WHO-EM/MAL/375/E

Report on the

Seventh meeting of the Regional Scientific and Technical Advisory Committee of the WHO/UNEP project supported by the Global Environmental Facility

Cairo, Egypt
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1. INTRODUCTION

A project entitled “Demonstration of sustainable alternatives to DDT and strengthening of vector control capabilities in Middle East and North Africa” is being implemented by the World Health Organization (WHO) Regional Office for the Eastern Mediterranean and the United Nations Environment Programme (UNEP), with financial support from the Global Environmental Facility (GEF). This regional project (2009–2014) covers the following countries of the WHO Eastern Mediterranean Region: Djibouti, Egypt, Islamic Republic of Iran, Jordan, Morocco, Sudan, Syrian Arab Republic and Yemen. A total of US$ 3.9 million has been made available to support the five components of the project at national and regional level.

In the WHO African Region a project with similar objectives entitled “Demonstrating cost-effectiveness and sustainability of environmentally-sound and locally-appropriate alternatives to DDT for malaria control in Africa” has been implemented since 2011 in two countries, Ethiopia and Madagascar.

The seventh and final meeting of the Scientific and Technical Advisory Committee (STAC) and the fourth meeting of the regional Project Steering Committee (PSC) of the WHO/UNEP/GEF projects in the two Regions, respectively, were jointly held in Cairo, Egypt, during 16–19 June 2014. For the programme see Annex 1. The seventh STAC meeting aimed to build on the recommendations of the previous STAC meetings held in: Amman, Jordan in November 2008; Cairo, Egypt, in July 2009; Damascus, Syrian Arab Republic in July 2010; Marrakesh, Morocco in July 2011; Cairo, Egypt in July 2012; and Khartoum, Sudan in June 2013. The fourth PSC meeting intended to review progress made in the two countries and find ways to accelerate the implementation of the project in view of the delay in the progress.

The objectives of the STAC meeting for the Eastern Mediterranean Region were to:

- present and review the status of project activities on the demonstration of alternative vector control interventions to DDT;
- report on the status of the disposal of obsolete DDT and other pesticides in Morocco, the Islamic Republic of Iran and Jordan;
- identify challenges and constraints in the overall implementation of the project in countries of the Region.

The objectives of the PSC meeting for the African Region were to:

- review project activities implementation in Ethiopia and Madagascar;
- review the two countries’ planned activities for the next malaria season;
- discuss the way forward to expedite implementation to ensure completion in the planned time frame;
- facilitate experiences and lesson sharing with the Eastern Mediterranean Region;
- provide highlights of the project.

Mr Simon Kuene (16 June), Dr Salaheldin Mubarak Elkhalifa (17 June), Dr Lama Jalouk (18 June) and Ms Caroline Barwa (19 June) were elected as Chair. Dr Hoda Atta and Ms Caroline Barwa were elected as Rapporteurs.

The meeting was attended by 37 participants including country delegates from both Regions, African Region and Eastern Mediterranean Region STAC and PSC members, and UNEP and WHO staff from country, regional and headquarters levels. For the list of participants see Annex 2.

The meeting was opened by Dr Hoda Atta, who delivered a message from Dr Ala Alwan, WHO Regional Director for the Eastern Mediterranean. In his message, Dr Alwan noted that this was the first meeting between countries belonging to the African and East Mediterranean Regions, providing an opportunity to share regional experiences in using alternatives to DDT for vector control.

Dr Alwan acknowledged the progress made since the project's inception in January 2006, with all countries practicing sound decision-making concerning the use of chemical and non-chemical alternatives to DDT in the context of integrated vector management (IVM) in countries such as the Islamic Republic of Iran and Morocco, where GEF-supported studies had provided strategic direction in tackling vector-borne diseases. He observed that the project had allowed countries to establish a strong country coordination mechanism, which extends to international partners such as the Food and Agriculture Organization of the United Nations (FAO), the Liverpool School of Tropical Medicine and the London School of Hygiene and Tropical Medicine.

Dr Alwan recognized the regional efforts made in developing a robust curriculum for a Masters degree programme in medical entomology and vector control which included a six month field training component, a unique feature of the programme which had been replicated in the Islamic Republic of Iran and Pakistan. He also highlighted that institutional arrangements to facilitate intersectoral and intrasectoral collaboration had been strengthened through the development of strategic plans and steering committees that emphasized the commitment of all participating countries to IVM. He noted how this had been further supported by the Framework for action on the sound management of public health pesticides in the Eastern Mediterranean Region (2012–2016).

Dr Alwan concluded by saying that a milestone had been crossed when the Islamic Republic of Iran, Syrian Arab Republic and Sudan had joined the other participating countries in the ratification of the Stockholm Convention on Persistent Organic Pollutants, highlighting their commitment to eliminating or restricting the production and use of persistent organic pollutants (POPs) within the Region. He applauded the public health pesticide component of the project which had dealt with the safe collection, repackaging and disposal of approximately 87 tonnes of POPs and contaminated equipment used in public health and agriculture from Jordan and Morocco, while the transportation of 32.5 tonnes from the Islamic Republic of Iran was currently underway and the incineration of the hazardous waste was expected to be completed by August 2014.

On behalf of UNEP/GEF, Mr Jan Betlem, Head Monitoring, Office for Operations, Quality Assurance Section, UNEP, observed that forums such as these were excellent

opportunities for technical personnel belonging to different projects to learn from each other's experiences in order to consolidate and replicate the gains made. He urged United Nations (UN) organizations to continue to have a pivotal role in coordinating partnerships between countries, research institutes and convention secretariats to achieve project deliverables. He informed participants that the Parties to the Stockholm Convention had embarked on an initiative to encourage countries to reach consensus on a road map to deal with DDT chemicals, but emphasized that this could only be achieved if there were suitable alternatives to DDT which needed to be more concretely defined as the way forward. UNEP had recently approved a project proposal to reduce DDT production in India (over five years) and replace it with a bed net manufacturing factory. He concluded by saying that within 6–7 years there would be no more countries using DDT, especially with the alternatives being used through IVM.

2. EASTERN MEDITERRANEAN REGION PROJECT PROGRESS REPORT

Ms Caroline Barwa, WHO Regional Office for the Eastern Mediterranean

The regional activities conducted in the year ending June 2014 were presented in relation to each outcome. Details relating to each country activity are covered in the country presentations (see Section 4).

Outcome 1: Sustainable and cost-effective DDT alternatives demonstrated. Onsite technical support was provided to Morocco for data analysis and manuscript finalization and to Sudan for data analysis. During the malaria programme review, site visits were made to the Islamic Republic of Iran study site and in Yemen where a data analysis was conducted on the entomological surveys (pre- and post-intervention).

Outcome 2: Capacity built to implement DDT alternatives based on the principles of IVM. In-depth malaria programme reviews were conducted in three countries in 2013 (Islamic Republic of Iran, Sudan and Yemen), consisting of a joint evaluation of national control programmes within national strategic planning and programming cycles, to further improve evidence-based, effective and efficient programme management. Malaria programme reviews were led and owned by endemic countries themselves, and built around the principle of capacity-building at country level, allowing national stakeholders to perform an independent self-assessment of all technical and management areas of malaria control policy and programming in the country, including vector control.

An IVM workshop was held in Khartoum, Sudan, in December 2013 to update the IVM strategy (2014–2018). The strategy addresses the current challenges and gaps, and translates the political vision and the desired changes of the Federal Ministry of Health into actions for sustainable vector control through the use of cost-effective, environmentally-sound and sustainable interventions, and to minimize the risks associated with the use of pesticides to humans and the environment. A regional consultation to discuss the working draft of the Global Technical Strategy (GTS) for malaria (2016–2025) was held in Morocco in April 2014 to obtain contributions from participants on the different aspects of the GTS including

strategic directions and long-term scenarios for accelerated malaria control and elimination; this extends to intensifying efforts in developing a comprehensive insecticide resistance management plan and proper monitoring and data management. This was directly followed by a regional consultation for developing the second Global Malaria Action Plan overseen by the Roll Back Malaria Partnership that aimed to bring together key stakeholders from the major Roll Back Malaria constituencies including health sector representatives, civil society, the private sector, product development partnerships, research and academia, as well as foundations, and multilateral and bilateral development partners, to ensure a broadly consultative process and rich exchange. An IVM questionnaire has been developed from the WHO handbook on monitoring and evaluation indicators for IVM, respective country vector needs assessments and IVM strategies for the seven countries, and this has been used as a situation analysis to document the achievements of the project under this component. Specific national capacity-building activities were reported by countries.

Outcome 3: Repackaging and disposal of POPs. Details are included under Section 3 below.

Outcome 4: Good practices on sustainable alternatives are shared. A workshop on the development of pesticide specifications was held in Isfahan, Islamic Republic of Iran, during 4–6 November 2013. The workshop was attended by 19 staff of the Ministries of Health and Medical Education and Agriculture and from the Department of Environment. The objectives of the workshop were to provide an introduction to the principles and practices of defining acceptable quality and equivalence of pesticides, improve skills on the development of pesticide specifications for quality control and improve/develop skills on evaluation of dossiers submitted for product registration with regard to product specifications and equivalence determination. As part of the spill-over effect, a situation analysis of public health pesticide practices was conducted in Pakistan by a WHO assessment team. The assessment was carried out with the aim of improving management of these chemicals in the face of the increasing burden of vector-borne diseases in the country, minimizing potential health and environmental risks associated with their use, optimizing utilization of resources and ensuring effective and efficient use of pesticides in a manner that contributes to sustainable improvement of public health and the environment.

Outcome 5: Trans-boundary and national coordination and information sharing to promote IVM without the use of DDT. In addition to organizing the seventh STAC meeting, the Regional Office has revamped its malaria control and elimination web site, which includes the GEF web page (http://www.emro.who.int/entity/malaria-control-and-elimination/index.html). E-materials, which include posters, infographics and fact sheets were developed for World Health Day 2014 (7 April) for eight vector-borne diseases (on the theme of “Small bite, big threat”) in several languages (Arabic, English and French). Five posters were developed to document the achievements of the project: three illustrating study results from the Islamic Republic of Iran, Morocco and Sudan, one highlighting the deliverables achieved for the management of public health pesticides and one documenting the achievements made in capacity enhancement to implement DDT alternatives based on IVM principles. The

Regional Office has also circulated three handbooks (on malaria entomology and vector control, larval source management and updated malaria control in humanitarian emergencies) and five guidance notes recently published by WHO addressing: combining indoor residual spraying (IRS) and long-lasting insecticide-treated nets (LLINs); achieving universal coverage with LLINs in malaria control; sound management of old LLINs; estimating longevity of LLINs; and capacity-building in malaria entomology and vector control.

The financial implementation rate of the project is reported at 87% and the balance at approximately US$ 395 000. Except for Jordan and Morocco, there has been delay in the final wrap-up of activities. To date, aside from three countries submitting timely progress reports, communication and response by GEF focal points has been poor and countries are reminded of their obligations to submit their progress reports in a timely manner. There has been a delay in financial expenditure in Yemen.

