit for purpose; (ii) user friendly; (iii) participatory and equity focused; (iv) wide ranging; and (v) providing co-benefits. The report found that few tools were currently used in the East African Community to assess the impacts of environmental change on health (the full report is available here: <http://bit.ly/10t9Z48>).

DSTs, in the context of climate change related challenges, are "documents, computer programs and websites that help people undertake all or some part of a climate risk screening and/or assessment process" (Hammill and Tanner 2011:16) and which can be applied at one or more of the stages of the adaptation planning cycle/decision-analysis process. One computer-based tool originally proposed in the description of work (DoW) for HEALTHY FUTURES is the 'ADX' DST.

In its present form, ADX focuses on integration of climate information with other priorities in adaptation decision-making, for example see Figure 1. In May 2013, SEI renamed

the tool to better explain how it can help decision-making. This was done in consultation with HEALTHY FUTURES project partners. The 'Climate Adaptation options explorer ADX', which is the new name for the ADX tool, will be one of the tools of work package 5 that we will be evaluating in the coming months.



**Figure 1**

**a)** Selecting decision-making methods to be applied to potential adaptation options;

**b)** Comparing the performance of options (shown as blue circles) across three selected methods: participatory assessment (PAR), multi-criteria analysis (MCA) and cost-benefit analysis (CBA).

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The ADX is offered through the weADAPT climate adaptation platform and was developed through the support of a number of earlier projects. For more information about ADX see the factsheet (available at: <http://bit.ly/11va2ry>).

Applying ADX in health contexts will be challenging. In the most ambitious scenario, the main goal of this work will be the development of DSTs that integrate outputs from other project WPs and meet all of the above criteria, and which can be implemented in the study area to assist decision makers in eastern Africa. A more modest outcome would be partial achievement of these goals, with progress towards effective communication about DST requirements between decision makers and health researchers. This should lay the groundwork for stakeholder take-up and ownership of tools, their dissemination and use beyond the end of the HEALTHY FUTURES project.

Ideally a range of tools, methods and approaches should be considered. For this reason ADX has an open architecture; its key feature is the ability to select and compare different methods applied to the same adaptation situation. Decision

support should incorporate the results from research into tools that will be useful to stakeholders working in various contexts, and this means that a number of different methods need to be available for consideration.

**Therefore we would like to hear from readers who have suggestions as to what DST features they would like to see and to what contexts they would envision applying them in their own work. Please get in touch with either or both of us at our email addresses below!**

### Reference

Hammill, A. and Tanner, T. (2011) - Harmonising Climate Risk Management: Adaptation Screening and Assessment Tools for Development Co-operation. OECD Environment Working Paper, 36. OECD Publishing.

<http://ideas.repec.org/p/oec/envaaa/36-en.html>, accessed June 20 2013.

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## MEETING REPORT

**Environment and Health in Africa (Climate and vector-borne diseases) Symposium, 29 March 2013**

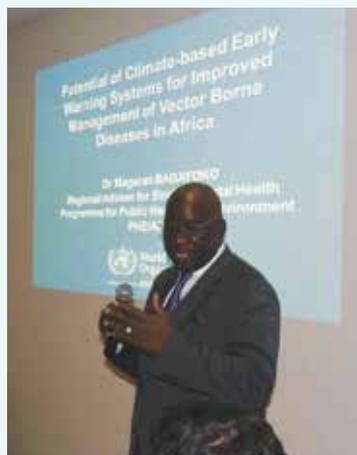
The fourth Annual East African Community Health & Scientific Conference, Kigali, Rwanda, 27-29 March 2013 ([www.rbc.gov.rw](http://www.rbc.gov.rw))



The fourth Annual Health & Scientific Conference in Kigali, Rwanda, in March 2013, targeted eastern African health priorities and opportunities in a changing world. Spread over three days in several venues in Kigali, the conference programme comprised four sub-themes (Maternal and Child Health, Non Communicable Diseases and Trauma, Health Systems Strengthening, and Quality of Health Care) and four symposia (HIV and AIDS, Integrated disease surveillance and disaster preparedness, Environment and Health in Africa, and Tobacco Control).

