National IRS Strategy for Burundi

2012-2017

Integrated Vector Management (IVM) Task Order 2

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Prepared for:

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Prepared by:
RTI International
3040 Cornwallis Road
Post Office Box 12194
Research Triangle Park, NC 27709-2194

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REPUBLIC OF BURUNDI

NATIONAL IRS STRATEGY

2012-2017

(DRAFT)

Content

Terminology

AIDS	acquired immunodeficiency syndrome
CAMA	Corporate Alliance for Malaria in Africa
CDC	US Centers for Disease Control and Prevention
ELISA	enzyme-linked immunosorbent assay
FAO	The Food and Agriculture Organization of the United Nations
GFATM	Global Fund for HIV/AIDs, TB and Malaria
IVM	integrated vector management
IRS	indoor residual spraying
LLIN	long lasting insecticide treated nets
MOC	Ministry of Commerce
MOE	Ministry of Environment
MOH	Ministry of Health
NGO	non-governmental organization
NIPH	National Institute of Public Health
PNLP	Programme National de Lutte contre le Paludisme (National Malaria Control Program)
NISC	National Inter-Sectoral Committee
PCR	polymerase chain reaction
RBM	Roll Back Malaria
RTI	Research Triangle Institute
VBD	vector borne diseases
WHO	World Health Organization
WHOPES	World Health Organization Pesticide Evaluation Scheme

Forward

The 2008-2012 *National Malaria Control Strategy* for the Republic of Burundi, has the goal of improving the health of the population by reducing the burden of malaria with a view to its eventual elimination. The vision is that by 2030, malaria will cease to be a major health problem or a cause of poverty in Burundi. In pursuit of these goals and consistent with the recommendations of the World Health Organization, Burundi has adopted an integrated vector management approach as part of its national malaria control strategy. The *National Malaria Control Strategy* anticipates a rapid scale up in the use of long-lasting insecticidal nets, as well as indoor residual spraying in epidemic-prone highland areas. The objective is to cover all populations at risk of malaria, including scaling up IRS coverage to up to eight provinces, inhabited by about 52.59% of the national population.

The national IRS strategy herein outlined, stems from the context of an overarching integrated vector management (IVM) approach to the control of local vectors of human diseases. It is anticipated that this strategy will enable the development of more comprehensive and multi-year work plans that effectively address all aspects of planning, management, implementation and evaluation for cost-effective and more sustainable scale up of IRS, as well as promote effective mobilization and allocation of financial resources. The strategy proposes guidance on critical technical and human resources that will be required. A framework is provided for strengthening relevant national capacities in order to generate required local data to inform sound decisions, including decisions on the where to target IRS, which insecticides are best suited for which geographical areas, and how the development of insecticide resistance in the vector populations will be prevented or managed. As the eco-epidemiological drivers of malaria transmission changes with the scale up of interventions, such evidence based approaches will enable progressive refinement of IRS deployment, especially when co-deployed with LLINs and other complementary interventions. With a more clarified national strategy collaboration and support by Burundi's developmental partners in national malaria control should be enhanced, as it will allow proper targeting of those contributions.

1. MALARIA/IRS BACKGROUND IN BURUNDI

The entire population in Burundi is at risk for malaria, although risks vary depending on the elevation. Malaria is the primary public health problem and the highest contributor to morbidity and mortality. The disease accounted for 77% of cases in health centers in 2006. Malaria accounted 41.6% of hospital deaths in 2006 (source PNLP).

Plasmodium falciparum is the main parasite and accounts for more than 90% of infections, with *Plasmodium malariae* accounting for 8% and *plasmodium ovale* 2%. There are also mixed infections of *P. falciparum* and *P. malaria*.

There is no current update of the epidemiologic situation. Existing data from 2006 indicate three epidemiological statuses. (i) Hyperendemic areas below 1400 meters elevation or intense transmission, (ii) Meso-hypo endemic areas occurring at altitudes between 1400 - 1750 meters where transmission varies from medium to low and the potential for epidemic outbreak is high, and (iv) above 1750 meters, classified in 2009 as non-endemic areas with only imported cases.

Eight of the 17 provinces in the country are at risk of epidemic outbreaks. These are Gitega, Karusi, Kayanza, Muramvya, Muyinga, Mwaro, Ngozi and Cankuzo. This area represents 56% of the national population. Eighty percent of recent outbreaks have occurred in the proximity of marshlands where there is increasing cultivation of rice or mixed farming, with attendant irrigation schemes that favor the persistence of vector breeding sites.

There are no current data on the distribution of malaria vectors in Burundi. Historically, *Anopheles gambiae* (sl) is the predominant vector, accounting for more than 80% of recorded cases. *A. funestus* accounts for 12% of recorded cases.

The Government of Burundi is scaling up the use of long lasting insecticidal nets (LLINs) in the whole country, as well as the use of IRS in the highland provinces to control and prevent epidemic outbreaks. Currently, selected communes around marshlands in two provinces (Ngozi and Kayanza) are being covered with IRS, although the goal of government is to target all eight

epidemic prone provinces, as well as some selected areas of lower endemic regions. The goal of the current IRS strategy is to provide a framework to achieving and sustaining this goal.

Effective malaria control in Burundi will require that:

(i) Relevant national capacities are established to ensure that IRS implementation is ecologically sound, cost-effective and progressively more efficient, in order to be sustainable. It is important that limited resources are applied judiciously to reduce the gap in population coverage. Appropriate infrastructure and technical and managerial capacities must be established to ensure effective efforts at the central/national, provincial, district and communes. Timely generation and evaluation of local data on malaria transmission and program outcome and impacts, is critical for continued improvement of overall program efficiency and disease reduction. The development of resistance to WHOPES approved insecticides within local mosquito vectors remains a perennial threat to the long term utility of any insecticide-based intervention. This imposes a need to develop sufficient technical competence in entomology and vector ecology.

(ii) A robust regulatory system must be established to ensure that public health insecticides are effectively managed and judiciously used; the quality of insecticide products imported or manufactured locally for IRS are as recommended; and that adequate human and environmental safeguards are in place for the handling, use and sound disposal of public health insecticides.

2. OBJECTIVES OF THE NATIONAL IRS STRATEGY

The *2008-2012 National Malaria Control Sstrategy* sets a goal of improving the health of the population by reducing the burden of malaria with a view to its elimination. The strategy envisages that by 2030, malaria will cease to be a major health problem or a cause of poverty in Burundi. Specifically, the malaria control strategy seeks:

- 50% reduction of malaria mortality by 2010 compared to 2000, and a further reduction of 25% between 2010 and 2015, particularly among children under five, pregnant women and other vulnerable groups
- 50% reduction of malaria morbidity in 2010 compared to 2000, with a further reduction of 25% between 2010 and 2015
- A 50% reduction of malaria-related fatality among hospitalized patients by 2015 compared to 2000

The Programmatic objective for IRS under the 2008-2012 National Strategy is that:

"*At least 90% of people living in targeted areas will sleep in homes treated with indoor residual spraying according to the schedule established by the national policy in this area.*"

Cognizant of the above national goals the following objectives are set for a national IRS strategy.

Strategic objective for IRS:

Implement ecologically sound, cost-effective and sustainable indoor residual spraying to control malaria, based on sound local evidence on disease eco-epidemiology.

Specific Objectives for IRS:

(i) To scale up IRS to protect the population in eight high elevation provinces of Burundi (Gitega, Karusi, Kayanza, Muramvya, Muyinga, Mwaro, Ngozi and Cankuzo) with the aim to prevent and control outbreaks of malaria epidemics.

(ii) To complement the use of IRS to reduce malaria morbidity and mortality in certain endemic lower regions of the country such as Bubanza, Cibitoke, as well as parts of Bujumbura in the environs of Lake Tanganyika.

(iii) Strengthen and maintain appropriate and sufficient human, technical and infrastructure capacities for IRS. Efforts in this direction will be within the context of strengthening relevant competencies for implementation of the national IVM strategy.