This first interregional meeting is an opportunity to enhance the replication of the results and adaptive management approach for the benefit of other countries, including in other Regions, through dissemination of best practices in regional meetings and cross-border collaborations overseen by WHO offices. Reciprocal visits of policy-makers and programme managers should be proposed to non-GEF and African Region countries for sharing of experiences on policies, institutional arrangements and implementation.

The next steps include: developing a comprehensive and time bound action plan for the finalization of the project by each country; discussion on how to implement the remaining funds; development of a plan of action to ensure all funds are fully implemented in the most effective manner by December 2014 (with no cost extension to December 2015); agreeing a timeline for completion of data analysis; finalization of the project including final evaluation, reports and other documentation; dissemination of data through publication of articles in order to share important experiences and lessons learnt with other Eastern Mediterranean Region countries; and discussion on the possibility of new collaboration following the project.

The Region is experiencing an increasing risk of vector-borne diseases. The proposed technical priorities for the future include: a planned regional IVM training course (Cairo, August 2014), updating regional/country IVM strategies, completing the disposal of POPs in the Islamic Republic of Iran, expansion of POPs disposal to other non-Africa Stockpiles Programme countries (such as Djibouti and Egypt), completing the insecticide resistance database and identifying new environmentally-safe larval source management as an alternative to public health pesticides to synergize efforts in tackling vector-borne diseases such as malaria and dengue.

3. UPDATE ON COLLECTION, REPACKING AND DISPOSAL OF PERSISTENT ORGANIC POLLUTANTS

Dr Richard Thompson, FAO

The majority of the waste DDT covered by this component has been destroyed during the reporting period.

Project activities in Jordan have been completed. The 23.8 tonnes of DDT and other obsolete stocks that were repacked in June 2013 were destroyed at the Tredi SA high temperature incineration facility in France in December 2013.

In Morocco, safeguarding was completed in June 2013 with the repacking of 42.5 tonnes of DDT and contaminated packaging. The concentrated DDT waste (41.2 tonnes) was shipped to France and destroyed by high temperature incineration in December 2013. A proportion of the safeguarded contaminated packaging (1.2 tonnes) that was temporarily stored at the contractor's store in Casablanca will shipped in June 2014 and destroyed by August 2014.

In the Islamic Republic of Iran, due to delays in the process for obtaining Basel Convention authorization to ship the waste, safeguarding activities were phased to commence in January 2014. The contractors initiated safeguarding at the first five stores using locally-procured packaging and personal protective equipment until Iranian customs authorities released their imported safeguarding equipment. The safeguarded stocks were centralized in the Tehran store where they were repacked into UN-approved containers, and 28.7 tonnes of repacked DDT was shipped from Tehran on 21 May 2014 and is expected to arrive in France in August 2014 and be destroyed in September 2014. A proportion of the safeguarded contaminated packaging (four cubic metres) could not be shipped in the first consignment and will be shipped in August 2014.

Through efficiency savings in project execution and lower quantities of wastes, there are approximately US$ 80 000 of residual funds available. It is recommended that these funds are used to build capacity in monitoring disposal activities in France and designing an empty pesticide container management scheme. This will require the project to be extended until June 2015.

In discussion, it was clarified that Jordan and Morocco had banned DDT in 1995. Concerns were raised for landlocked countries that are at different stages of ratification of conventions such as the Stockholm and Basel Conventions. This issue has been addressed through environmental health bodies in the respective countries, but progress has varied. Ethiopia was cited as an example where huge stockpiles of DDT and obsolete pyrethroids have not been resolved and this needs to be discussed with FAO, who are currently in discussion with the environmental health authorities there.

4. EASTERN MEDITERRANEAN REGION COUNTRY REPORTS: DEMONSTRATION OF ALTERNATIVES TO DDT IN VECTOR CONTROL

4.1 Djibouti

The project's objective in Djibouti is to strengthen capacity for integrated vector control and routine entomological surveillance. The Government has initiated efforts to develop strategies against vector-borne diseases with high level political support from the Minister of Health who chaired the previous IVM steering committee meeting held in 2013.

Djibouti has faced a dramatic upsurge in confirmed malaria cases from 28 in 2012 to 4437 in 2014. The majority of cases have been confirmed by rapid diagnostic test (RDT), although 300 cases from 2013 were diagnosed clinically due to stock-out of RDTs. To date, all 2014 cases have been confirmed by RDT (supplied by WHO), although some cases have not come to the clinics, seeking self-medication instead.

Past entomological surveys have identified household storage practices (jerry cans, household buckets), as well as stagnant pools of water found within the vicinity of households, as primary breeding sites of the vector (belonging to the *Anopheles gambiae* complex species). The large larval collections made inside household water containers is not indicative of malaria vectors, which generally breed outdoors in stagnant pools of water and this issue needs to be further explored by professional entomologists to confirm these findings, including a fully-fledged situation analysis and needs assessment on the vectors present and the most effective vector control interventions. Fumigation should be considered as the last resort given its poor cost-effectiveness.

In 2012, 17 field staff were trained on vector collection methods and insecticide resistance monitoring to strengthen the capacities of the public health institute team responsible for vector control. This was followed in 2014 by the training of 32 technicians/field staff on basic entomological surveillance methods, which included identification of mosquitoes and how to design a surveillance study. The programme continues to face challenges in sustaining capacity-building. None of the 44 hygiene agents trained last year have managed to proceed in their careers with distinct job descriptions and the two staff members trained on entomology have been unable to implement any activities due to no annual work plan or budget. To compound problems further, the programme continues to be affected by high staff turnover and there is no pesticide storage unit, no entomological field equipment, intermittent political commitment and insufficient stakeholder participation from other sectors.

The last suspected dengue outbreak occurred in 2013, but suspected cases were found to be negative through enzyme-linked immunoabsorbent assay (ELISA), although the international military base confirmed the cases to be dengue. Further investigation by the Ministry of Health was constrained by lack of sufficient resources resulting in the outbreak being categorized as an unknown fever. Efforts will be made to document the failure to respond rapidly and effectively (the cost of not reacting) to prevent further escalation in coming years.

4.2 Egypt

The project's objective in Egypt is to build national capacity in the areas of IVM, vector surveillance/mapping and resistance monitoring, as well as sound management of public health pesticides. At least seven vector-borne diseases of public health concern affect Egypt, of which lymphatic filariasis and Rift Valley fever are the most important. There has been no reported case of dengue but the risk exists in the Red Sea Governorate from *Aedes albopictus*.

The Vector Control Department and Research Institute of Medical Entomology, Ministry of Health and Population, Egypt aimed to establish an electronic geographic information system (GIS)-based database of different Egyptian vectors in almost all governorates. To accomplish this, entomological investigations were conducted during 2012–2014, surveying mosquitoes, flies and rodents including their susceptibility levels to common insecticides used in vector control. GIS has allowed researchers to visualize data distribution on maps together with environmental parameters such as temperature and relative humidity. The obtained results can thus provide a new basis for directing the control of mosquito vectors as they provide health authorities with precise maps of mosquito breeding habitats in a timely manner. The distribution of different vectors was studied in three phases to cover 23 of the 26 governorates of Egypt. In September 2013, the final phase was conducted in six governorates and species distribution has been identified in three governorates (Menofia, Assiut and New Valley), while the data is currently being analysed for the remaining three. The survey included mosquitoes (adult and larvae), house flies, sand flies, rodents and fleas, as well as insecticide resistance, in order to prepare a map using GIS to study the risk areas and select the most appropriate methods of vector control. The common house fly *Musca domestica* Linnaeus was the most common species found in all governorates. Overall, six mosquito species (*Culex pipiens, Cx. antennatus, Cx. perexiguus, Culiseta longiareolata, Ochlerotatus detritus* and *An. multicolour*), adults and larvae, were found to be the most common mosquito species found in all study areas. The surveillance also found that both adult and larvae of *Cx. pipiens* were found to be resistant to two or more insecticides in almost all governorates.

The Vector Control Department and Research Institute of Medical Entomology has guided the vector control programme to use IVM and increase collaboration between health and non-health sectors at the peripheral level of local vector control units in different governorates. One of the key successes for Egypt has been the national IVM steering committee, which operates independently without international donor funding. The committee continues to meet to strengthen the IVM concept in the health and non-health sectors through an IVM action plan which enhances the role of each non-health sector and is approved by all key ministries. The functioning of the IVM steering committee without any GEF-supported funds has been one of the achievements of the project, with representatives from non-health sectors, such as environmental affairs, agriculture and academia, all of whom have been very pro-active since the inception of the project contributing to the sustainability of the approach.

The impact of the integration between the health sector (Vector Control Department and Research Institute of Medical Entomology) and the non-health sector (Ministry of Water Resources and Irrigation, Ministry of Agriculture and Land Reclamation, Ministry of State for Environmental Affairs) was examined and evaluated in case studies in two governorates. The first case study was in Fayoum governorate where the bank of an irrigation channel in El Bats village collapsed during December 2013, leading to the flooding of a large number of houses in the village and surrounding area. The number of breeding sites of mosquito larvae increased dramatically, with over 30 breeding sites identified (only three sites had been detected prior to the flooding). Collaboration between the health and non-health sectors has successfully tackled the excess water and eliminated more than 90% of the breeding places in the area.

The second case study focused on the malaria outbreak reported in May 2014 in Al Adua village, Aswan governorate. The Vector Control Department implemented focused IRS operations using deltamethrin insecticide and environmental management with non-health sectors targeting 70 breeding places in Al Adua and surrounded villages, successfully stopping transmission two weeks post the outbreak. Overall, 20 malaria cases have been observed and all cases have recovered and returned home.

Both studies have highlighted a shortage of highly-qualified entomologists in the “hot spot” governorates (Aswan and Fayoum) and inadequate logistics including a lack of equipment such as light and other traps (gravid, ovitraps), and transportation vehicles. There is a need to establish several sentinel sites in Aswan and Fayoum governorates, supported with high qualified personnel and sufficient facilities for monitoring through entomological investigations (including insecticide resistance) and appropriate laboratories to detect parasites in vectors and human samples.

4.3 Islamic Republic of Iran

The project in the Islamic Republic of Iran aimed to replace the currently-used chemicals with environmentally-friendly vector control alternative methods that are viable, available, sustainable, cost-effective and compatible with the principles of IVM. The project was implemented in Chabahar city as this is the last urban area with malaria transmission. There is cross-border population movement, the climate is semi-arid/tropical (similar to other malarious areas) and the community is marginalized, suffering from a low income status and a high level of illiteracy. Larval source management (LSM) is recommended for urban settings as there have been a few research trials focusing on LSM, and given the behaviour of the vector, emerging insecticide resistance and other operational issues, LSM has played a pivotal role as a malaria control intervention in the malaria strategy of the country.