The Environment and Health in Africa Symposium was jointly coordinated by members of the HEALTHY FUTURES and QWeCI (<http://www.liv.ac.uk/qweci>) research projects and brought together researchers at the cutting edge of efforts to understand the relationships between health and environment, and in particular links between climate and vector-borne diseases (VBDs), in Africa. The symposium was well-attended, despite being timetabled for the last day of the meeting, which was Good Friday and a public holiday throughout eastern Africa. I was particularly impressed (and pleased) by the level of coordination and cooperation

between HEALTHY FUTURES and QWeCI researchers on show, in terms of organising and participating in the symposium, and the research that underpinned several of the presentations. This augurs well for future collaboration after the completion of the HEALTHY FUTURES and QWeCI projects.



Dr Magaran Bagayoko at the joint HEALTHY FUTURES/ QWeCI Symposium in Kigali, Rwanda

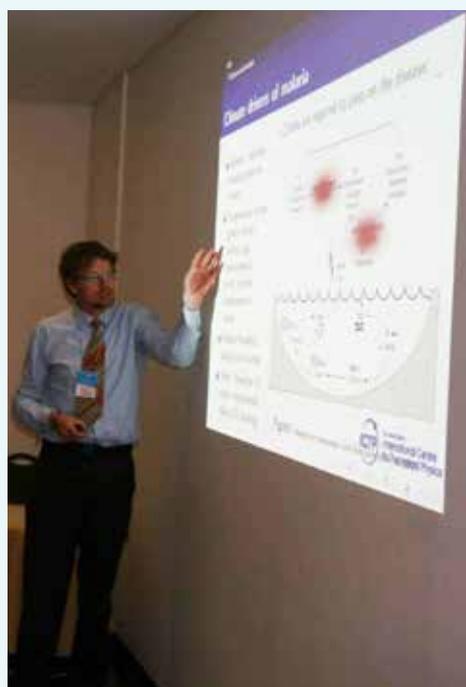
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Magaran Bagayoko (Protection of Human Environment Programme, World Health Organisation (WHO) Regional office for Africa, Brazzaville, Congo Republic) was the plenary speaker at the symposium. His talk, on the potential of climate-based early warning systems for improved management of VBDs in Africa, was highly appropriate and exceptionally well-received.

Sixteen presentations followed on a range of topics relating to climate and vector-borne diseases in Africa, from speakers who had travelled from other parts of the continent and from Europe and Asia (see the programme published in the third issue of the HEALTHY FUTURES newsletter for titles of talks and the names of those who presented).

Although the presentations were all very high quality and well received (perhaps apart from mine!) they were too numerous to detail here. The most memorable presentations, as far as I was concerned, aside from the plenary: Sheila Chemjor's (Eastern Africa Regional International Federation of Red Cross and Red Crescent, Nairobi, Kenya) talk on her fascinating work on Community Perceptions of Health Risk Management in Changing Climate in Tanzania<sup>1</sup>; Stefan Kienberger's (PLUS, Salzburg, Austria) presentation on Mapping the underlying causes of vector-borne diseases in East Africa, during which he interacted fully with the audience; Adrian Tompkins' (Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy) overview of the new Vector borne disease community model of ICTP, Trieste (VECTRI) and Francesca Di Giuseppe's (European Centre for Medium-Range Weather (ECMWF), Reading, UK) introduction of a prototype Malaria Early Warning System being developed jointly by ECMWF and ICTP.



Dr. Adrian Tompkins at the joint HEALTHY FUTURES/QWeCI symposium in Kigali, Rwanda



Jean Pierre Bizimana, National University of Rwanda, presenting at the Environment and Health in Africa (Climate and vector-borne diseases) Symposium, Kigali, Rwanda

Several graduate researchers also delivered impressive presentations at the symposium, including: Jean Pierre Bizimana (NUR) who spoke about malaria risk in urban Kigali; James Chirombo (Malawi Ministry of Health) who described a statistical model of malaria among children in Malawi; and John Gachohi (International Livestock Research Institute (ILRI), Kenya) who also spoke about disease modelling, in his case the modelling of Rift Valley fever transmission in eastern Africa.



Dr. Laragh Larsen (Trinity College Dublin), Seraphine Habimana (The New Times newspaper, Rwanda) and Dr. Francesca Di Giuseppe (ECMWF, UK) during a break from symposium proceedings.