(iv) Establish a national scheme to effectively manage the development of resistance to WHOPES approved insecticides among the local malaria vector populations.

The strategy recognizes the use of IRS within the context of integrated vector management and sustainable gains.

3. IMPLEMENTING IRS IN THE CONTEXT OF INTEGRATED VECTOR MANAGEMENT

The World Health Organization (WHO) defines IVM as *"a rational decision-making process for the optimal use of resources for vector control."*[1] IVM provides a framework for ecologically sound, cost-effective and sustainable control of vector-borne diseases. The implementation and scale up of IRS in Burundi will therefore be under an overarching national IVM Strategy which will enable deliberate planning, implementation and evaluation of IRS operations and their outcomes and impacts. Table 1 presents the five characteristics of a national IVM framework and for each of these areas of the current IRS strategy are aligned. This framework will be further detailed in the successive sections of the document.

[1] WHO (2010). *WHO Position Statement on Integrated Vector Management*. World Health Organization, Geneva Switzerland. *WHO/HTM/NTD/VEM/2008. 2*

Table 1: Application of IVM Elements to the organization of IRS

IVM Element	Summary of scope	Application to IRS Operations
Policy and Legislation	• National policy on integrated vector control established and updated • Regulatory and legislative controls for public health and pesticide management well established, reviewed, kept current and relevant	• National IVM policy established to contextualize the role & scope of IRS and provide basis to mobilize national efforts for planning/implementation • Clarify, update and enforce environment and health impact assessments on resource development projects • National insecticide legislation & regulatory mechanisms updated and adequate -ensuring judicious use & safeguard of human health & environment • Appropriate taxes and tariffs established on equipment, public health insecticides & supplies to promote IRS
Advocacy/ social mobilization	• IVM principles embedded in development policies of all relevant agencies, organizations & civil society	• Policy makers, implementers, communities & other stakeholders including donors & developmental partners, provided with appropriate advocacy/communication on IRS.
Cross sector collaboration	• Functional collaboration between public & private sectors • Effective communication among policymakers, VBD control programs and partners	• Establish national and subnational mechanisms for effective consultation, joint planning and implementation by stakeholders, with clearly defined roles/responsibilities. • Recognize and reward collaboration between stakeholders, particularly between public sectors programs/departments
Capacity building	• Essential physical infrastructure, financial resources and adequate human resources developed at all levels to manage local vectors	• Range of skills/competencies, staffing levels and location identified for effective IRS operations • Trained human resources (spray operators, pesticide warehouse managers, entomology and epidemiology capacities, vector control, environmental safety/compliance etc.) and mobilization of relevant cross sectoral capacities • Establish infrastructure for IRS (e.g. insecticide warehouses, insectaries and entomology labs, waste disposal systems) • Build and integrate vector control information system with national disease/malaria information system
Evidence-based decision making	• Strategies and interventions adapted to local ecology, epidemiology and resources, guided by routine monitoring and evaluation and operational research	• Information required for decision making clarified, complete with indicators and data collection methods • Establish entomological and epidemiological monitoring plans for targeting, M&E • Select insecticide based on local knowledge on vector susceptibility/resistance • Assure timeliness and completeness of data; manage and utilize evidence for decisions on IRS implementation and strategy refinement
Integrated approaches	• Rational utilization of resources, including appropriate integration of vector tools, methods & multi-disease control approaches.	• Clarify/justify IRS target areas within a national IVM context, utilizing generated local evidence • Assure adequate and evidence-based guidance on combinations with LLINs, short-term impact and long-term disease control objective

3.1 Policy and Legislation for IVM Implementation

An overarching national policy on IVM will be established to provide context to the role and scope of IRS in malaria control in the country. The IVM policy will be integral part of the health policy targeting the control of vector borne diseases. A framework will be established to enable periodic multi-sectoral evaluation of the outcomes and impact of the IVM policy, including the specific aspects on IRS. This will enable ongoing improvement on the relevance of policy and the effectiveness in its implementation.

Public health insecticides must be fully regulated to ensure that human health and the environment are adequately protected. This requires a national management framework that enforces the establishment of appropriate safeguards. As part of the national IVM implementation, there will be a detailed assessment of the adequacy of existing legislation and regulations on the use of public health insecticides in general, including the WHOPES approved insecticides for IRS. The objective will be to strengthen national regulatory and enforcement processes for sound scaled up of intervention. The ministries of Health, Environment and Commerce will work together to enhance and clarify procedures for registering, licensing and importation of WHOPES approved insecticides for IRS to ensure that approved vendors are equipped to transmit all appropriate information on the handling, use and disposal of the insecticide to end users. The streamlining of procedures will also facilitate timely national consideration of new insecticides that are subsequently approved by the WHO Pesticide Evaluation Scheme (WHOPES).

A risk assessment of the potential risks to human health and the environment in the use and scale up of IRS will be undertaken and periodically reviewed, to ensure compliance with enhanced national regulations on public health insecticides, as well as relevant recommendations of the WHO and FAO (e.g. *International Code of Conduct on the Distribution and Use of Pesticides).* The risk assessment will detail the different ecological zones in Burundi which may be targeted for IRS (e.g. areas bordering the lakes). It will also provide a rationale for the selection of any insecticide for IRS (including consideration of the impact on any preexisting tolerance/resistance in the local vector populations), potential risks in the handling and judicious use of the IRS

insecticides. This assessment will lead to the establishment of a checklist of safeguards for compliance inspections of IRS operations. Appropriate educational, advisory, extension and health-care services will be created or enhanced. Human health and environmental safeguards will include the following considerations:

a. There will be regular review and update of relevant national pesticide management laws, regulations and institutional arrangements. The objective will be to ensure adequate safeguards to protect the environment and human health in IRS operations.

b. Procedures will be established for timely communication and collaboration between the IRS program implementers (e.g. PNLP and local administrations) and enforcement agencies such as police and the Ministry of Environment. To facilitate compliance penalties, there will be targeted information on penalties for flouting regulations on insecticides. To reduce risks, access to IRS insecticides will be restricted to authorized persons and institutions.

c. Only WHOPES approved insecticides will be used for IRS in Burundi, assuring full compliance with recommended formulations and product quality. As necessary, special authorization may be granted for the use of newer insecticides, which have been certified by the Innovative Vector control Consortium (IVCC) and are awaiting final recommendation by WHOPES. Decisions on such will be in done in consultation with relevant national experts and as needed, guidance of WHO.

d. Transparent national procurement procedures will be established for public health insecticides and will be strictly enforced. It will include procurement from internationally certified manufacturers and/or their certified and authorized local agents; certifiable importation, shipment and chain of custody within country from central storage to provincial and districts storage, and supervised utilization. As a longer term goal, country laboratory capacity will be established to enable validation of the quality (active ingredient and formulations) of procured insecticides.

e. Storage places will be established IRS-related supplies and equipment within the targeted Provinces and districts. Unified inventory practices will be established to track the distribution and end use of the insecticides and equipment.

f. A certification scheme will be established for all insecticide application equipment. The use of personal protective equipment by all IRS workers who directly handle IRS insecticides (spray operators, warehouse keepers, disposal personnel, washers/cleaning staff, transporters, etc.), will be strictly enforced. There will be appropriate and stipulated training for all categories of insecticide handlers (spray operators, store keepers and transporters/drivers) will be trained and certified on best practices in accordance with national regulations, as well as relevant recommendations of WHO and FAO. Training will cover the insecticide life cycle, i.e. transportation and storage, end-use, and disposal of insecticide contaminated waste. It will be a national requirement to certify all spray operators, in which certification will be based on completing stipulated training or undertaking stipulated periodic refresher training.

g. Use of standardized procedures and practices, such as rinse water recycling to minimize effluent; the use of soak pits or concrete evaporation tanks, depending on the insecticide selected; ensuring compliance with relevant recommendations such as non-proximity of pits to river or underground water, and restricted access; environmentally sound disposal procedures for insecticide contaminated waste and packaging.

h. The MOH and the MOE will collaborate to ensure that there are adequately trained and sufficient numbers of environmental compliance inspectors to monitor IRS field operations. IRS operations will strictly comply with safeguard procedures that will be outlined from risk assessment processes on IRS. Mechanisms will be established to ensure timely use of lessons from compliance inspections to enhance practices.

i. Health facilities in the IRS provinces and districts will be selected and equipped to serve as reference points for insecticide poisoning. Relevant staff of these facilities will be trained to manage incidences of poisoning.