The goal of the project was to demonstrate cost-effective, sustainable and alternative larval control methods in urban settings. The specific objectives of the randomized clustered trial were to: assess the efficacy of covering breeding places with natural materials (mats made of date leaf); assess the efficacy of covering breeding places with synthetic materials (i.e. ceramic); assess the efficacy of regular larviciding by *Bacillus thuringiensis israelensis*

(Bti); determine the knowledge, attitude and behavior of the target population regarding interventions (before and after); assess community acceptance of planned interventions; and assess the cost-effectiveness and sustainability of interventions. The expected outcomes/outputs were: selection of LSM solutions based on environment management; revised and standardized LSM procedures for planning, implementation, and monitoring and evaluation; and knowledge sharing through standardization and documentation of all aspects of the study (larviciding, environmental management, peer-to-peer education of local community members). The project conducted a knowledge, attitude and practices survey focusing on LSM and is in the process of assessing the efficacy, sustainability, durability and community acceptance of LSM interventions. Strong partnerships have been established with the Ministry of Health and Medical Education, Zahedan University, and international organizations (WHO and United Nations Development Programme) and research centres.

The study was implemented in four phases.

1. Preparatory phase (2010–2011). To define the scope of the problem a situation analysis was undertaken involving the gathering of information on all breeding habitats, a serological survey, analyzing the epidemiological situation and an entomological survey. The possible solutions were explored: six types of water reservoir lids constructed and compared, assessing feasibility, affordability (cost), acceptability, sustainability and effectiveness. The information was compiled and used to finalize the study design and develop an action plan. A census and mapping of the target population was also undertaken and an estimation made of the required supplies and equipment.

2. Pre-intervention phase (April–June 2013). Baseline surveys, preliminary community assessment, capacity-building for implementation of the interventions (entomological and knowledge, attitude and practices surveys) and resource mobilization were undertaken.

3. Intervention phase (June–August 2013). This involved peer education by trained community health workers (one per 50 households) and environment management. Several advocacy meetings were also held with the governor and rural Islamic council members to seek support from stakeholders and policy-makers.

4. Post-intervention phase (August 2013–September 2014). This includes an assessment of the intervention's durability, sustainability, community acceptance and cost-effectiveness and the reporting and dissemination of best practices and lessons learnt. The assessment of durability, sustainability and community acceptance was conducted in 30% of randomly-selected households in target clusters three months post-intervention. An entomological survey was also conducted to determine larval density in 10% of randomly-selected water reservoirs every two weeks during the malaria transmission season. The cost-effectiveness analysis of the intervention is pending, and the development of the final report will be completed by September 2014. An external evaluation of the project is planned by mid-September 2014.

The current findings are that:

- community acceptance of covering water reservoirs with natural materials is low and the coverings are not sustainable and have no effect on larval density;
- compared with lids made from natural materials, covering water reservoirs with ceramic is an accepted method by community members but is not as cost-effective;
- routine larviciding using Bti is more feasible and cost-effective.

In discussion, the Islamic Republic of Iran was encouraged to investigate whether these interventions would prevent humidity increases for control of breeding sites for sand flies in co-endemic areas of both diseases. It was suggested that the findings on cost-effectiveness were inconclusive given the absence of epidemiological data. Although incidence (2010–2013) of cases is zero, cross-border movement increases the risk for introduced cases. The safety of applying Bti to drinking water was discussed, and it was clarified that there was not a hazard to humans if the Bti is manufactured to the highest quality and hygienic standards under appropriate conditions that meet WHO Pesticide Evaluation Scheme (WHOPES) specifications. It was explained that the durability of material outweighed the cost-effectiveness of locally-produced materials making Bti a more viable option. The programme was urged to provide all necessary details of the study at the earliest convenience to substantiate the findings.

4.4 Jordan

A training course on vector surveillance and monitoring of vector susceptibility to operational insecticides (temephos, deltamethrin and lambda-cyhalothrin) was held in Ghor Al-Safi from 3 to 6 March 2014. Twelve participants from all regions of the country attended the training course. A second training course was held on vector surveillance and susceptibility tests for technicians in the Jordan Valley (Deir Alla) from 27 to 30 April 2014.

A study on the susceptibility of mosquito larvae and adult mosquitoes to the used insecticides was conducted at different sites of the highly receptive areas of Jordan (Ghor Al-Safi and Deir Alla lowlands) during March–May 2014. Suspected deltamethrin resistance was detected among *An. superpictus* (Deir Alla), deltamethrin resistance among *Cx. theileri* (Ghor Al-Safi) and *Cx. laticinctus* (Deir Alla), while lambdacyhalothrin resistance was identified in *Cx. pipiens* (Ghor Al-Safi) and *Cx. theileri* (Deir Alla).

A study is currently being conducted to develop a geographical distribution information system (GIS) for *Phlebotomus* sandflies in Jordan from February to May 2014. Sandflies were collected from 24 known active foci of cutaneous leishmaniasis transmission nationwide. In each focus, 18 sticky traps and two light traps were used for collection of sandflies from animal shelters. Two aspirators were used for the collection of sandflies from houses. The sandflies have been identified to species level: *P. papatasi, P. sergenti, P. alexandri, P. major syriacus* and *P. mascittii canaaniticus.* A small field trial to evaluate the efficacy of local larvivorous fish for larval control is underway. The trial is being conducted in collaboration with the Jordanian Environment Society. The local fish (*Aphanius*

richardsoni) have been collected from the Al-Mazrah area and introduced to selected breeding sites in the Dead Sea area. The average larval density in the intervention site was 15 larvae/250 ml prior to the intervention (measured by dip technique), and will be monitored on weekly basis after the intervention.

4.5 Morocco

The main study conducted within the framework of the project has been a three-armed randomized cluster trial in 42 localities in eight leishmaniasis-endemic provinces (*Leishmania tropica*) in Morocco. The three study arms were: use of LLINs plus environmental management; residual spraying with alpha-cypermethrin (IRS) plus environmental management; and environmental management only. The incidence of new cutaneous leishmaniasis cases was determined by passive and active case detection, and cost and cost-effectiveness of interventions were compared between study arms over five years (two pre- and three post-intervention). Sandfly density and other entomological data were collected in a subset of clusters and compared between study arms.

In parallel to this study, many small studies were conducted: sandfly distribution and bionomics; LLIN usage assessment in LLIN localities in 2012; the residual effect of alpha-cypermethrin in two IRS localities and its impact on sandfly gravidity; sandfly susceptibility status; and health/environment conditions and their impact on leishmaniasis transmission.

The findings were that: IRS with alpha-cypermethrin is an effective intervention for cutaneous leishmaniasis control in Morocco; LLINs had a weak effect that was not statistically significant but its efficacy may have been reduced by low usage rates; the cost of both IRS and LLINs was high in the study area; neither LLINs nor IRS appeared to be cost-effective (using WHO thresholds), but IRS can be recommended for areas of relatively high cutaneous leishmaniasis incidence in Morocco; the residual activity of alpha-cypermethrin at the concentration used lasted 10 weeks after spraying; *P. sergenti* and *P. papatasi* are still susceptible to the insecticides tested in the studied villages; susceptibility of *Phlebotomus* resistance should be regularly monitored; and the environmental conditions involved in leishmaniasis transmission were identified and the related risk quantified and a cross-sectional/case study should be conducted to confirm the findings. The study article is near completion and will be submitted for publication soon.

Concerns were raised on the comparison of the intervention areas to the control made on the basis of the measurement of transmission by new cases. After the transmission season, some members of the community who have been bitten, will be immunized but will still be included in the category of those who remain susceptible (as identified by the leishmaniasis test). Therefore, the denominator is constantly modified annually, hence the need for a mathematical model to analyse infection according to age, specifically targeting the younger generation to give more robust data. The researchers involved in the randomized control trial stated that extensive efforts had been made to detect and treat all cases of leishmaniasis,

hence validating the findings, and that the study had successfully demonstrated a marked reduction in sandfly density resulting in no cases being reported in the final year.

Poor LLIN usage remained a challenge throughout the project despite concerted efforts to change the habits of the population through vigorous information campaigns resulting in enhanced awareness for active case detection at health facilities and recognition of the beneficial effects of LLINs. Poor collections were made using United States Centers for Disease Control and Prevention (CDC) light traps due to incorrect battery voltages being used and, as such, the sticky trap collections reflect the outdoor density sandflies collected within the vicinity of households and cattle sheds and do not show the direct impact of either IRS or LLINs on the indoor resting density of sandflies.

Both interventions had the same impact on sandfly density (reduction) when disaggregated by gender (previous studies have shown males to exhibit pheromones, enticing female sandflies for mating at feeding locations). Despite the assessment of health environment conditions indicating caves as a high risk for transmission, the probability of an infection is minimal as community members do not frequent these places. One conclusion to draw from the study has been the impact that environmental management alone has had on the reduction of sandfly density during the three consecutive years in the control locality Ait Boukidour (Tinghir province), where the vector *P. papatasi* resides mainly in rodent burrows and animal shelters. It was observed that neither IRS nor LLINs were found to be cost-effective but this may be a reflection of the high cost of the experimental set-up. The calculations for cost-effectiveness were made on resource inputs (nets) during the study period and did not take into account the replacement of the insecticide-treated bed nets (ITNs) with LLINs in the second year of the study. LLINs are cheaper per person and this is linked with operational scale; therefore, the overall cost per protection is expected to reduce. Even though IRS is more expensive, the effect is stronger than LLINs (the WHO threshold only serves as a guideline for countries). It was noted that measuring cost-effectiveness in elimination will be pointless as few cases are averted and few disability life adjusted years (DALYs) are saved. Alpha-cypermethrin (used in the IRS campaign) was not used in insecticide susceptibility tests due to procurement constraints resulting in a similar type two pyrethroid being used (lambda-cyhalothrin).

4.6 Sudan

The Sudanese project has two main objectives: to determine whether combining LLINs and IRS provides additional protection compared to one method alone; and whether insecticide resistance has an impact on the effectiveness of vector control interventions. To achieve these two key objectives, the study was designed to have two arms, an LLIN arm (70 clusters) and an LLIN plus IRS arm (70 clusters), distributed equally in four study areas. The background and study design have been previously reported.

In April 2014, new LLINs replaced previously distributed LLINs (272 940) from April 2011. In 2013, two rounds of IRS application campaigns were implemented in all of the 70

clusters targeted for IRS (70 clusters with bendiocarb), achieving 96.4% coverage in the first round and 92.5% in the second round. The malaria incidence collected by active case detection (May 2013 to March 2014) by community health workers from the two study arms was compared and the result showed no additional protection resulting from combined LLINs plus IRS versus LLINs alone, with statistically no significant difference between them. The total reported malaria incidence per 1000 was 41.1 for the combined arm (498 cases) and 47.1 for the LLINs alone (569 cases).

The result of comparison of low and high resistance clusters by study arm (May 2013 to March 2014) showed there was statistically no significant difference between both study arms and between both low and high resistance cluster groups. For low resistance clusters, total cases for the combined arm were 131 and 76 for LLINs alone, with a confidence interval of 0.30–2.87 and $P = 0.9$, resulting in no significant difference between the two arms. For the high resistance clusters, the total cases in the LLINs alone arm was 177 and for the combined arm was 56, with no significant difference observed between both arms, with a confidence interval of 0.21–2.75 and $P = 0.67$.