A large debt of gratitude is owed to members of the symposium organising committee, led by Theophile Niyonzima (NUR), for their organisation and running of a very successful and enjoyable symposium. Particular thanks are due to Seraphine Habimana (a journalist for The New Times, Rwanda), not only for making prior accommodation arrangements for speakers and checking on the venue, but also for working hard to raise awareness of the symposium and issues relating to climate change and health among both the general public and new broadcasters in Rwanda.

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<sup>1</sup> For more information on the larger "Health risk management in a changing climate" Red Cross and/Red Crescent project see the information leaflet at: [http://www.climatecentre.org/downloads/File/RCRCCC\\_health\\_CS\\_4p-for%20web.pdf](http://www.climatecentre.org/downloads/File/RCRCCC_health_CS_4p-for%20web.pdf)

## Project Meetings

Fourth partners' and third Expert Review Panel meetings, Abdus Salam International Centre for Theoretical Physics (ICTP) campus, Trieste, Italy, 29 April-1 May 2013

The HEALTHY FUTURES project has just passed its half-way point and is now at a critical stage. With this in mind, project partners and members of the ERP spent three productive days discussing and planning the next important phases of the project at the fourth partners' meeting and accompanying third ERP meeting. The meetings were held at the ICTP campus in the picturesque surroundings of Trieste, Italy.



Participants at the fourth HEALTHY FUTURES Partners' Meeting

On the first day of the partners' meeting, the work package leaders presented updates on the work carried out and progress made in their work packages since the last partners' meeting, held in Arusha, Tanzania, May 2012.



Discussions at the partners' meeting in Trieste went on long into the evenings

On the second day the partners discussed, and made decisions on, specific aspects of the project, including the integration of data to and the design of the portal for the project database (an information platform which will be accessible via the project website), the revised work plan for WP3 (Environment-disease transmission relationships & modelling), the focus of next year's project workshop, to be hosted by NUR, and the stakeholder engagement aspects of WP5 (Adaptation and support tools: Development of decision support tools). These decisions will help to ensure that the project continues to progress smoothly going forward.



The third Expert Review Panel Meeting in session

The ERP provides scientific supervision, reviews the project's methodologies and comments on draft outputs. The ERP mainly comprises experts who are not members of HEALTHY FUTURES. However, the panel also includes representatives from the project management team and work package leaders, to ensure continuity across the project. Two members of the ERP were present at the partners' meeting, which was greatly appreciated and provided opportunities for the external experts and project partners to engage formally during the meeting sessions and informally during breaks and meals.

This provided a good foundation for the discussions held during the third ERP meeting, which was held on 1 May and chaired by Theophile Niyonzima, NUR. The ERP assessed the progress made by the individual work packages since the last meeting and reviewed the decisions made at the partners' meeting, making further recommendations where needed. The report from the ERP meeting, including the minutes, will be made available in the coming month to the general public through the HEALTHY FUTURES project website.

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### Second Generic Skills and Networking Workshop, Abdus Salam International Centre for Theoretical Physics (ICTP) campus, Trieste, Italy, 15-26 April 2013

The second Early Stage Researcher Generic Skills and Networking Workshop took place in April 2013, and included attendance at the Spring School on Modelling Tools and Capacity Building in Climate and Public Health in the ICTP, Trieste, Italy. The content of this school was of particular relevance to the work being carried out in the HEALTHY FUTURES project. Six early stage researchers (ESRs) from five of the HEALTHY FUTURES partner institutions participated in the two-week school, which was attended by more than fifty people in total. In addition, several other members of the HEALTHY FUTURES team contributed to teaching at the school.

The school was organised by Adrian Tompkins and Felipe Colon Gonzalez from ICTP and HEALTHY FUTURES, along with Rachel Lowe (Catalan Institute of Climate Sciences), Marilia Sa Carvalho (FioCruz), Gilma Mantilla (International Research Institute (IRI), University of Columbia), and several guest lecturers. The course consisted of a combination of lectures, practical classes and group project work. Lectures covered a wide range of topics, including the fundamentals of climate and public health, climate modelling, remote sensing, and environmental epidemiology. Material covered in the course focused on developments in statistical and dynamical disease modelling, particularly schistosomiasis, dengue fever and malaria. Practical sessions provided experience and training in the use of a variety of tools for analysing climate and disease data – and included an opportunity to work with the VECTRI malaria model developed at ICTP, which is being used in HEALTHY FUTURES. Several practical sessions focused on the use of the computer program R to develop data analysis and modelling techniques.