Taxes and Tariff adjustment to promote IRS

The Government of Burundi will work towards meeting the April 25, 2000, Abuja Declaration of by African heads of state, which advocates the elimination of taxes and tariffs on anti-malaria commodities to enable sustainable disease control. Such decisions will be done within the broader context of national planning and may relate to the importation of insecticides, IRS pumps and personal protection equipment, by public and non-profit making entities to promote rapid scale up of IRS operations.

2.2 Advocacy and Social Mobilization

To be effective and sustainable, IRS operations should involve active participation of stakeholders. The goal of advocacy and communication efforts will therefore be to create and sustain an enabling policy environment and empower communities and stakeholders to proactively engage in IRS efforts and make positive choices on compliance. The PNLP will coordinate an advocacy and communication effort linked to IRS operations utilizing a consultative process that includes input from communication outfits within the MOH and other sectors (e.g. MOE). The advocacy and communication efforts will target the following stakeholders:

- *Policy makers*: The objective of advocacy and communication efforts for this group will be to obtain support for IRS and ensure adequate allocation in the annual budget of MOH. Communication will be concise and focus on benefits of IRS operations in malaria control in Burundi. Information on the safeguards put in place to address potential risks will be provided to address any disquiets. Other areas will include funding gaps/requirement to enable forward planning and in-country resource allocation, experiences and lessons from implementation with direct policy implications, as well as successes in coverage and transmission reductions.
- *Donors and developmental partners*: Advocacy and communication to this group aim at relaying the national strategy and goals for malaria control and the role of IRS (as an integral part of an overarching IVM strategy) towards achieving the goals; targeted

population to be protected through IRS, and the consequential and anticipated health and socio-economic impacts; implementation experiences and fund mobilization and gaps. The target may be within as well as external to the country.

- *IRS targeted communities and general public:* The objective for this group will be to promote buy-in and maximize acceptance and compliance rates. Communication will usually precede and also occur during field operations. Communication will be in local dialects, as necessary. It will focus on informing the general public about the purpose and conduct of IRS intervention, and explain the anticipated role of household occupants including actions to reduce exposure and clarify misconceptions. Advocacy and communication will be through various news media, public fora with communities, as well as visits of trained IEC/BCC communicators to individual households prior to and during IRS spray rounds.
- *Technical staff implementing IRS programs*: This will include staff at the central, provincial and district levels of program administration. The character and content of information will be level-appropriate and aimed at supporting decision making at the various program administration levels.
- *Other stakeholders* (e.g. private sector): Advocacy/communication to this target group will be aimed at clarifying the IRS intervention, along with its place and role in malaria vector control. It will also aim at soliciting stakeholder participation. For the private sector, an additional goal will be to either solicit direct contribution to the national program (financial, technical, supplies) or promote the initiation of private sector driven IRS operations as part of workplace or "corporate social responsibility" efforts for nearby/catchment townships.

Action Points:

- PNLP to provide day-to-day leadership to advocacy and communication efforts, with the close support of the IRS Technical Group. It to oversee the development of advocacy and communication materials targeting all stakeholders

- PNLP will work with partners to integrate appropriate BCC/IEC in their vector control interventions.
- PNLP and all stakeholders to participate in mobilization of human and financial resources towards advocacy for vector control.

Indicators:

- Advocacy materials on IRS produced targeting various stakeholder groupings.
- Advocacy meetings on IRS at the national and district levels.
- Number of targeted stakeholders that have allocated resources for vector control.
- Number of targeted communities receiving advocacy information on IRS.

2.3 Cross Sector Collaboration

The local factors that drive malaria cut across the purview of the health sector, as there are many other actors whose actions or inactions may aggravate disease transmission. An IRS Technical Group will be established to coordinate day-to-day implementation and facilitate stakeholder action for IRS. A potential mandate for the group is outlined in Box 1. Collaboration between PNLP and the following are considered particularly vital for IRS operation:

- *Ministry of Environment (MOE):* Collaboration with the MOE is critical to promoting appropriate environmental safeguards in the handling, storage, use and sound disposal of IRS insecticides. The MOH and MOE will collaborate closely to ensure adequately trained staff to undertake compliance inspection of IRS field operations.

BOX 1 Potential Terms of Reference: IRS Technical Group

- Serve as Expert Group under the National Intesectoral Steering Committee.
- (NISC) on IVM, to guide the implementation of IRS under the auspices of the PNLP.
- Coordinate the implementation of national IRS strategy and work plans, ensuring cost-effectiveness, and efficiencies.
- Identify ongoing needs and priorities for IRS; oversee the evaluation outcomes and impact of IRS implementation to inform decisions of NISC in enhancing the IRS strategy as well as the overall national IVM strategy.
- Provide guidance to efforts by IRS stakeholders and ensure that all stakeholders are updated on status of national implementation.
- As may be required, initiate operational research with the consent of the NISC to address priority information gaps.

- *Ministry of Agriculture*: As a primary user of insecticides, some of which share the same active ingredient(s) with public health insecticides, the MoA is critical to harmonizing national regulatory mechanisms for insecticides, as well as the implementation of any national insecticide resistance management scheme. The MoA has a well-developed infrastructure for farmer extension services, which in many other countries has been used to promote judicious use of public health insecticides among farming communities.

- *Ministry of Commerce (MoC):* Collaboration will aim at ensuring streamlined procedures for the registration and importation of approved insecticides with right quality and formulations for IRS.

- *The Ministry of Internal Affairs*: Collaboration is critical to mobilizing targeted communities in IRS operations.

- *Private Sector*: For the private sector, malaria is a major cause of lost productivity from disease-related worker absenteeism and reduced worker output and therefore a direct threat to profitability. Workplace and community-based programs in malaria prevention programs could reverse the adverse impact on private business operations. The private sector also has significant business management capacities that could contribute to improving the efficiency of IRS operations in the public sectors. The inclusion of the private sector is important, as an understanding of relevant policies and malaria vector control safeguards in natural resource development (e.g. agriculture, mining, water resource development), will promote effective disease control. As a policy, the government will prioritize mobilization and active participation of the private sector in corporate social responsibility and work place malaria control endeavors. Opportunities for public-private-partnerships (PPP) will be fully explored and encouraged, and companies will be encouraged and facilitated to establish, IRS operations to cover staff where appropriate. Such efforts will be most desirable within the agribusiness and extraction sectors that usually involve mass worker settlement or clustered contracted private farmer groupings.

- *Research Institutions*: The goal will be to identify and establish effective modalities with research organizations that can contribute to vector control to support the national effort.

Research entities such as the National Institute of Public Health (NIPH) can support the bridging of knowledge gap in local malaria transmission and vector ecology. Support may be in the form of ELISA and PCR-based evaluations linked to entomological and epidemiological surveillance and monitoring.

- *Non-Governmental Organizations (NGOs)*: NGOs, including community-based organizations, play important roles in malaria control in the country. The objective will be to mobilize NGOs for community-based vector control efforts, including initiatives on behavior change communication.

- *Developmental Partner Organizations*: The goal is will be to further enhance partnership with organizations such as WHO, UNICEF, Global Fund, and USAID that are already actively collaborating with the Government of Burundi on malaria control. Efforts will aim at improving the match between the support from these partners and the objectives of the national IRS and IVM strategies.

Under the auspices of a National Intersectoral Steering Committee, and the leadership of the PNLP, the IRS Technical Group will ensure broad and adequate consultations with stakeholders on specific issues, and encourage their participation IRS operations appropriately.