The rate ratio during the study period June 2012–May 2013 when deltamethrin was used, and June 2013–March 2014 when bendiocarb was used, indicated a highly significant difference between the two study periods, with the confidence interval being 0.34–0.67 and $P < 0.001$. For the combined LLIN and IRS (deltamethrin) study cluster during the June 2012 – May 2013 period, the number of cases was 126 and for LLINs alone it was 115. The confidence interval was 0.43–2.73 and $P = 0.87$, resulting in no significant difference between the two arms. For the time period June 2013–March 2014, the total number of cases for LLINs and IRS (bendiocarb) was 74 and for LLIN alone it was 147, with no significant difference observed between the two groups, with the confidence interval being 0.21–1.22 and $P = 0.125$ (i.e. insignificant).

A prevalence survey conducted in 2013 using rapid diagnostic test (RDTs), indicated malaria prevalence to be very high in the Galabat study area in comparison with other areas, and blood spots have been collected on filter paper for serology analysis at a later stage. Further comparison of malaria prevalence by study arm in the Galabat study area between 2012 and 2013 indicated that the combined arm in 2013 was associated with lower odds of outcome (i.e. malaria prevalence), but this was not found to be statistically significant. Overall, there was no significant difference between the two time periods or among the two study clusters belonging to either time period.

However, direct comparison of malaria prevalence by year within the study arm in the Galabat study area indicated a significant difference in the reduction of malaria prevalence (from 10.5% to 3.9%) when IRS campaigns replaced deltamethrin with bendiocarb in 2013; the odds ratio was 0.35, with a confidence interval of 0.15–0.81 and $P = 0.019$, while for the LLIN arm, the reduction in malaria prevalence in 2013 was not statistically significant; the odds ratio being 0.66, with the confidence interval being 0.23–1.89 and $P = 0.4$. Prevalence of infection by study arm in the Galabat study area in 2013 indicated there was no statistical significance

between the two study arms. Overall, a notable difference in resistance levels between the study arms was observed once bendiocarb replaced deltamethrin (see Tables 1 and 2).

The data related to allele frequencies conducted in 2013 is currently being processed and will be reported in the progress report. The vector behavioural data is under analysis. The role of the IVM structure needs to be further strengthened to counteract malaria resurgence in states such as Gezira (see the published paper) and vector control activities continued beyond the decline of malaria burden. There have been delays in the procurement of insecticide susceptibility test kits and unavailability of the reagent for the detection of insecticide resistance mechanisms in the local market. The government has experienced financial constraints and has been unable to support the national malaria control programme in implementing the second round of the routine IRS campaign in 2012 and 2013 in Gezira state (the Global Fund financed the first round). This is mainly attributed to the cost of the insecticide bendiocarb, costing US$ 96 per kilo. Strong commitment from all stakeholders (senior decision-makers, international organizations and donors) is needed to advocate for public health insecticides to be sold at a subsidized price.

4.7 Yemen

A malaria knowledge, attitudes and practices study was conducted in June 2013 in the project's demonstration area to assess local communities' understanding of malaria transmission, recognition of signs and symptoms, perceptions of cause, treatment-seeking

Table 1. Resistance to deltamethrin

Study site	Number of clusters with resistance (> 90%)	Number of clusters with suspected resistance (90–97%)
Al Hoosh	13	5
Hag Abdalla	14	4
Galabat	8	3
New Halfa (excludes data from one cluster)	15	2

Table 2. Clusters identified as remaining susceptible to bendiocarb

Study site	Number of clusters susceptible	Number of clusters with suspected resistance (90–97%)	Number of clusters with resistance (> 90%)
Al Hoosh (excludes data from three clusters)	15		
Hag Abdalla (excludes data from three clusters)	15		
Galabat (excludes data from two clusters)	10		
New Halfa (excludes data from four clusters)	14		

patterns, and preventive measures and practices, in order to inform the project. The summary of the results is as follows: 97% of household respondents showed reasonable knowledge of malaria, including correct association between malaria and mosquito bites; 97% stated fever is an important symptom of malaria and displayed reasonable awareness of malaria's potentially fatal consequences and correct treatment practices; 86% stated that they had received information on malaria and 36% of them received this information through the outreach team responsible for the distribution of mosquito nets; 89% stated they had knowledge of the beneficial effects of insecticide-impregnated mosquito nets; and 81% confirmed that information on impregnated mosquito nets had been obtained from the outreach teams during the distribution of the nets. The study also found that the proportion of mosquito net possession reached 99% among the households surveyed and the proportion of using these nets was 96% of total households.

An entomological survey was conducted between June and September 2013 in the 12 study clusters. The methods of collection used were: pyrethrum spray catches, CDC light traps, exit traps and clay pots. The survey also recorded the following entomological parameters: species identification; female/male ratio; and abdomen condition. *Anopheles* abdomens (blood fed) were squashed on Whatman filter paper for testing of the host species source of the blood meal by enzyme-linked immunosorbent assay (ELISA) and all *Anopheles* head and thoraces were placed in Eppendorf tubes for sporozoite testing (ELISA) and preserved in sealed plastic bags containing silica gel, until testing. The survey conducted in June 2013, resulted in 131 *An. arabiensis*, while the density of *An. sergenti* remained low (9). In September 2013, there was a surge in *An. arabiensis* (785), while a slight increase in *An. sergenti* (46) was observed. A higher proportion of *An. arabiensis* was found indoors in the LLIN arm rather than the IRS and LLIN arm, and this trend continued but with a more marked variation between the LLIN arm (481) and LLIN and IRS (182). The proportion of indoor resting *An. sergenti* remained low between the two arms during June 2013 (LLINs = 2 and IRS and LLINs = 7), while a slight increase was noted for the LLIN arm (44) in September, and a reduction was noted in the IRS arm (2). Nevertheless statistical analysis (the Mann-Whitney *U* test) revealed no significant difference (0.096) in the indoor resting density of mosquitoes in the LLIN and IRS study arm pre- and post-intervention.

In October 2013, WHO and the United States Naval Medical Research Unit 3 (NAMRU-3) facilitated the transportation of the collected samples to CDC (second batch) for further advanced analysis; the final report on the advanced analysis of the two batches (2012 and 2013) of mosquitoes was sent to CDC and is expected by the end of June 2014. The first batch has been processed by CDC and molecular analysis (of the samples collected during April and September 2012) is ongoing.

The ELISA protocol was used to identify mosquito blood meal host source (human, sheep, goat, bovine and donkey). This found that of all September 2012 samples (n = 402), 113 samples (28.1%) were positive for human blood meal host source; and of all April 2012 samples (n = 120), 85 samples (70.8%) were positive. These results highlight a higher level of anthropophilic behaviour in April than September.

Given that resistance to DDT and pyrethroids has been detected in the study area, polymerase chain reaction (PCR) will be used to detect the presence and frequency of *kdr*-type mutations on the sodium channel gene in *An. arabiensis*. The same sample of DNA that was used for *Plasmodium* detection will be used for *kdr* detection, using the TaqMan real-time PCR assay described.

LLIN condition and utilization was monitored during April and June 2013 using a standard questionnaire that examined frequency of bed net use and of washing, as well as by direct observation of the physical condition of all available LLINs. The survey found the percentage who slept under an LLIN the previous night to be 67.5%. LLINs with hole sizes of 0.5–2 cm had the highest percentage of holes (10.7%) and soap was the most common form of washing for LLINs. LLIN bioassays indicated 100% susceptibility.

Passive surveillance of the incidence of malaria in the study area was initially planned to be a routine, year round activity with the aim of regularly monitoring malaria trends and the performance of the health cadres working at the public health facilities within and in the vicinity of the study area during the entire period of the study. Community members were also encouraged to take their children to the health facility closest to their home when falling sick. Two hospitals (Al-Ahad, Althalouth), two health centers (Alraboua'a and Almusama'a), four health units (Alajaraf, Alathebout, Bani Husam, Bakhish) and the private sector were enrolled to measure malaria incidence. The health cadres in these heath facilities were trained on strict recording and reporting of all confirmed malaria cases. They were also trained on malaria symptoms and instructed to collect a blood sample from the visiting patient for RDT testing and a blood smear for confirmation. Diagnosis and treatment of malaria were provided free of charge. Whenever the security situation allowed, the study team maintained close supervision of the staff at these health facilities. They endeavoured to collect the recorded data on a weekly basis, replenished the needed supplies and provided other needed corrective measures. However, political turmoil throughout 2011 and the frequent eruption of violence thereafter has adversely affected the close supervisory visits to the study area as well as the regular compilation of malaria incidence data. There has been a progressive decline in confirmed malaria cases as reported from the health facilities between 2010 and 2013. Once the cross-checking of data has been completed, the results will be differentiated by study arm.

The ongoing political turmoil in Yemen, which started early 2011, has led to challenges including the inability of national staff/the study team to move freely to and from the field (vehicles have been targeted for hijacking) and the inability of the international staff to travel to Yemen. There have also been logistics constraints due to a severe shortage of fuel with a six-fold increase in petrol prices, affecting the smooth deployment of commodities to the field.

The initial plan for IRS application, as per the national strategy, was to rotate different classes of insecticides to mitigate the risk of resistance. However, despite the timely importation of bendiocarb by the national programme to replace lambda-cyhalothrin in the second round of IRS application in September/October 2013, this was not implemented because the Ministry of Agriculture, being the sole national authority responsible for the

clearance of all imported pesticides, refused to clear bendiocarb, a product banned for agricultural use. This delayed its release from the seaport for approximately four months. Further delay followed for one month due to lot testing and approval time for bendiocarb by the quality control authority. The conflicting schedules of the limited number of national malaria control programme entomologists and other technical staff has also affected the timely implementation of some activities of the demonstration project.

The principal investigator agreed to provide further data on the incidence of passive case detection for the past years to WHO. The registration of bendiocarb remains a contentious issue and will require the strengthening of intersectoral coordination and collaboration between Ministry of Agriculture and the Ministry of Public Health and Population to avoid delays in the licensing of future public health pesticide products, although some progress has been made with the establishment of a council for pesticides. This further highlights the need for more the proactive involvement of the IVM steering committee.

5. AFRICAN REGION PROJECT PROGRESS REPORT

Dr Birkinesh Ameneshewa, WHO Regional Office for Africa

Overall, progress in project implementation in both countries has been slow. Initially, the project was planned to take place during the period 2009–2013 (AFRO 1), but it was eventually initiated in 2011 in Ethiopia and in 2012 in Madagascar. Consequently, a request for a no cost extension was submitted to UNEP and has been granted. Now the project will end in December 2015 (AFRO 2).

Over the past few years, WHO has supported the countries in the preparation of plans, national capacity-building (training) and acquiring entomological and other supplies (including insecticides). In November 2012, an external consultant was sent to Madagascar to work with the programme in finalizing the project plan and the first year plan of action.