During the second week, members of the HEALTHY FUTURES consortium contributed to teaching in the school. Mark Booth (University of Durham (UDUR)) delivered lectures on helminth infections, and Nicky McCreesh (an ESR with HEALTHY FUTURES at UDUR) gave a talk about her PhD research on dynamical modelling of schistosomiasis. Riccardo Biondi (ICTP) spoke about using remotely sensed data related to climate and the environment in the context of health issues. David Taylor (NUS) spoke about long-term environmental change in low latitudes and about environment and disease discourses in Africa, and Andrew Githeko (Kenya Medical Research Institute (KEMRI)) gave lectures about the use of climate information in managing health risks, with a particular focus on epidemic malaria in the Kenyan highlands.

During two evenings of the second week, the HEALTHY FUTURES ESR participants gave presentations about their recent research and progress, which were attended by all HEALTHY FUTURES-related participants and contributors to the school. This provided an opportunity for extensive discussions about the research being carried out by the ESRs in HEALTHY FUTURES, and was of much benefit and interest to all present.

The five HEALTHY FUTURES-funded ESR participants at the workshop (Jean Pierre Bizimana, John Gachohi, Juser Kiplimo, Lisa Coop and Fredrick Obonyo Mukanga) worked together on a group project to examine the relative influence of climate and intervention strategies on malaria incidence in Rwanda, and presented the results of this project on the final day of the meeting, in addition to producing a group project report. A summary of their project is included below. Nicky McCreesh used the opportunity at ICTP to engage in discussions and meetings related to the schistosomiasis modelling work that forms part of her PhD research, and gained ideas about how to move forward with the schistosomiasis model. Nicky has been highly active of late in moving part of her research, the development of an agent-based schistosomiasis model, towards publication.



HEALTHY FUTURES-funded participants at the second ESR Generic Skills and Networking Workshop, ICTP, Trieste



ESR from HEALTHY FUTURES at the second ESR Generic Skills and Networking Workshop: Jean Pierre Bizimana, Lisa Coop, Juser Kiplimo, John Gachohi and Fredrick Obonyo Mukanga

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Attendance at the workshop, and in particular the school, provided a fantastic learning experience in an area highly relevant to the HEALTHY FUTURES project, and also provided an excellent networking opportunity.

The HEALTHY FUTURES ESR attendees were extremely positive about the experience they gained, and found the material covered to be interesting, useful and challenging. The skills and networking gained are highly relevant in terms of the participants' current work as part of HEALTHY FUTURES, and will also be of great benefit to their future research careers.

In reflecting on his experiences at the workshop John Gachohi stated: "the course was rich in content, extensive in coverage and challenged our focus in thinking. Moreover, it continues to be useful in our research projects". Jusper Kiplimo, another HEALTHY FUTURES-funded participant, went on to state that that the workshop provided "a great learning experience academically, professionally and socially".

The following summarises the project work carried out by Jean Pierre Bizimana (NUR, Rwanda), John Gachohi and Jusper Kiplimo (ILRI, Kenya), Lisa Coop (Climate System Analysis Group, University of Cape Town (UCT), South African) and Fredrick Obonyo Mukanga (University of Nairobi (UoN), Kenya) while attending the second ESR Generic Skills and Networking Workshop. Feedback on the project write-up, by two external evaluators, is provided at the end of the piece.

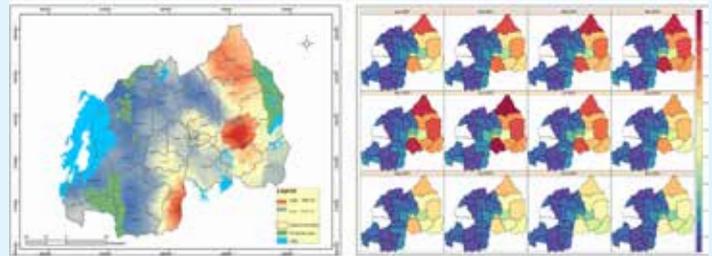
### An evaluation of the relative influence of climate and intervention strategies on malaria incidence in Rwanda

Malaria is an important mosquito-borne parasitic infection of humans. Malaria transmission is known to be sensitive to spatial and temporal variations in rainfall and temperature. The disease is endemic in Rwanda. To control the disease, the Rwandan government, in partnership with international development partners, scaled up integrated vector control strategies and accessibility of artemisinin-based combination therapy (ACT) from 2005 onwards. There are reports of major decline in malaria morbidity and mortality in Rwanda. However, it is important to assess and quantify the effectiveness of malaria transmission interruption under the pressure of the climatic variables in the area. This study aimed to determine the impact of the intervention strategies on malaria incidence.