Action Points:

- PNLP to establish an IRS Technical Group involving experts from primary partners to support IRS implementation. The Group will be one of the expert groups under the National Intersectoral Steering Committee on IVM.
- PNLP will establish procedures for effective consultations with stakeholders on IRS implementation, including periodic meetings.
- PNLP to provide guidance and encouragement to stakeholder

Indicators:

- IRS Technical Group established and functional
- IRS stakeholder meetings/meeting reports

- Number of primary Stakeholders involved in joint planning and/or implementation of IRS appropriate to their competitive advantage(s)

2.4 Capacity Strengthening

2.4a Human Resources

National scale up of IRS will require knowledge on the existing constraints, as well as the opportunities and requirements for resolving the constraints, in order to increase efficiencies and maximize sustainable reductions in disease burdens. Such evaluation, which will include evaluation of the range of competencies, skills and staffing levels required at the central/national, provinces, districts and communes (see Table 3), will need to be done within the context of the broader ongoing national transition to IVM, as per the recommendations of the WHO. As a medium to a longer-term goal, the PNLP, in close collaboration with relevant sectors and partners, will establish capacities that complement decentralized and appropriate decision making on vector control. Human resource capacity strengthening will include the following:

- The capacity of the Vector Control Unit of the PNLP will be strengthened to manage IRS operations within the context of the broader IVM capacity strengthening. The MOH will aggressively create opportunities for advanced education and in-service training to establish a full complement of critical skill set in epidemiology, vector ecology and control, entomology, logistics management, data management, as well as monitoring and evaluation. The competencies/capacities of relevant MOH divisions, as well as other primary stakeholder sectors such as Ministry of Environment will be appropriately strengthened to enhance national preparedness. There will also be efforts to strengthen the staffing and competencies at the provinces and districts with a medium-term goal of decentralizing IRS operations.
- Adequate numbers of trained entomology technicians will be created within districts to support monitoring activities at sentinel sites. A newly established insectary and entomology laboratory at Kahanga will function under the auspices of the PNLP to coordinate vector surveillance and monitoring within the country to support of vector control operations (refer subsequent section on entomology). The insectary activities will be complemented by

laboratories at the NIPH which will provide ELISA and PCR-based evaluations in support of entomological surveillance and monitoring activities.

Table 3: Core Functions at Different Administrative Levels of National Vector Control

National/Central Level	
• Strategic direction to programs • Policy development • Standard settings, norms and M&E indicators • Programme funding/resource mobilization • Prioritize and allocate financial resources. • Epidemiologic analysis • Quality assurance • Training and support for district/sector programs and vector control	• Coordination of emergency response • Evaluation & validation of operational research • Decision making and planning of region programs/activities • Determine human resource needs • Monitor and evaluate district/sector IVM implementation
Province and District levels	
• Local planning of implementation. • Resource prioritization and allocation • Disease surveillance • Programme monitoring • Health education	• Train field staff/village health volunteers • Undertake vector control activities, assist in operational research. • M&E: collection and initial collation of local data on various vector control aspects

- National capacity for quantification of IRS procurement (spray equipment and supplies, insecticides, and spray team sizes based on housing and population data) will be strengthened to ensure timeliness of spray operations. There will be institutionalized training on standardized methodologies for IRS needs quantification, as part of overarching IRS training efforts, to build such capacities within the targeted district and provinces.

- Appropriate and standardized training will be instituted to ensure adequate preparations of the broad range of temporary local field staff needed for spray operations within each of the targeted districts. These include spray operators, supervisors, store keepers, community mobilizers, pesticide transporters, waste disposal technicians, environmental compliance officers, and IEC/BCC workers. Training of the temporary workers will be decentralized to

the districts and will take place immediately prior to each spray season, to ensure that all operations are efficiently conducted, and that spray operator quality and safeguards to protect human health and environment are maximized. Master trainers will be established in each of the targeted counties, to conduct the required standardized training. Collaboration between the PNLP, the Ministry of Internal Affairs and local administrations, will be improved to facilitate the identification of temporary field workers.

- Health facilities will be selected in the IRS districts and equipped to serve as poison centers. Relevant staff of the facilities will be trained to manage incidences of insecticide poisoning.

2. 4b Information Management for IRS

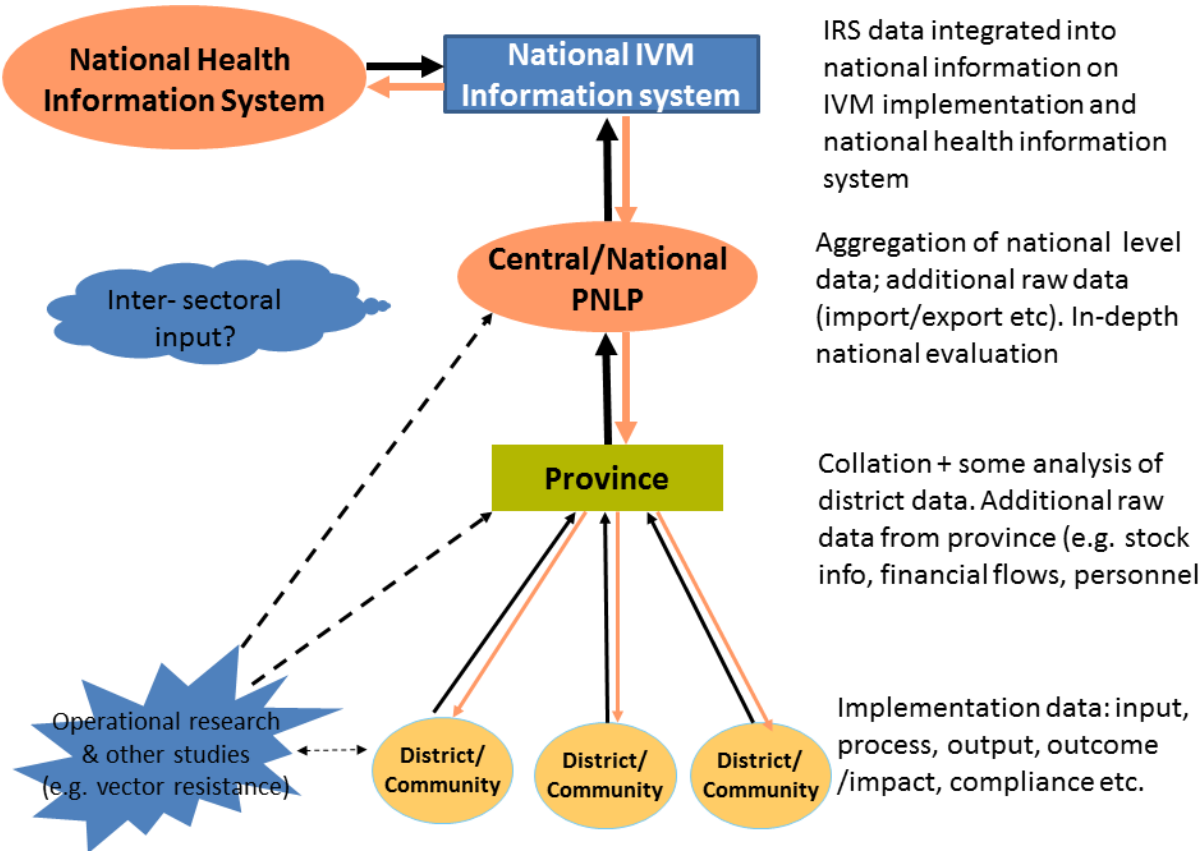
IRS is a time-sensitive operation. It needs to occur before, but as close to the rainy season as possible to ensure that the period of maximum residual efficacy of the IRS insecticides coincides with the increase and cresting of local disease transmission. The onset of rains makes this logistic dependent intervention difficult to undertake. The local eco-epidemiology of malaria changes, either in response to naturally occurring ecological changes, or brought about by the IRS and other vector control operations. Timely information between the central, provincial and district levels, is therefore, critical for successful IRS implementation (Fig. 1). Information of IRS operations will be collected and managed as part of an integrated information system on IVM. The Information system will have the following characteristics:

i. There will be appropriate and adequate technical and infrastructural capacities established at the central, provincial and district levels for timely collection, management and utilization of locally relevant data for decision making on IRS. Data collected will include the local malaria vector species, the eco-epidemiology and burden of malaria, progress made in the IRS implementation, including outcomes and disease level impacts. Indicators or data sets to be collected with a program monitoring and evaluation framework will be identified. The frequency of measurements of the indicators (input, process, output, outcome and impact) will be established, documented and disseminated to all relevant staff to harmonize efforts and ensure comparability of data sets. There will include insecticide quantities used, eligible

structures sprayed, households receiving IEC/BCC services, persons receiving training by category of work on IRS operations, IRS household refusal rate, entomology indicators as outlined in Table 4, malaria incidence in sprayed houses compared to unsprayed ones, planning meetings held, compliance rates on environmental and human health safeguards. Measures will be established to protect the integrity of data from the points of collection/measurement through to the point of interpretation and use.