Missions have been made to Ethiopia to participate in national project steering committee meetings to review annual progress and prepare yearly plans. Ethiopia has made substantial progress with the collection of baseline data. Household surveys (LLIN coverage and use, knowledge and awareness of communities), entomological data collection including resistance monitoring, a cross-sectional parasitological survey and a haemoglobin survey have been carried out.

A number of technical missions have been made by the regional vector control focal point to Madagascar to identify the main challenges and agree the way forward. A demographic and household survey, passive and active parasitological data collection, and entomological and anthropological surveys have been conducted.

During the regional PSC meeting held in Harare in 2012, the regional implementation of the project was appraised, which included the status of implementation and actions taken to address the challenges in order to expedite implementation of the project in both countries.

Experiences and lessons learnt from the implementation of similar projects in other regions were shared by PSC members. No PSC meeting was organized in 2013 except for a brief discussion held at the AFRO 2 project meeting in November 2013.

The main challenges of the project have been timely implementation, recurrent change of vector control strategies, insufficient human resources and delay in submission of the progress reports. Both countries experienced challenges due to the continuous changes in malaria control strategies in response to local situations, mainly due to insecticide resistance and the transition to universal coverage of vector control interventions. A degree of flexibility and designing the demonstration components of projects semi-independently from the control programme would avoid these challenges recurring in the two countries. The lessons learnt have been taken into consideration in designing the AFRO 2 project.

In Ethiopia, the repeated changes in the vector control strategy in response to the appearance of multi-insecticide resistance and an unprecedented increase in the cost of logistics for field work posed a serious challenge. Similarly, in Madagascar the concerns have been the changing malaria control strategy, specifically the introduction of delivery of LLINs for universal coverage in the project area, which was not included in the initial project plan. These issues resulted in a protracted process to finalize the country-specific project plan. Actions were taken to address the challenge including technical support missions and the recruitment of two national coordinators as limitation in human capacity in the national malaria control programme was indicated as a major factor delaying implementation. The project district was visited to gather first-hand information and the first year implementation plan was reviewed and finalized.

WHO has continued to work with both countries to expedite implementation and ensure conclusion of the project on time by December 2015. Both countries have completed multi-faceted baseline surveys. Project intervention activities (demonstrations) will be started in Madagascar (June–July) and Ethiopia (August–September). The midterm review is scheduled for later in 2014.

6. AFRICAN REGION PROJECT COUNTRY REPORTS: DEMONSTRATION OF ALTERNATIVES TO DDT IN VECTOR CONTROL

6.1 Ethiopia

Ethiopia’s project aims to evaluate the efficacy, residual life, cost-effectiveness and sustainability of alternative interventions to DDT in selected villages (intervention and control) of demonstration districts (Adama, Kola Tembien, Sodo and Tach Armachio) through a case-controlled study. It also aims to assess the susceptibility status of local vectors to insecticides, to determine the impact of alternative insecticides (pirimiphos-methyl/Actellic 300 CS) on malaria incidence, malaria prevalence during the peak transmission season, fever cases and anaemia, and to determine the impact on entomological parameters. Feasibility of use at programme level and acceptability by communities of the alternative insecticide is also being assessed.

A project launch ceremony was held to create awareness of the project and enable dissemination of project objectives targeting regional, zonal and district malaria control programmes in the respective regions, health extension workers, community elders and politically-influential people. Household surveys followed in the four districts, which included sampling households in the intervention and control villages in collaboration with health posts at village level. The required numbers of households were selected based on structured sampling methods.

Cross-sectional parasitological and haematological surveys were carried out in intervention and control villages. Data on malaria prevalence (malaria cases collected from health facilities) and haemoglobin was collected for two years (2012–2013) to estimate the proportion of mild and severe anaemia in all project districts. In Sodo district (2013), the population prevalence of malaria was 9/1670 (0.54%), the rate of low Hgb level (≤ 10 g/dl) was 42/1670 (2.52), and the rate of severe anaemia (≤ 8 g/dl) was 8/1670 (0.48). A reduction of 30% malaria prevalence in intervention and 20% reduction in control villages from the baseline is expected.

Entomological baseline data collection was carried out during the same period. Vectors of malaria were collected from sentinel houses (using knock-down catches, window traps and CDC light traps) from July to September. Abundance, density and other entomological parameters were documented, mainly for two vector species (*An. gambiae* and *An. funestus*). Samples were recorded and preserved for laboratory analysis, including *gambiae* complex and *funestus* group species identification.

The challenges and constraints of the project have been the low prevalence of malaria during cross-sectional surveys, the distance of project districts, accessibility, fund availability, management, logistics and expense.

6.2 Madagascar

The project in Madagascar aims to: develop alternative strategies to DDT with cost-effective and environmentally-friendly solutions; determine the remaining insecticides; compare the acceptability of approaches by communities, namely IRS and information, communication and education (IEC); determine the added value of IRS compared to IEC in their effects; assess the impact on the reduction of malaria transmission; contribute to a reduction in mortality and morbidity due to malaria in various communities and transmission situations; and ensure the dissemination of results to all communities across diverse local and ecological conditions. The study focuses on exploring the combination of ITNs and IRS, ITNs and IEC, and ITNs alone (in a total of 15 clusters).

The training of district health management teams and community health workers/agents in data collection and management, and their supervision, has been one of the contributions of the project to strengthening of capacity of the national malaria control programme in districts. Training was done in household, parasitological and entomological data collection

compilation and reporting methods, while training in management and supervision of the project was done targeting the district health team.

During November–December 2012, a demographic and household survey was conducted to identify study village and hamlet sites, and to identify and quantify individual households. The survey included census and geo-referencing to determine the size of population, develop a map of study sites, delimit study clusters and obtain baseline household data for monitoring the population throughout the study. Overall, 10 investigators were trained and involved in the survey.

During May and June 2013, in parallel with active parasitological data collection (see below), a socioeconomic assessment was also conducted through a household survey. The aim was to identify the factors that appear to be barriers to the use of mosquito nets and to determine the possible direct and indirect costs related to household management of malaria. The household surveys also assessed the understanding of community members on the usefulness of ITNs and the behaviours of household in the use of ITNs.

An entomological survey was conducted for a year (November 2012–February 2013, April–September 2013) in 10 selected representative sites. The methods used to catch mosquitoes were human landing catches and pyrethrum spraying collection. Outdoor potential resting sites near breeding sites were searched for mosquitoes. Two major vectors, *An. gambiae* s.l. and *An. funestus* were collected from all 10 sites and a minor vector, *mascariensis*, was reported in all but one. The results provided preliminary and baseline information on the resting behaviour, biting cycles, mosquitoes/man/night densities and seasonal population dynamics of the three vectors. Monitoring of insecticide resistance indicated that *An. gambiae* exhibited 100% susceptibility to bendiocarb. The species is resistant to pyrethroids.

Both passive and active parasitological data collection was carried out**.** Passive data collection was conducted to determine the incidence of malaria within the study sites through the collection of retrospective malaria data from January–December 2012 in five health centres of the four communities. Collection of up-to-date monthly parasitological data by community health workers at the local level and from health facilities was undertaken during February–December 2013. The data completeness rate was 93.3% for all five health facilities. According to both retrospective and current data collected, peak transmission was around January/February. Parasitological active case data collection was conducted to determine the prevalence of malaria in the study sites via active case detection of malaria in subjects under 15 years (May–June 2013).

An anthropological survey was conducted in January 2014 to gain an overview of polymorphic conditions that promote or hinder the adoption of the technical packages proposed for malaria vector control. This led to recommendations to develop an evidence-based strategy of communication and community education to improve compliance and increase ownership and use of malaria control interventions by beneficiaries.

7. THE FUTURE OF IVM

Dr Raman Velayudhan, WHO headquarters

IVM is promoted by WHO as the best approach to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of vector control. To achieve integration, vector control should be based on local evidence, adopt a multi-disease approach and combine interventions, wherever appropriate and feasible. In its implementation, IVM depends on collaboration between health sector programmes, other sectors and communities. Currently the main focus of work on IVM is to develop guidelines on the decision-making process in various disease settings. Challenges in the implementation of the IVM approach include the emergence of insecticide resistance, adaptation to environmental changes, capacity-development and career pathways. The newly established Vector Control Advisory Group (VCAG) reviews the evidence for new tools in vector control. The composition of the VCAG consists of an array of qualified representatives from different regions (including a gender balance), who have been selected based on a thorough screening process.

IVM plays a pivotal role in sustaining and consolidating the achievements of the past, but this needs to be extended to include other vector-borne diseases through strong advocacy efforts targeting policy-makers for adequate resource mobilization and intrasectoral collaboration between the different disease programmes. IVM is still just a concept in many countries and the challenge remains to make it more appealing to policy-makers, harnessing the management component of the principle and emphasizing environmentally-sound approaches for integrated vector control. All regions are experiencing similar problems, for instance in parts of Latin America there is co-endemicity of dengue, leishmaniasis and malaria, yet the control programmes do not coordinate with one another for insecticide resistance management and consequently one programme can easily shift from using one class of insecticide to which a specific disease vector has developed resistance to, while the remaining programmes continue to use the same insecticide in their control interventions.

In the next 5–10 years, 60% of the population will be living in urban areas, with mass urbanization increasing in Africa, making it the hotspot for different vector-borne diseases (dengue outbreaks have been reported in Mozambique and the United Republic of Tanzania recently). Outbreaks of emerging and re-emerging diseases have become a major concern, extending to developed as well as developing countries; for example, the control of West Nile virus is a huge operation in Europe and the United States.

WHO has recognized the need to improve upon monitoring and evaluation indicators and would like to consolidate all vector control needs assessment tools from all WHO regions to produce a generic global tool that can be adopted at the regional level. A recent WHO/UNEP-supported project in Kenya, Tanzania (United Republic of) and Uganda, examined malaria decision analysis to assist policy-makers to rapidly assess health and socioeconomic impacts on malaria control and this can be replicated in other countries in the African Region.

Malaria control programmes are currently experiencing a severe shortage of trained entomologists and this will impinge heavily on combating malaria. Strong investment is needed in capacity-building, supported by appropriate resource allocation for strengthening entomological surveillance and enhancing skills for data collation, analysis and decision-making for vector control. Reports from some countries in the Eastern Mediterranean Region (Jordan and Sudan), have indicated imported cases of leishmaniasis, re-emphasizing the importance of strong surveillance, information sharing and cross-border collaboration including joint planning for the control of all vector-borne diseases.

The primary focus of the WHO/UNEP interventions has been the use of chemical-based interventions and, aside from the larval source management intervention being implemented in the Islamic Republic of Iran, there have been minimal efforts made in using non-chemical larval source management measures and this needs to be considered for future interventions. Encouraging communities to use LLINs requires a long term effort; for instance, in the Solomon Islands an increase in LLIN utilization from 10% to 66% was achieved only after seven years. Programmes are encouraged not to invest in LLINs alone, but to see IRS as another feasible option. These remain the main interventions in malaria-endemic settings, while new innovative tools are in the pipeline. Countries exploring non-chemical interventions have been encouraged by WHO to evaluate their larval source management measures so as to ensure judicious use of resources.