To achieve this objective, we assembled data on the number of confirmed malaria cases in health centres aggregated at district hospitals and climatic variables from the nearest weather station, estimated the influence of rainfall and temperature on incidence of malaria and characterised the impact of seasonality and inter-annual variability on the malaria incidence in Rwanda using the VECTRI model.

The analysis utilised the generalised linear model (GLM) using the log linear link with the function  $\text{lm}(\log())$  in R software.

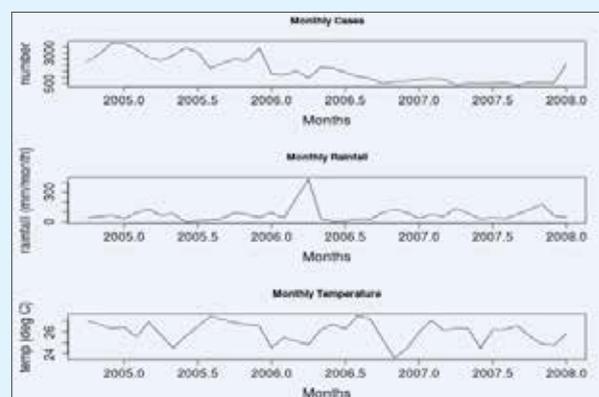
Figure 2 (left) shows the spatial distribution of the observed cases in 2007. Figure 2 (right) illustrates the VECTRI results for the same year. Both figures showed similar spatial pattern in the incidence of malaria.



**Figure 2**

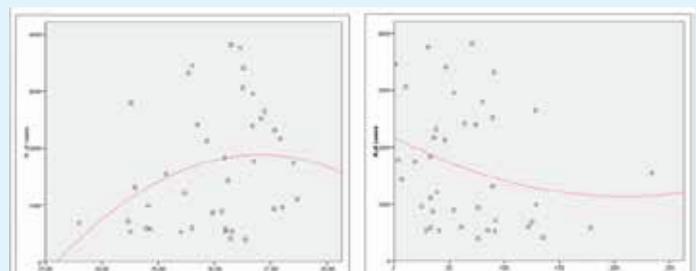
VECTRI output of the proportion of population with detectable malaria in Rwanda during 2007

Time series analysis showed a clear downward trend in cases (Figure 3). No relationship could be detected between cases and temperature on one hand and rainfall on the other (Figure 4). Cases were compared to temperature and rainfall of the same month and the three preceding months. There was no evidence of lag effect (data not shown).



**Figure 3**

Time series analysis of monthly cases, rainfall and temperature, for Kayonza District, Rwanda (2004-2008)



**Figure 4**

Relationship between cases and temperature (left) and cases and rainfall (right) for Kayonza District, Rwanda (2004-2008)

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The relationship between malaria incidence and rainfall, and malaria incidence and temperature, independently, was not significant ( $p=0.19$ ,  $p=0.77$  respectively). When the two variables were combined and the intervention incorporated into the model, taking into account seasonality, only the intervention and seasonality were significant (data not shown). A model with intervention alone accounting for seasonality was subsequently fitted. Both variables were significant at  $p<0.05$  (Table 1). Analysis of variance, used to compare the two models, returned a p-value of 0.5 meaning that one model was not better than the other one. We chose the model with intervention alone accounting for seasonality (Table 1).

**Table 1**

Final model showing the relationship between malaria incidence and intervention accounting for seasonality

Variable	Coefficient	Standard error	p-value
Intervention	-0.53	0.21	0.017
Time	-0.036	0.009	0.0003

A complete lack of relationship between malaria incidence and climatic variables was unexpected given the reported climate sensitivity in malaria. This could be attributed to insufficiency of data to detect relationships between the variables or to masking by the effectiveness of the interventions implemented in 2005.