ii. There will be regular dissemination of level-appropriate information at all levels of IRS operations, to facilitate timely decisions and ongoing improvement of IRS outcome and impact. The IRS Technical Group, serving as a sub-committee of the NISC, will assist with IRS relevant input into the IVM policy review mechanism. There will be timely utilization of gathered scientific data in advocacy and communication targeting various stakeholders as outlined under Section 2b.

Fig 1: potential routes for vector control data collection/management



2.5 Evidence-Based Decisions Making

Local data on entomology and disease epidemiology on malaria is critical to successful implementation of any vector control intervention. Adequate human resources and relevant infrastructure will be established to plan, implement, and conduct required monitoring. The objective will be to enable ongoing improvement in the targeting of IRS operations and to maximize the overall impact on local disease burden.

2. 5a Entomology Monitoring

Entomological capacity will be established with the following components:

i. *Trained human resources*. Efforts will be made to ensure adequate placement of trained staff (central managerial level, entomology field technicians and laboratory technicians) all levels for effective implementation. PNLP entomology focal points and technicians at the central level have undergone critical training in standard surveillance and monitoring methodologies. Additional training and mentoring will be provided as needed.

ii. *Functional infrastructure*: This will include equipped insectary and associated entomological laboratory, sentinel sites). Such a central facility has been established at the Gihanga Health Post to undertake a broad range of evaluations in support of malaria vector control. The insectary will support the coordination of assessments by sentinel field stations (see Table 2). An ELISA and PCR capable laboratory will also be established at the National Institute for Public Health (NIPH) to support PCR based evaluations associated with entomological surveillance and monitoring.

iii. *An entomological surveillance and monitoring regime*, with clearly defined indicators and standardized protocols will be instituted to generate local information. Entomology sentinel sites will be established within the districts, and these will be staffed by trained entomology technicians (see Table 2). The sentinel sites will form a national network to capture relevant data on the major eco-epidemiological settings of malaria transmission in the country, as well as the impact of IRS and other vector control interventions on malaria transmission.

iv. *Efficient data management and utilization capacity:* This is covered under a previous on "information system."

Recognizing that foci of resistance (reduced susceptibility) to some WHOPES recommended IRS insecticides exist in some local malaria vector populations in the East African region, the development of relevant entomological monitoring systems to enable effective management of insecticide resistance will be a top-most priority. The NIPH will assist with PCR-based evaluations of the insecticide resistance mechanisms amongst local vector populations to inform the development of a national resistance management scheme.

Table 2: Basics on Entomology Sentinel System

- A national entomology sentinel system will be established and linked to the central insectary and entomology laboratory that will be sited at the Gihanga Health Post, as well as the PCR laboratory at the NIPH.
- The number and location of the sentinel sites will be guided by subsequently developed and periodically updated criteria, ensuring coverage of (a) major ecotypes in the country, (c) potentially isolated vector populations due to geographical barriers (b) areas with known reduced insecticide tolerance or resistance
- The sentinel sites will conduct ongoing monitoring and surveillance (see Table 3) on local malaria vector populations in defined geographical locations, using standardized and internationally recognized methodologies/protocols.
- Other ecological/environmental factors with direct impact on the vector populations (e.g. rainfall, temperature) will also be recorded.
- The generated data will provide insight on vector ecology, vector population structure and distribution and spatial and temporary changes in species, disease transmission related behavior (biting and resting preferences); efficacy and effectiveness of vector control intervention employed to control malaria
- Sentinel sites will be manned by entomology field technicians (two and a supervising technician) who would have received formal training and attained proficiency on all the required methodologies and assessments to be conducted at the site. The technicians will be literate (with previous technical or secondary education) and able to document data, read and understand simple instructions in the official national lingua franca.
- The sentinel sites will have basic equipment and supplies to conduct its assessments, including microscopes, insect cages, dissecting kits etc.
- The technicians will be guided by detailed and user-friendly sentinel site (field) manuals. As needed, they will mobilize and train persons in nearby communities to provide temporary support to field assessments as may be described in the sentinel site manuals.

Table 3: Desirable entomological monitoring indicators linked with IRS operations

BASIC Entomological evaluations (measured monthly) – Category 1 (sentinel sites):

i. *Insecticide residual effectiveness (Cone bioassay)*—on major wall surface types (mud, painted or unpainted cement, and wood) in the localities where indoor residual activity is conducted and on LLINs. Provides rate of decay of the insecticide determined for (a) IRS by 24 hour mortality of mosquitoes exposed to sprayed walls for 30 minutes and (b) for LLIN as 24 hour mortality of mosquitoes exposed to LLINs for 3 minutes.

ii. *Night catches (indoor & outdoor)*—provides insight into biting behaviour of local vectors

iii. *Pyrethrum spray catches*—done between 6am and 8am at pre-selected houses. Indicator provides insight into vector entry into sprayed rooms over time. Compared with unsprayed homes and other higher category 2 evaluations on the catches (e.g. parity, sporogony, and blood meal analysis) provides insight on effectiveness of intervention and indicate transmission risk changes in sprayed rooms.

iv. *Species identification (morphological) and composition*—from monthly catches listed above. This will enable mapping of vector distribution and tracking of any changes in species composition within the year

v. Vector susceptibility evaluation (CDC) bottle assay or WHO method: 2x/year for WHOPES approved insecticides

vi. Humidity, rainfall and temperature data (daily with monthly averages)

Entomological evaluations: Category 2 (insectary/entomology laboratory at Gihanga)

The Category 2 evaluations require advance training and access to relevant ELISA and PCR equipment.

The following indicators will be assessed:

i. Sporozoite rates (quarterly)–provides insight into risk of getting malaria
ii. Entomological inoculation rates (quarterly)—measure risk of getting malaria through infected bite
iii. Blood meal analysis (half yearly)—provides insight into feeding preference of mosquito vector
iv. Parity evaluations (quarterly)—especially from room catches denotes the effective intervention is in killing off vectors
v. Resistance mechanism (annually)

2.5b Epidemiological Monitoring

As part of national transition to IVM, country capacity will be strengthened to improve collation and utilization of routine facility-based and parasitologically confirmed monthly malaria incidence data. This will provide data and detailed mapping of disease prevalence. Such capacity will also assist the evaluation of IRS implementation and ongoing refinement of IRS targeting and overall cost-effectiveness. There is an urgent need to update the map and stratify malaria prevalence in the country to support vector control implementation generally.

2.5c Operational and Outcome Indicators

Clear and standardized indicators will be established to enable harmonized evaluation of the cost-effectiveness and impact of the IRS intervention. These will include the following:

- *Input indicators:* Insecticide quantities used, total staff hours, the amount of personal protection equipment utilized, cost of operations; IEC/BCC communication
- *Output indicators*: Percentage of eligible structures sprayed, as a function of the total structures identified in the target area; population covered by spray operations (total, by gender, and by preferred age/groupings such as children under five years of age and pregnant mothers). Other output indicators will include percentage households receiving IEC/BCC services; numbers of the various IRS worker categories receiving training; spray refusal rate among targeted households.
- *Outcomes/impacts*: Reduction of vector entries into sprayed houses, compared with unsprayed; changes in vector population age structure; reduction in vector biting rates; changes in the vector infectivity rates; reductions in local disease burden etc.