Recently, the Global Fund to Fight AIDS, Tuberculosis and Malaria has continued to use LLINs found to be of poor quality. WHO has emphasized that companies should submit their products for approval by WHOPES on a voluntary basis. Approved products are updated on the WHOPES website every month and communicated to other stakeholders (UNDP, UNICEF). The responsibility of implementing these recommendations rests with the country programmes who work closely with the Global Fund.

There is a need to link and strengthen the innovative tools available for integrated vector control of all vector-borne diseases. One of the innovative tools is *Wolbachia*, which relies on micro-organisms being introduced into the vector to reduce or prevent biological transmission of the pathogen to humans (specifically dengue viruses to humans) and this can be used for all insect genera, including *Aedes*. This is the latest vector control tool which has been submitted to the VCAG based on trials conducted in Australia, where the tool has been found to be very successful in controlling *Aedes aegypti*. Another tool currently being reviewed is the use of a synergist called piperonyl butoxide on LLINs; it enhances the effects of pyrethroids by inhibiting the metabolic mechanism. An ongoing trial of durable wall lining is being conducted by the Mentor Initiative against malaria in Liberia; this approach has been replicated in Latin America for dengue control, although countries have been cautioned in using this current pyrethroid-based product as it plays a limited role in insecticide resistance management. USAID is currently funding a new trial with a new insecticide class in a wall lining product which may be submitted to the VCAG at a later stage.

There will be two upcoming regional workshops (in Africa and South-East Asia) on the sound management of DDT, and this will be an ideal platform to further disseminate the exchange of information and allow for review on how to address the challenges raised at the current meeting. There will be a technical review held in November (conducted every two years) to discuss the situation analysis of countries in respect to remaining DDT reserves. UNEP is tasked to implement their conventions on DDT and POPs; in the past UNEP has tried to implement some of the tasks on public health pesticides, but countries have directed the Secretariat to coordinate this activity with WHO. This led to the virtual closure of the Global Alliance Initiative after their recent meeting in Geneva in 2012. Hence, for anything related to public health pesticides, countries rely on the guidance of WHO (WHOPES and the International Programme on Chemical Safety).

8. PARTICIPATORY IVM FOR MALARIA CONTROL IN KENYA AND ETHIOPIA

Dr Clifford Mutero, ICIPE

The International Centre for Insect Physiology and Ecology (ICIPE) is an intergovernmental organization (its charter signed by 13 countries), and a centre of excellence in Africa, for research and capacity-building in insect science and its applications. Key focus areas include: improving food security, nutrition and farmers' income through integrated pest management (IPM); developing sustainable solutions for important disease vectors, such as tsetse flies and ticks, and emerging zoonotic diseases such as Rift Valley fever; and contributing to biodiversity conservation through development of tangible strategies that improve the livelihood of communities living in the vicinity of protected areas. The Centre promotes holistic and integrated control of vector-borne diseases and addresses increasingly important linkages between human health and agriculture, such as those due to irrigation, pesticide use and fish farming. During 2006–2012, ICIPE oversaw a project that to promote sustainable malaria control (LLINs, Bti, LSM and community mobilization/education) through integration of IVM, IPM and income generation, funded by the Biovision Foundation.

An external evaluation found IVM to be relatively successful in Malindi, Kenya, mainly attributable to an elaborate local system of community mobilization, supported by research institutes and government ministries. The average number of anopheline mosquitoes caught nightly in a light trap in Malindi decreased from 0.196 at baseline to zero during the intervention period, while the proportion of malaria cases among children in Malindi declined significantly from 23.7% in 2006 to 10.47% in 2011. However, IVM was less successful in Tolay (Ethiopia) and Nyabondo (Kenya): there was a decline in neither the abundance of adult anopheline mosquitoes nor of malaria cases in either of the project sites. The study has demonstrated that successful implementation of IVM requires the participation of community-based groups, nongovernmental organizations, international and national research institutes, and various government ministries.

The specific focus of the current phase of ICIPE's IVM work in Ethiopia and Kenya (2013–2015) is on the standardized evaluation and scaling-up of different IVM interventions

including: larviciding with Bti; community mobilization and education; linking IVM for malaria with IPM and income generation activities; promotion of the use of innovative eco-friendly bio-pesticides for vector control and environmental conservation; strengthening advocacy at the policy level for integration of IVM into national malaria control strategies in eastern Africa; and assessment of the impact of IVM strategies on the health, livelihood and environment of communities. There is a need to further document successful case studies, such as Malinidi, and to target policy-makers to highlight that strong resource investment by all stakeholders combined with community engagement can make substantial gains as has been demonstrated in both Ethiopia and Kenya. More advocacy is needed at the policy-maker level for integrated pest and vector management to become common practice, for instance by having larval control at fish hatcheries.

9. THE PLAN AND TOOLS FOR THE EASTERN MEDITERRANEAN REGION PROJECT EVALUATION

Dr Henk van den Berg, WHO Regional Office for the Eastern Mediterranean

WHO is planning an internal review during the final phase of the project. The purpose of the review is to provide a comprehensive account of the project by assessing its performance vis-à-vis the project objectives. This will build on the findings of the mid-term review, revisiting recommendations made and obtaining more detailed data on specific project components.

As WHO plans to request from GEF a no-cost extension of the project until the end of 2015, the remaining time period allows the review to provide feedback on issues that need further attention and to synthesize lessons for future activities and projects. In addition, the review will assist WHO in the evaluation and strategic planning of its regional activities related to vector-borne diseases. This internal review is separate from the terminal evaluation of the project; the latter will be externally conducted by UNEP at the end of the project.

The proposed components of the internal review are: assessment of project results; assessment of risks to sustainability of outcomes; assessment of monitoring and evaluation systems; monitoring of long-term changes; assessment of contemporary processes that affected project activities and results; the catalytic role and replication effect of the project; and lessons learnt and recommendations.

WHO has prepared a draft evaluation framework at country and project level. The framework proposes pertinent questions and indicators in relation to the project's design, planning, implementation and results, addressing the relevance, effectiveness, efficiency, sustainability and impact of activities of individual project components. Methods of data collection for the review include: questionnaires tailored to each country; semi-structured interviews; analysis of documentation; archival records; and field site visits to most project countries (except for the Syrian Arab Republic and Yemen).

Participants were requested to provide their inputs to the draft evaluation framework following the meeting to help ensure the suitability, relevance and user-friendliness of the framework. Further planning is needed to: establish a timeline for the evaluation; identify members of the evaluation team, with division of tasks; revise the evaluation framework; update the assessment of available documentation; and prepare questionnaire and interview formats carefully adapted to the country context or target group. There was a general consensus among participants on the importance of conducting the internal review.

10. REDUCTION IN THE USE OF DDT AND OTHER INSECTICIDES: THE USE OF GIS FOR TARGETED VECTOR CONTROL TOWARDS MALARIA ELIMINATION IN SWAZILAND

Mr Simon Kunene, Ministry of Health, Swaziland

The goal of Swaziland's malaria elimination strategy is to eliminate malaria from Swaziland by 2015 and achieve the WHO certification of elimination by 2018. The strategy comprises a multi-pronged approach: case management; IVM (utilizing advanced technologies, specifically case and intervention mapping); surveillance; epidemic preparedness and response (through immediate case reporting by health facility by SMS and follow-up by agent visits 4–7 days after case presentation); and IEC activities. During 2015–2020, all active foci are to be identified and eliminated through intensified surveillance, targeted vector management, environmental management and human parasite reservoir interventions.

Reactive case detection is conducted within a 500 metre radius of an index case. Residents are screened using RDTs and a molecular test processed on dried blood spot cards collected in the field. Questionnaires are administered to identify risk factors associated with infection and global positioning system (GPS) coordinates of all screened individuals are captured at the front door of their sleeping structure. GIS is also used to show weather patterns for monthly periods, with malaria cases plotted against weather variables to give a better understanding of the distribution of malaria cases for a particular month. Study of weather maps gives information on potential transmission areas. Spatial interpolation techniques are used to make weather maps. The weather variables are temperature, humidity and rainfall. To eliminate areas of focal transmission, it is imperative to gather information on features of locations that exhibit transmission potential. Foci investigations have been conducted in areas reporting local transmission. The information that is collected includes elevation and topography, remotely-sensed mosquito breeding sites, proximity of households to health facilities, access roads, agricultural activities and vegetation cover.

Swaziland has geospatial data on malaria cases which can help identify areas at risk of local transmission. Operations should be guided by more precisely defined areas at risk of transmission, proactive direct vector control, active case detection to prevent transmission rather than react to it, and identifying areas where no cases have been observed, but where risk may exist. Maps should be utilized to predict the locations of local cases (not prevalence), account for imported cases, be temporarily specific and identify how risk changes over the year, and should be easily updated to help guide strategy as epidemiology

changes. Predicted risk can be mapped using available and malaria intervention-targeting variables such as distance to imported cases, high wetness areas, irrigation or lakes, minimum rainfall and vegetation index.

11. OVERVIEW OF INSECTICIDE RESISTANCE WITHIN AFRICAN REGION COUNTRIES

Dr Birkinesh Ameneshwa, WHO African Region

IRS and LLINs are the major vector control methods within the African Region and have contributed to the reduction of the malaria burden in a number of countries. Insecticide resistance threatens these achievements and prevents further progress from being made. The African Network on Vector Resistance (ANVR), established in 2000 by WHO, supports countries to monitor and manage insecticide resistance. Current malaria strategies mitigate risk through the inclusion of a planned and budgeted insecticide resistance management component, as well as by creating and sustaining capacity in trained staff, equipment and basic laboratory facilities. Countries are guided on the choice of insecticide and interventions, and the best management approaches to undertake. Countries are being strongly encouraged to sustain insecticide resistance/susceptibility monitoring annually, provide information and feedback to the programme, participate in information sharing and exchange, and maintain established national and regional databases.

To date, achievements include a prototype of a computer-based vector control decision support tool for surveillance of vector-borne diseases, an atlas of insecticide resistance in malaria vectors in the African Region (two editions), an updated version of the standardized protocol for resistance testing, country-specific malaria entomological profiles, and an insecticide resistance database, which comprises over 1909 bioassay results covering 364 different sites in 30 countries. DDT (22 countries) and pyrethroid (24 countries) resistance has become widespread, while only six countries have reported resistance to carbamates and two to organophosphates. WHO has vigorously supported countries to implement the five pillars of the global plan for insecticide resistance management in malaria vectors (GPIRM) through training, provision of test kits and laboratory reagents, field testing activities, reinvigoration of ANVR's coordination and management role, and harmonization of regional and national databases.