Our results are corroborated by predictions of malaria cases in Rwanda using the VECTRI model, albeit with spatial heterogeneity, which is a proof of association between climatic variables and malaria incidence in Rwanda. It follows that the differences in output between our model and VECTRI model could have largely resulted from a high impact consequence and not migration alone. This study suggests that the effect of interventions masked the known relationship between climate and malaria incidence in Rwanda. This needs further exploration with data for a longer period and more locations.

The group project work carried out by the HEALTHY FUTURES participants, outlined above, focused on the relative influence of climate and intervention strategies on malaria incidence in Rwanda. The following is feedback on the project write-up from two external evaluators:

**The output from this project provided a good summary of the influence of climate and intervention strategies on malaria incidence in Rwanda, using the VECTRI model. There was no relationship found between malaria incidence and climatic variables, which may be due to masking by the intervention strategies implemented during the**



period modelled. However, the result of the project also raises several useful points regarding climate and malaria modelling. For example, migration of people from where they are infected to where malaria cases are identified is an important consideration, as this has implications for the spatial distribution of malaria incidence data. Furthermore, as with any study comparing datasets gathered in different locations, the distance between climate stations and health centres must be taken into account, particularly if the climate stations are relatively sparse. In addition, the use of monthly averages for climatic parameters may obscure important patterns in terms of extremes of temperature, rainfall intensity, and dry spell durations, which can play an important role in malaria incidence. Such considerations should be incorporated into further studies of the relative influence of climate and intervention strategies on malaria incidence.

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### FORTHCOMING EVENTS

Information on forthcoming events of relevance to environment and health is provided on the HEALTHY FUTURES project website in the form of a frequently updated list. This can be found on the front page of the website (<http://www.healthyfutures.eu/>) and as an events calendar by clicking on "Events" at the top of the same page.

Upcoming events (including courses) not currently included on the HEALTHY FUTURES project website that may be of interest are:

The 12th International National Centre of Competence in Research (NCCR)/Swiss Climate Summer School Grindelwald, Switzerland, 1-6 September 2013. The theme of the school is "from climate reconstruction to climate predictions". More information is available at [http://www.oeschger.unibe.ch/education/summer\\_school/](http://www.oeschger.unibe.ch/education/summer_school/)

The third International Conference on Climate Services (ICCS 3), Montego Bay, Jamaica, 4-6 December 2013, will explore constraints to scaling up climate services, paying specific attention to issues of drought monitoring, coastal management, and climate and health interventions. More information on the conference, including conference registration etc, is available at <http://csp-dev.zaloni.net/event/international-conference-climate-services>

The fifth HEALTHY FUTURES partners' and fourth ERP meetings are scheduled for Nairobi, Kenya, early in 2014. As in Kampala, Arusha and Trieste, the meetings will run back-to-back. The organisers also plan to hold the first meeting for stakeholders regarding DSTs that are being developed through HEALTHY FUTURES in Nairobi and directly after the partners' and ERP meetings (see article by Stacey and Richard in this issue of the newsletter).

HEALTHY FUTURES will also organise a major international conference targeting climate change and health, which will be hosted by NUR, and scheduled to coincide with release of the next (fifth) IPCC Climate Change Assessment report.

Details of the conference will be posted on the project website and emailed to stakeholders in HEALTHY FUTURES as soon as they are available. Dr Theophile Niyonzima ([tniyonzima@nur.ac.rw](mailto:tniyonzima@nur.ac.rw)), Deputy Director at the Centre for Environment Entrepreneurship and Sustainable Development and a member of faculty in the Geography Department, Faculty of Science at NUR, is chair of the local organising committee for the conference.

### NEXT ISSUE OF THE NEWSLETTER

The next (fifth) issue of the HEALTHY FUTURES project newsletter is scheduled for release in early 2014. Please send contributions for the next issue to:

David Taylor ([david.taylor@nus.edu.sg](mailto:david.taylor@nus.edu.sg)) or Paul Lowen ([paul@aquatt.ie](mailto:paul@aquatt.ie)). Please send your contributions as soon as possible, rather than waiting for the deadline for submissions to become imminent. As we are always keen to improve, please also send Paul and David any suggestions as to how the newsletter might be improved in the future.