2.5e Insecticide Selection for IRS

The following factors will be considered in the selection of IRS insecticides:

- Selected insecticides must be recommended by WHOPES for IRS. All selected insecticides for IRS must be duly registered for that purpose in the country. Where such insecticides are not registered, the full national requirement for registration will be fulfilled prior to its

importation, except where temporary exemption under emergency conditions is provided by a duly authorized national agency.

- *Susceptibility of local vectors*: The local vector populations in the IRS target areas must be susceptible to the insecticide formulation selected. Vector susceptibility can be determined using standardized WHO or CDC protocols. The test should be done at least once a year to inform decisions on insecticide procurements are made. General WHO guidance for the interpretation of susceptibility rates will be followed. Where resistance exists, an insecticide with a different mode of action will be used to enhance the management of resistant vector strain(s).

- *Emergency situations*: In an upsurge of insecticide resistance to available WHOPES recommended insecticides, special authorization may be provided by the MOH for limited/temporary use of a newer insecticide developed by or that have passed the evaluation of internationally recognized authorities such as the Innovative Vector Control Consortium (IVCC).[2] The use of such insecticides will be primarily for resistance management. Hence a basic criterion will be that the newer insecticide will have a different mode of action. Utilization of such newer insecticide under special circumstances should be preceded by: (i) consultation among relevant national experts and, as appropriate, international peer references including WHO: (ii) professional scrutiny of the performance of the insecticide in other countries of similar eco-epidemiology and transmission profiles: and, (iii) confirmed susceptibility of local vector populations that are to be targeted under the temporary emergency resistance management initiative.

- *The length of IRS residual efficacy on sprayed surfaces*: This is the length of time in which the insecticide is able to knock down targeted vectors under existing local conditions. The residual efficacy is therefore synonymous with the protection period the insecticide provides. The desire is to have insecticides that cover the duration of the local malaria

[2] IVCC is a not-for profit Product Development Partnership aimed at the "accelerated development and delivery of new products and tools that increase the effectiveness and efficiency of the control of insects which transmit disease." http://www.ivcc.com

transmission. Since malaria transmission is almost year-round in Burundi, a longer residual efficacy is desirable. Newer formulations of selected insecticides with longer residual efficacy, or new class(es) of WHOPES recommended insecticides entering into the market place will be proactively assessed for suitability.

- The cost of insecticide of choice compared to other alternatives is an important criterion that may inform selection. However, this should not be the only criterion. Other criteria must be adequately considered, including the length of residual efficacy, pre-existing vector resistance, peculiar operational cost associated a particular insecticide (including cost of environmental compliance and related waste disposal).

2.5f Management of Vector Resistance to IRS Insecticides

The development of insecticide resistance in the local vector(s) of malaria is a major area of concern for any insecticide based intervention, as it will directly threaten the continued viability of the insecticide. Pre-existing foci of kdr resistance allele for DDT and pyrethroids have been confirmed for many locations in the East Africa region. Additionally, recent evaluations under ongoing IRS operations have also shown significant reduction in vector susceptibility to some pyrethroids in certain locales. Thus, the establishment of a robust management scheme to prevent and manage the development of insecticide resistance is a primary consideration for IRS operations in Burundi.

The PNLP will collaborate with NIPH to determine the levels, types and distribution of resistance alleles/mechanisms in the mosquito populations in Burundi. The information is relevant for establishing a national resistance monitoring scheme (Fig 2), which should have the following component steps:

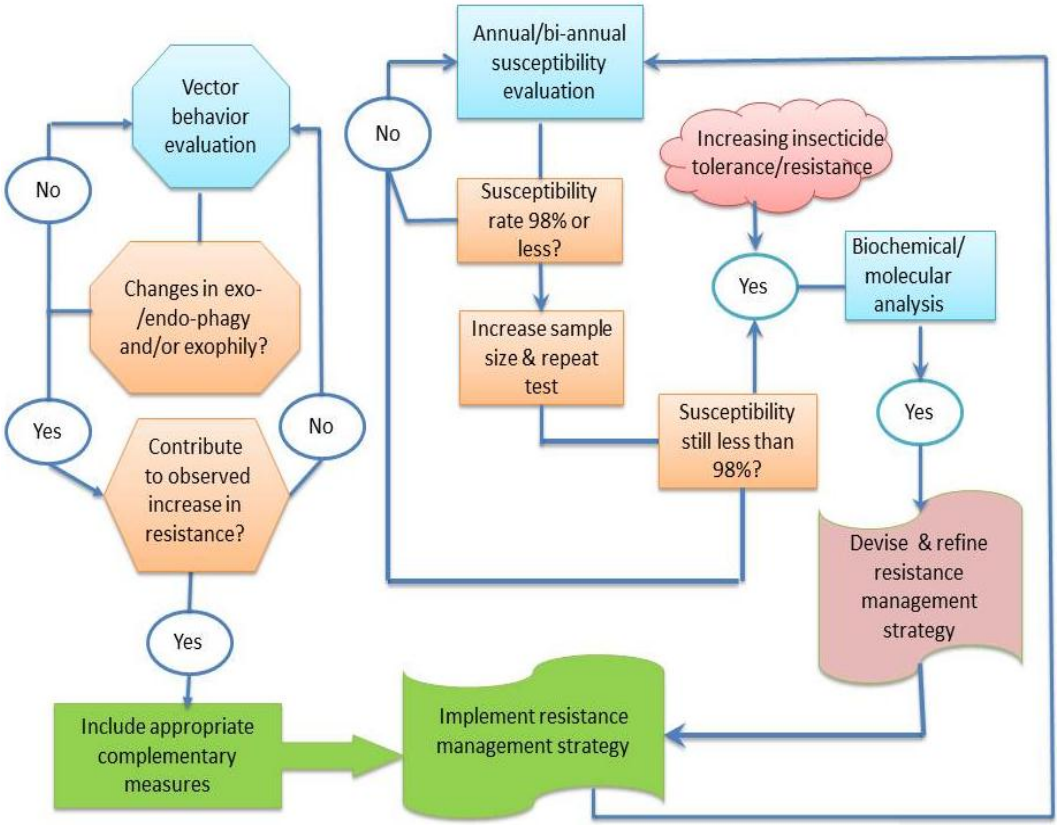
a. A national entomology sentinel system, linked to the overarching national transition to IVM, will be established to ensure representative sampling of the major ecological settings within IRS targeted areas.

b. The susceptibility of the vector populations at the sentinel sites to WHOPES recommended insecticides for IRS will be measured to establish a baseline distribution. This will be followed by annual evaluation of vector susceptibility. A determination of susceptibility rate

of 98% or less will trigger a larger sample for evaluation. If the value of less than 98% is confirmed, then biochemical/molecular evaluation of resistance mechanisms will be initiated including knock down resistance (kdr), Gluthanione and Gluthatione-S-Transferase (GSTs), Cytochrome P450s, Esterases, Acetylcholinesterase (AchE) or Modified Acetyl Cholinesterase (MACE), and Gamma-Amino Butyric acid (GABA)], using either TaqMan Plasmodium Assay or Polymerase Chain Reaction (PCR).

The aforedescribed evaluation scheme will provide insight to the local divers of the observed tolerance or resistance. An appropriate resistance management scheme will be established. Where pre-existing tolerance to insecticides exists, a six-monthly monitoring of susceptibility will be established. Vector susceptibility/resistance data also be shared with WHO moderated regional database on insecticide resistance, to assist region-wide strategies to manage insecticide resistance.

Fig. 2. Potential resistance monitoring and management scheme



Major Action Points

- PNLP to provide leadership to the development of an entomological surveillance and monitoring plan and oversee the implementation of the plan with support by the IRS Technical Group.
- PNLP to oversee the development of a national resistance management scheme which includes clarified roles for relevant partners such as NIPH on advance entomological (ELISA and PCR-based) evaluations.
- PNLP, with support of IRS Technical Group to identify human resource for effective IRS implementation. This will include the placement and competency/skills sets required.
- Establishment of an IRS information system as an integral part of a national IVM information system.