In discussion, it was agreed that insecticide resistance management needs to be pre-emptive and to sustain insecticide susceptibility. The new intervention tools need to manage existing tools, such as Actellic 300 CS, effectively. The need to address the high cost of the insecticide used in IRS campaigns and how this has prevented programmes from achieving/sustaining maximum coverage was noted. The compilation of the insecticide resistance database (including data on insecticide resistance mechanisms) has been a collaborative effort between the national progammes and research institutions, and it was felt that countries implementing IRS campaigns need to strongly advocate for an increase in budget allocation for insecticide resistance monitoring given the huge investment made in resources (financial and human) in implementing this activity. Up to 15% of Global Fund financial

support to vector control is earmarked for monitoring and evaluation including insecticide resistance, and it was pointed out that programmes should utilize these funds for the intended activities, although there have been some exceptions to this. For example, in Somalia where funds have been redirected to TB, overlooking entomological surveillance activities. It was noted that there needs to be more focus on the judicious use of pesticides, an aspect which goes beyond the health system. It was also expressed that WHO needs to develop updated guidelines addressing larviciding criteria for susceptibility/resistance for countries with low malaria endemic settings. Residual transmission is not a major concern in African Region countries, except in a few, such as Botswana, that are still able to control malaria.

12. THE INSECTCIDE RESISTANCE FRAMEWORK AND GLOBAL INSECTICIDE RESISTANCE DATABASE

Dr Tessa Knox, WHO headquarters

WHO's Malaria Policy Advisory Committee (MPAC) provides independent strategic advice and technical input to WHO for the development of policies related to malaria control and elimination. It was established in 2011 and has had five meetings to date with the next to be held in September 2014. MPAC reviews evidence and proposed recommendations or guidance presented by the Vector Control Technical Expert Group (VCTEG), which was established in 2012. Thus far, MPAC has reviewed and endorsed a position statement on larviciding in sub-Saharan Africa (2012), recommendations for achieving universal coverage of LLINs, guidance notes on estimating LLIN longevity and capacity-building for public health entomologists (2013), recommendations on the sound management of old LLINs, and guidance for combining IRS and LLINs (March 2014). Associated documents are available via the WHO website (http://www.who.int/malaria/mpac/en/), and meeting reports are published in the Malaria Journal.

As outlined in the GPIRM, insecticide resistance, especially to pyrethroids, threatens to reverse recent gains in malaria control. Urgent efforts must be taken to prevent the further emergence and spread of resistance. Countries are therefore urged to develop and implement comprehensive insecticide resistance management strategies, which should include a national insecticide resistance monitoring scheme and effective data management, as well as the establishment or reinforcement of enabling mechanisms (advocacy, human and financial resources).

The WHO Global Malaria Programme is providing technical support and guidance through a number of initiatives. A five-country study is currently underway to determine the impact of IRS and LLIN on malaria disease burden and malaria transmission in relation to insecticide resistance in the main vector species. Field activities will be completed in December 2015 with full results anticipated in mid-2016. In addition, a project to strengthen national capacities for routine monitoring of insecticide resistance, establish and maintain national databases on insecticide resistance, and establish/strengthen national mechanisms for data analysis, interpretation and sharing was commenced in 2013 in five countries and expanded to 10 countries in 2014. A framework for the development of national insecticide

resistance management plans has been developed in order to ensure adherence to GPIRM objectives and support standardization across countries in the structure and content of plans. These plans should form an integral part of the vector control component of all national malaria strategic plans. A global insecticide resistance database is under development which will collate information on insecticide susceptibility and resistance mechanisms of *Anopheles* malaria vectors from 2000 to present. Finally, a system is being constructed to support data availability at global, regional and country levels to ultimately inform evidence-based vector control policy setting and implementation.

WHO recognizes the emerging threat of insecticide resistance in the Eastern Mediterranean Region and is working closely with countries to establish national databases. These will feed into the existing regional database, which has been established and optimized through support from the WHO/UNEP GEF-supported project. Establishment of an Eastern Mediterranean Region network on insecticide resistance similar to ANVR will be explored and discussed further in the upcoming IVM workshop. The supply of insecticide resistance monitoring kits and ITNs remains a challenge for many countries in both the Eastern Mediterranean and African Regions. While options are being investigated to expedite the delivery of these commodities from Universiti Sains Malaysia, such as through an online payment system, setting up additional regional supply centres may have cost implications given that current supplies are provided at a subsidized price. WHO is in the process of re-establishing a regional stock of the supplies in the African Region to alleviate this problem. Intersectoral collaboration specifically between FAO, WHO and Member States needs to be enhanced to further support pesticide registration and quality control boards to ensure timely availability of appropriate formulations for use in vector control and for judicious use and better management of insecticides. The issue of insecticide resistance and the relatively limited evidence base on non-insecticidal vector control interventions highlights the need for further investment in assessing the efficacy and operational impact of alternatives to IRS and LLINs, especially in low malaria transmission or elimination settings.

13. EASTERN MEDITERRANEAN REGION RECOMMENDATIONS AND NEXT STEPS

Stockholm Convention on Persistent Organic Pollutants

1. The Secretariat of Basel, Rotterdam and Stockholm Conventions has recently circulated a questionnaire for Parties to notify their technical support needs in the implementation of the Conventions. The scope of the questionnaire includes information on issues related to obsolete stocks of POPs. Participants should coordinate with national focal points for the Stockholm Convention in the Ministry of Environment, as soon as possible, on needs related to management of POPs, as appropriate.
2. The Secretariat is in the process of undertaking activities to support countries in the sound management of DDT in disease vector control and in promoting non-chemical alternatives. In this context, there should be collaboration between WHO regional

offices and national programme managers of projects to gather evidence on implementation of nonchemical alternatives to DDT.

3. The DDT expert group, established by the Conference of the Parties to the Stockholm Convention, has undertaken an assessment of the continued need for DDT for disease control for consideration at the next Conference of the Parties. The information generated through ongoing DDT project activities will be very useful for their work and relevant reports should be made available for this purpose.

Member States

4. In order to finalize the project and develop the final report, experiences should be disseminated at country level and a journal publication developed for global dissemination.
5. The IVM strategic plan should be updated and ways explored for future sustainability. Efforts should be exerted to sustain the achievements attained under the project to strengthen IVM structures and, specifically, to explore non-chemical interventions.
6. Proposals should be submitted to the upcoming Special Programme for Research and Training in Tropical Diseases (TDR) proposal workshop.

FAO

7. FAO should continue to work closely with WHO to implement a strategic framework for POPs management, training courses on pesticide specification and registration.
8. FAO should work with WHO to encourage Member States to establish a board of pesticide registration and quality control. This should be further reinforced at regional consultations.
9. FAO should support a documentary film on POPs disposal in the three regional countries similar to Mission: Planet De-Tox, which documents the whole POPs management process from inventory, safeguarding and shipping to disposal of a new POP called endosulphan in Benin.

WHO

10. To support the capacity of Member States in the area of IVM, WHO should simplify the definition and ensure advocacy on IVM inside WHO and to other partners.
11. WHO Regional Offices for Africa and the Eastern Mediterranean should continue to cooperate. The cooperation should be structured by a framework to define areas of cooperation, including malaria elimination, insecticide resistance management, and integration of vector-borne diseases and methods. Cooperation could take place through, for example, bi-regional meetings or training, country visits, exchange of experts and study tours.
12. Advocacy should be conducted to support non-chemical measures through IVM and to communicate this to national programmes, decisions-makers and major donors such as the Global Fund. There should be ongoing dialogue to sustain this activity.

13. WHO should coordinate with research institutions to support country efforts for capacity-development in epidemiology, and to support project countries to develop journal publications and publish lessons learnt.

14. AFRICAN REGION RECOMMENDATIONS AND NEXT STEPS

Ethiopia

14. To overcome the delay in the procurement of insecticides for IRS in Ethiopia, timely spraying should be ensured by holding intensive communication with the supplier, exploring the possibility of paying tax so as to expedite the clearance period once the shipment of insecticide arrives in the country and exploring the option of delivering the requisitioned supplies through airfreight rather than via sea shipment.
15. To facilitate compilation and reporting of the available data in Ethiopia, every annual report (in English to facilitate communication among all steering committee members) should include detailed outcomes of the surveys (including the data), while quarterly/six-monthly reports should summarize the activities and achievements (but not necessary include research data).

Madagascar

16. Technical support should be provided for the preparation of the March–April 2015 and March–April 2016 assessments, the development of a communication and community education strategy and the procurement of the insecticide needed for the November–December 2014 and November–December 2015 spraying rounds.
17. An IRS campaign should be undertaken in June 2014 using bendiocarb.
18. A cross-sectional survey should be undertaken in August 2014, ensuring that it does not have a negative impact on the preparations for the second round of IRS in November–December 2014, which coincides with the peak season for using Actellic 300 CS.
19. Coordinators should make their requisitions for the desired insecticide and any other additional items to WHO at the earliest opportunity.
20. Parasitological surveys should collect data from samples rather than all > 15 year olds and the sampling should consider the population size.

WHO/UNEP project supported by GEF

21. There should be frequent and proactive communication between all stakeholders (WHO, steering committee members and countries), supported by timely reporting and evaluation of project progress in countries to ensure successful and timely completion of project activities. This could include annual meetings (steering committee members and countries), six-monthly reporting (only steering committee members) and quarterly-reporting (by telephone and/or Skype).

22. For AFRO 2, any changes to the existing protocols should be discussed and reviewed by independent experts to avoid any amendments during the implementation period and any revised protocols should be circulated widely through the internet to technical consultants.

WHO

23. The WHO Regional Office for Africa should organize a joint meeting with the participation of countries from the Eastern Mediterranean Region.
24. WHO should explore the possibility of supporting a representative from project countries to attend the pesticide disposal workshop conducted by FAO in France later in 2014.
25. Human resources constraints in WHO should be addressed in order to sustain the Organization's technical guiding role.
26. The Regional Office for Africa should explore the possibility of assimilating the Regional Office for the Eastern Mediterranean TDR small grants scheme for its Region.
27. Efforts should be made to lobby the Global Fund to support implementation of non-chemical methods, in addition to IRS and LLINs, to contribute to the reduction of use of DDT and other insecticides.
28. WHO should revitalize and strengthen efforts on career path development for entomologists to ensure retention capacity.

15. STAC DECISIONS ON BUDGET ALLOCATIONS TO EACH COUNTRY

STAC members met and reviewed the submitted country and regional plans in anticipation of approval of a project extension at no cost until end December 2015. They agreed that the following activities should be supported by the remaining balance with WHO and FAO for the period July 2014–December 2015.

Regional activities

Regional total	**US$ 315 500**
Salary of the administrative staff for 1.5 years	23 000
Regional IVM training workshop for project countries and support to priority non-project countries (August 2014)	80 000
Regional consultation for updating regional IVM strategy (February 2015)	37 000
Design, printing and dissemination of regional IVM strategy	2 500
Final WHO meeting for project aimed at advocacy, information dissemination, awareness of decision-makers and vector control focal points in all countries of Region, in one of the project countries, tentatively Islamic Republic of Iran or Jordan (proposed September 2015)	88 000
In-depth project review and development of comprehensive project report (includes country visits, regional mission, desk review, questionnaires, interviews)	60 000
Connection with AFRO 2 project (expert support, meeting, training, and so on)	10 000
Preparation of 2–3 regional journal publications of project experience (consultant for writing, journal fees). Suggested topics: The project in the Eastern Mediterranean Region: a partnership among three UN agencies and research agencies, experiences and lessons learnt; Regional experience in supporting IVM in project-supported countries: concerns and issues for ensuring sustainability.	15 000

Support to countries

Support to countries (total)	US$ 92 500
Project country publications in international journals, funds to be kept at WHO and sent to countries after sharing of information on journal acceptance	25 000
Consultant to Morocco to support public health pesticides	15 000
Support to Jordan for developing technical guidelines and for training	12 500
Completion of vector surveillance in Egypt	10 000
Yemen	10 000
Consultant for documenting and publishing the story of Djibouti's malaria outbreaks in the last three years	20 000

Future activities in component 3 by FAO, using the remaining balance in FAO

Total available funds	US$ 800 00
Complete disposal of POPs in Islamic Republic of Iran	26 000
Capacity-building in end of life management of pesticides: three staff from three related sectors (health, environment, agriculture) from each of Islamic Republic of Iran, Jordan and Morocco	34 000
Documenting and publication of project experience in disposal of POPs from three regional countries in cooperation with UNEP and WHO	5 000
Support for developing an inventory of POPs in Sudan (expected co-finance from Federal Ministry of Health and possibly from WHO, if funds available for core voluntary contribution)	15 000

Annex 1

PROGRAMME

Monday, 16 June 2014

08:30–09:00	Registration	
09:00–09:45	Opening Session	
	Message from Dr Ala Alwan, Regional Director, WHO Eastern Mediterranean Region	*Dr J. Mahjour*
	Speech by Representative of UNEP	*Dr J. Betlem*
	Objectives of the meeting and methods of work	*Dr H. Atta, Dr B. Ameneshewa*
09:45–10:30	Regional overview of implementation of the Eastern Mediterranean Region project	*Ms C. Barwa*
10:30–11:30	Update on collection, repacking and disposal of POPs	*Dr R. Thompson*
11:30–12:30	Reports from Eastern Mediterranean Region countries on demonstration of alternatives to DDT	
	Impact of insecticide resistance in *Anopheles arabiensis* on the effectiveness of malaria vector control in Sudan	
	Demonstration of sustainable and effective alternatives to DDT in leishmaniasis vector control in Morocco	
12:30–14:00	Regional overview of implementation of the AFRO 1 project	*Dr B. Ameneshewa*
14:00–14:30	Progress in implementation of the project in Ethiopia	
14:30–15:15	Discussion on Ethiopia project	
15:15–15:45	Progress in implementation of the project in Madagascar	
15:45–16:00	Discussion on Madagascar project	

Tuesday, 17 June 2014

08:30–09:30	The future of integrated vector management	*Dr R. Velayudhan*
09:30–10:30	Participatory integrated vector management for malaria control in Ethiopia and Kenya	*Dr C. Mutero*
10:30–12:00	Reports from Eastern Mediterranean Region countries on demonstration of alternatives to DDT:	
	Islamic Republic of Iran: To demonstrate cost-effective and sustainable larval control methods in an urban setting as an alternative solution to the use of chemical methods	
	Yemen: To demonstrate the effectiveness of sustainable DDT alternatives	
12:00–12:30	Syrian Arab Republic: Impact of the humanitarian crisis on vector-borne diseases	

12:30–14:30	Reports from Eastern Mediterranean Region countries on capacity strengthening activities: Djibouti Egypt Jordan	
14:30–16:00	AFRO 1 implementation plan for the forthcoming season Ethiopia (planned activities, processes, expected outcomes) Madagascar (planned activities, processes, expected outcomes)	*Dr M. Gebremariam* *Dr N. Razafindraleva,* *Dr T. Franchard*

Wednesday, 18 June 2014

08:30–09:30	Presentation on the plan and tools for Eastern Mediterranean Region project evaluation	*Dr H. van den Berg*
9:30–10:30	Group work to develop the implementation plan for finalization and evaluation of the Eastern Mediterranean Region project	
10:30–12:30	Country presentation on planned activities for project finalization and evaluation of the Eastern Mediterranean Region project	*Plenary*
12:30–14:00	Regional activities of AFRO 1 and support for implementation in Ethiopia and Madagascar Progress in the development of AFRO 2 and discussion	*Dr B. Ameneshwa*
14:00–14:30	Reduction in the use of DDT and other insecticides: the use of GIS for targeted vector control towards malaria elimination in Swaziland	*Mr S. Kunene*
14:30–16:00	Side meeting for STAC members to discuss Eastern Mediterranean Region project finalization/evaluation country plans	

Thursday, 19 June 2014

08:30–09:00	IVM: future perspectives	*Dr J. Williams*
09:00–09:30	Overview of insecticide resistance within African Region countries	*Dr B. Ameneshwa*
09:30–10:00	Insecticide resistance framework and global insecticide resistance database	*Dr T. Knox*
10:00–10:30	Discussion	
10:30–12:00	Feedback of the STAC meeting on finalization/evaluation of the Eastern Mediterranean Region project	
12:00–13:00	Conclusion and recommendations	
13:00–13:30	Closing session	

Annex 2

LIST OF PARTICIPANTS

EASTERN MEDITERRANEAN REGION

DJIBOUTI

Mrs Fahima Omar Meke
Head, Training and Research Services
National Institute of Public Health
Ministry of Health
Djibouti

EGYPT

Eng. Mariam Aboul Fotouh
Director General
Vector Control Disease
Ministry of Health and Population
Cairo

ISLAMIC REPUBLIC OF IRAN

Dr Ahmad Raeisi
National Malaria Elimination Programme Manager
National Malaria Programme
Ministry of Health and Medical Education
Tehran

Dr Seyed Mehdi Tabatabaei
Assistant Professor of Epidemiology
Zahedan University of Medical Science
Zahedan

JORDAN

Dr Khalil Kanani
Director, Parasitic and Zoonotic Diseases
Ministry of Health
Amman

MOROCCO
Dr Btissam Ameur
Head, Vector Control Department
Directorate of Epidemiology and Disease Control
Ministry of Health
Rabat

SUDAN
Mr Hmooda Toto Kafy
Medical Entomologist
Integrated Vector Management Unit
Environmental Health Department
Federal Ministry of Health
Khartoum

Dr Salaheldin Mubarak Elkhalifa
Director of Environmental Health and Food Control
Federal Ministry of Health
Khartoum

YEMEN
Dr Mostafa Othman Al Silwi
Director, Vector Control Programme
Ministry of Public Health and Population
Sana'a

Mr Ahmed Salim Milqat
Director General of Planning and
GEF Focal Point in Environmental
Protection Authority
Ministry of Environment
Sana'a

AFRICAN REGION

KENYA
Dr Ahamed Din Hassan Omar
Vector Control Focal Point
Malaria Control Progamme
Ministry of Health
Nairobi

LIBERIA
Ms Gracella W. Cooper
Vector Control Coordinator
National Malaria Control Programme
Ministry of Health and Social Welfare
Monrovia

SENEGAL
Dr Mady Ba
Coordinator, National Malaria Control Programme
Ministry of Public Health and Social Affairs
Dakar

SWAZILAND
Mr Simon Kunene
Programme Manager
National Malaria Control Programme
Ministry of Health
Mbabane

MEMBERS OF THE REGIONAL SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE (STAC)

Dr Jaouad Mahjour
Director, Communicable Disease Prevention and Control
WHO Regional Office for the Eastern Mediterranean
Cairo
EGYPT

Mr Jan Betlem
Head, Monitoring
Office for Operations, Quality Assurance Section (QAS)
UNEP
Nairobi
KENYA

Dr Abolhassan Nadim
Professor of Epidemiology (retired)
School of Public Health
Tehran University
ISLAMIC REPUBLIC OF IRAN

Dr Joshua Otto Yukich
Research Assistant Professor
Tulane University and School of Public Health and Tropical Medicine
New Orleans
UNITED STATES OF AMERICA

Dr Lama Jalouk
Director, Leishmaniasis Programme
Ministry of Health
Aleppo
SYRIAN ARAB REPUBLIC

Dr Richard Thompson
Technical Officer
Pesticide Risk Reduction Group
FAO
Rome
ITALY

STEERING COMMITTEE MEMBERS (AFRICAN REGION)

Dr Clifford Mutero
Coordinator, Integrated Vector Management
International Centre for Insect Physiology and Ecology (ICIPE)
Nairobi
KENYA

Dr Messay F. Gebremariam
WHO National Professional Officer
WHO Country Office
Addis Ababa
ETHIOPIA

Dr Herisolo Razafindraleva
Project Coordinator (Entomology)
National Malaria Control Programme
WHO Country Office
Antananarivo
MADAGASCAR

Dr Thierry Franchard
Project Coordinator,
National Malaria Programme
Antananarivo
MADAGASCAR

OTHER ORGANIZATIONS

UNITED NATIONS DEVELOPMENT PROGRAMME (UNEP)
Dr Gamini Manuweera
Programme Officer
Scientific Support Branch
Secretariat of the Basel, Rotterdam and
Stockholm Conventions
Geneva
SWITZERLAND

WHO SECRETARIAT

Dr Hoda Atta, Regional Adviser, Malaria Control and Elimination, Department of Communicable Disease Prevention and Control, WHO Regional Office for the Eastern Mediterranean, Cairo, Egypt
Dr Birkinesh Ameneshwa, Scientist, Regional Focal Person, Integrated Vector Management Protection of Human Environment, WHO Regional Office for Africa, Brazzaville, Congo
Dr Raman Velayudhan, Coordinator, Vector Ecology and Management, Department of Control of Neglected Tropical Diseases, WHO headquarters, Geneva, Switzerland
Dr Tessa Knox, Technical Officer (Entomologist), Vector Control Unit, Global Malaria Programme, WHO headquarters, Geneva, Switzerland
Ms Caroline Barwa, WHO Temporary Adviser, Malaria Control and Elimination, Department of Communicable Disease Prevention and Control, WHO Regional Office for the Eastern Mediterranean, Cairo, Egypt
Dr Abdelbaset Badreldin Zayed, WHO Temporary Adviser, Professor of Medical Entomology and Zoology Department, Faculty of Science, Al-Azhar University (Girls' Branch), Cairo, Egypt
Dr Immo Kleinschmidt, WHO Temporary Adviser, Reader in Epidemiology, London School of Hygiene and Tropical, Medicine, London, United Kingdom
Dr Hendrik van den Berg, WHO Temporary Adviser, Vector Control Expert, Wageningen University, Netherlands
Mr Farah Ahmed, Entomologist, WHO Djibouti
Dr Tarig Abdelgader, Malaria Focal Point, WHO Sudan
Ms Nahla Ibrahim, Programme Assistant, Department of Communicable Disease Prevention and Control, WHO Regional Office for the Eastern Mediterranean, Cairo, Egypt
Mrs Fatmire Shala, Team Assistant, Department of Communicable Disease Prevention and Control, WHO Regional Office for the Eastern Mediterranean, Cairo, Egypt

World Health Organization
Regional Office for the Eastern Mediterranean
P.O. Box 7608, Nasr City 11371
Cairo, Egypt
www.emro.who.int