Indicators

- National entomological surveillance
- Number of functional sentinel sites, also expressed as a proportion of total sentinel sites anticipated
- Number of required indicators measured in each year
- National resistance management strategy
- Number of trained personnel undertaking functional role in IRS implementation, as a proportion of the overall national need in that functional area
- A functional IRS information system

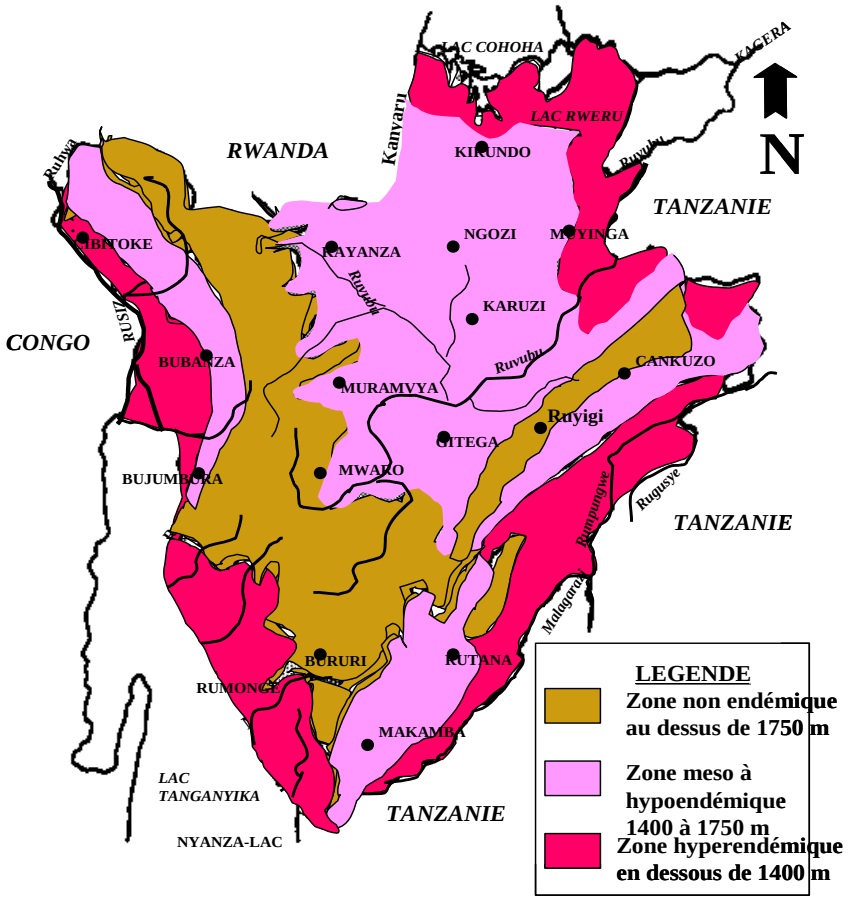
3. SELECTION OF IRS TARGET AREAS

Consistent with the stated goals of the *National Malaria Strategic Plan* to halve malaria morbidity and mortality by 50% from 2000 and by a further 50% by 2015, The National Malaria Control Program envisages expanding IRS to cover:

- Eight priority high elevation provinces (Gitega, Karusi, Kayanza, Muramvya, Muyinga, Mwaro, Ngozi and Cankuzo). The population in the eight provinces forms about 52% of the total national population.
- In addition, the utility of IRS, as a complement to a main LLIN intervention in parts of some lower elevation provinces (Cibitoke, Bubanza), will be evaluated. In the past, portions of Bujumbura in the environs of Lake Tanganyika were covered by IRS, however, these regions tend to experience periodic inundation. Therefore, IRS implementation in the lake environs will be evaluated in terms of cost-effectiveness and potential environmental release risks that such inundations may pose, if any.

- IRS is effective in all levels of malaria endemicity, from very intense to hypo endemicity. The strategy for deployment, however, changes from broad application to surveillance-driven focal spraying as endemicity is reduced down through meso-endemicity, hypo-endemicity and local elimination.

Table 1: IRS Target Provinces, also showing malaria endemicity (as at 2009)



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3.1 Timing of IRS Operations

IRS operations are best conducted in the drier period just before the onset of the rain season for three main reasons:

- IRS implementation is logistics intensive. It involves the transportation of a substantial number of people (spray operators, etc.) and supplies (insecticides, and equipment - spray pumps and accessories), all of which may be seriously hampered by the onset of the rainy season.
- There is a need for households to take some possessions outside of the rooms, in order to access the walls for spraying, which will be hampered by rain.

- It is desirable that the maximum residual action of the insecticides (i.e. vector knock-down properties) coincides with the peaking of local transmission of malaria.

For the eight elevated provinces, it is anticipated that successful implementation of IRS may result in control efforts progressing increasingly to focal/residual transmission. This will require epidemic prediction and detection capacities to ensure timely mop up transmission hotspots.

Major Action Points

PNLP to oversee development of a set of criteria for selecting IRS target districts

Indicators

Criteria for selection of IRS target districts

4. ONGOING REFINEMENT OF IRS AND INTEGRATION WITH LLIN DEPLOYMENT

This IRS strategy will form an integral part of an overarching national IVM strategy. This means that IRS implementation will be coordinated with LLINs in order to optimize the overall cost-effectiveness of national malaria vector control efforts, enhance the management of insecticide management, as enable informed transitions in the joint deployment of the two interventions in the long term. Joint deployment strategies for IRS and LLINs are especially critical as local transmission is successfully reduced and pre-elimination conditions are achieved in certain geographical areas, or as total population coverage targets for LLINs are achieved. Decisions on joint deployment will be based on credible and integrated disease surveillance system and will draw upon relevant recommendations and guidance of WHO.

There is currently no standardized way to determine the circumstances under which the combination of the two interventions (or what levels of combination) will result in maximum disease reduction benefits and cost-effectiveness. As a general principle, WHO recommends combining IRS and LLN, when a single intervention cannot completely cover all of the

populations at risk, or achieve the maximum disruption of transmission that is possible.[3] For Burundi, the current priority is to assure full and universal coverage of all population at risk of malaria, utilizing the two interventions of IRS and/or LLINs. For IRS specifically, priority will be given to the high elevation provinces that are prone to epidemic outbreaks. With adequate resources and enhanced national capacities, IRS coverage may then be extended to complement LLINs in other areas. LLINs will continue to be scaled up in the lower endemic regions of the country with the aim of achieving maximum utilization rates. As pre-elimination conditions are achieved in local geographic areas, an elaborate surveillance driven strategy will be established to consolidate gains.

4.1 Cross Border Collaboration

Cross border collaboration will be encouraged to ensure that malaria vector control efforts in the border areas with surrounding countries are coordinated to achieve maximum results. There should be proactive exchange disease transmissions data, vector population profiles, lessons and impacts of interventions.

Major Action Points for cross border collaboration

PNLP to provide leadership for establishing modalities for effective consultations and collaboration with surrounding countries on vector control in border areas..

Indicators

Meeting reports of consultations or joint planning missions

[3] *WHO (2010). WHO Technical Consultations on combining Indoor Residual Spraying and long lasting insecticidal net intervention*, World Health Organization, Geneva Switzerland, 20 p.

5. WASTE MANAGEMENT

Effective management and sound disposal of waste is a primary consideration in the successful implementation of any IRS intervention. There are two categories of waste for which the following:

- **Insecticide contaminated liquid waste (from washing and rinsing activities linked to IRS)**. Two major actions will be taken to minimize effluent generation and reduce environmental contamination.
    - *A progressive triple rinse-water reuse***:** Spray pumps will be rinsed out via a series of barrels at the end of each workday spray activities. The rinse-water will be reused for the following day by filing the first round of each operators pump. The washouts from the last day of the spray campaign will be decanted into the soak pit. A policy of "minimum release of water into the environment" will be strictly enforced
    - *Use of Soak pits and prevention of washouts into drains*: Wash water from daily cleaning of spray operator PPE (e.g. coveralls), will be decanted into a soak pit, built to standard specifications - to trap the pesticides long enough to ensure denaturing within the soak pit. No wash water will be released into the general environment. The soak pits will be sited away from streams or underground water.

- **Insecticide contaminated solid waste**. This includes discarded gloves, mouth guards, empty insecticide sachets and paper carton materials. There will be strict inventory to ensure that all solid waste get retrieved from point where they are generated , secure-stored and transported under supervision, to designated disposal locations. Solid waste from IRS operations will be disposed in high temperature incinerators that meet relevant WHO-FAO recommendations/ standards for environmentally sound incineration of

insecticides.[4] To meet the demand of a scaled-up IRS implementation, national capacity to dispose insecticide contaminated waste there will be increased with the installation of incinerators that meet relevant FAO and WHO specifications.

Major Action Points for waste disposal

- PNLP, in collaboration with MOE and other relevant stakeholders to develop an IRS waste disposal plan will appropriate and adequate safeguards to human health and environment

Indicators

- IRS waste disposal plan
- Proportion of waste from annual IRS operations that is disposed in full compliance waste disposal plans

6. RESOURCE MOBILIZATION

A detailed, multi-year and fully-costed national IRS work plan will be developed, based on this strategic plan. It will be an integral part of a costed and overarching IVM work plan, which anticipates the deployment of LLINs, as well as other complementary vector control interventions. Efforts will concentrate on mobilizing dedicated financial resources for cost-effective implementation and expansion of IRS. The IRS work plan will detail and cost all aspects of planning, managing, deployment and monitoring and evaluation, including staffing at the various levels (both long term and temporary field workers), community mobilization, forecasted procurement, storage and transportation, disposal, and data collection and management.

[4] WHO (2007), *WHO-UNEP Manual on Sound Management of Pesticides and Diagnosis and Treatment of Pesticide Poisoning: A Resource Tool*, World Health Organization, Geneva. (Document also accessible at: www.who.int/ipcs/en/a)

The IRS strategy and work plan will form the basis for structuring an aggressive resource mobilization efforts—as it will enable forward planning by government on the allocation of in-country resources and facilitate targeted submissions to the country's developmental partners, such as The Global Fund for Malaria, HIV/AIDs and TB, World Bank, African Development Bank, and the private sector.

6.1 Encouraging Private Sector Investment

The potential of malaria to raise the cost of labor through disease-related absenteeism and reduced worker output is a significant threat to the profitability of the private sector. Private sector investment in workplace and community-based programs in malaria prevention programs has been demonstrated to reverse the adverse impact of malaria on business operations. Opportunities for private sector input and public-private-partnerships (PPPs) exist in Burundi. This will be fully explored to build on the existing relationship between the PNLP and private sector partners. Modalities and incentives will be established to facilitate private sector investment in 'corporate social responsibility' vector control initiatives, including IRS operations.

Major Action Points for resource mobilization

PNLP to coordinate resource mobilization strategy based on elaborated work plans on IRS

Indicators

- IRS resource mobilization plan
- Annual funds mobilized as a proportion of total IRS budget estimate
- Number of partners providing resources to nation IRS implementation
- Number of functions PPPs on IRS

MAJOR FOLLOW UP ACTIVITIES

The following are proposed follow up actions to the national strategy on IRS.

Major Activity	Timeline
Formal approval/adoption of the National IRS Strategy	September 2012
Development of a 4-year budgeted work plan on IRS based on the National IRS Strategy	December 2012
Establishment of National IRS technical group with enhanced mandate	September 2012
National IVM strategy to provide overarching framework for vector control • Drafting of National IVM strategy • National adoption of a National IVM Strategy	 August 2012 August 2012
Initiate fund mobilization based on work plans based on the work plans, including • Elaborate opportunities/options for private sector investments/involvement in malaria vector control	 December 2012
Entomology	
• Fully functional insectary and entomology laboratory, including PCR lab, at LIBR	May 2012
• Refresher training for laboratory & insectary technicians	June 2012
• Establish and equip entomology sentinel sites; finalized national entomology surveillance protocols, data management schemes and field technician manuals	December 2012
National Insecticide Resistance Management Strategy • Comprehensive entomological baseline to (a) identify distribution of malaria vectors, and (b) status and distribution of susceptibility/resistance • Develop a resistance management strategy • Initiate implementation of resistance management strategy	 December 2012 January 2013 February 2013
Pesticide Management	
• Comprehensive review of national public health insecticides management scheme, including environmental health safety and disposal within national IRS scale up	November 2012
• Assessment of incineration requirement for scaled up coverage target and establishment and certification of incinerator(s)	January 2012

ANNEX 1: ENVIRONMENTAL & HUMAN HEALTH SAFEGUARDS IN IRS

RISKS RELATING TO PESTICIDE LIFE CYCLE	MITIGATION MEASURES
Procurement	
Procurement from uncertified sources	• Mandatory registration process requiring submission of insecticide specification, source of supply etc.
	• Designation and licensing local importer, linked to a known single international supplier
	• Establishment of a transparent tendering process
Importing wrong pesticide specification	Above-listed mitigations plus • Robust inspection at port of entry and manufacture specification
Pilferage at port-of-entry and en route to central storage	• Linking transportation from port-of-entry to central warehouse as part of importer responsibility
	• Use of certified/licensed drivers and dedicated transportation.
	• Use security guard during transportation
Pilferage at central stores	• Pesticide stock protected by same high level security for drugs and other essentials
Inland transportation	
Inadequate transportation	• Use of certified/licensed drivers and dedicated vehicles.
Pilferage	• Use security guard during transportation
Transport relation incidents	• Transporters trained on first response to incidents (e.g. secure site, call emergency response)
Storage and pesticide management in districts and sub-districts	
Pilferage	• Secure, dedicated storage facilities and, as necessary, use of security guard
	• Strict auditing scheme (e.g. daily spray cards, team leader daily summary cards, supervisor daily summary cards)
	• Regular inventories
Inappropriate storage practices	• Trained storekeepers in pesticide management
	• Regular inspections
	• Good storage maintenance
	• Effective inspection regimes

Annex 1 [cont'd]

RISKS RELATING TO PESTICIDE LIFE CYCLE	MITIGATION MEASURE
End-use of pesticide: human safety	
Exposure of spray operators and other handlers	▪ Training on best practices for all categories of workers
	▪ Use of full PPEs by spray operators
	▪ Availability and effective use of ablution facilities
	▪ Clear criteria for reprimand for non-compliance
Exposure of households	▪ IEC implementation to enhance household safety and compliance (1-2 hour wait time before re-entry etc.)
	▪ Field supervision to assure best operator practices
	▪ Avenue for receipt of household complaints
	▪ Effective inspection regimes
Poisoning incidents	▪ Staff training and IEC with components aimed at preventing poisoning.
	▪ Enhance capacity for poison management by: o Training of all category of workers to identify danger signs and required response o Training health workers, designate & equip district reference points for treatment of incidents of pesticide poisoning
End-use of pesticides: Environmental Safety	
Fugitive release into environment from handling/spray activities	▪ Best practices (triple wash/rinse water re-use)
	▪ Use of pits
	▪ Prohibition of decanting into streams and open drains
	▪ Prohibit worker washing in streams
	▪ Clear criteria for reprimand for non-compliance by IRS workers
	▪ Effective inspection regimes
Non-recommended use of pesticides	▪ Secure storage, management and inventory system
	▪ Effective enforcement
	▪ Significant punitive measures against pilferage
	▪ Effective IEC on dangers and consequences of non-recommended use of pesticides
	▪ Effective coordination between MOH/PNLP, MOA, MOC and Agriculture-based NGOs (including farmers groups)
Release of empty sachets/packaging in general environment or reuse for non-recommended purposes	▪ Strict auditing (see above) and accounting for empty sachet and packaging materials for sound disposal