

Standard Operating Procedure for larval source management of *Aedes* mosquitoes

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SOP #: LSM-2026



PacMOSSI

Pacific Mosquito Surveillance
Strengthening for Impact

1. Purpose

This Standard Operating Procedure (SOP) provides guidance for the safe, effective, and consistent implementation of Larval Source Management (LSM) activities targeting container-inhabiting *Aedes* mosquitoes (e.g., *Aedes aegypti*, *Ae. albopictus* and *Ae. polynesiensis*) in Pacific Island Countries and areas (PICs).

It covers planning, source reduction, habitat management, larviciding, community engagement and documentation of LSM activities.

It should be read in conjunction with national vector control guidelines, approved product labels, Safety Data Sheets (SDS), and relevant PacMOSSI operational procedures.

2. Scope

This SOP applies to Ministry of Health (or equivalent) personnel, contractors and partner organisations involved in Larval Source Management (LSM) activities.

It provides the operational procedures for planning, implementing, monitoring and documenting LSM activities. Detailed guidance on larval habitat identification, larvicide products, application methods and community engagement is provided in other PacMOSSI guidance noted below.

Using This SOP

The following PacMOSSI resources should be used together:

Document	Purpose
LSM SOP	Provides operational procedures for conducting larval source management activities. Annexes include operational forms, checklists and supporting guides.
Larvicide Technical Notes	Provide product-specific guidance on approved larvicides, including dosage, application, PPE, storage and disposal requirements.
Risk Communication Guide	Provides guidance on community engagement, risk communication and behaviour-change messaging to support LSM activities.
Information for Key Messages: <i>Aedes</i> Larval Control During an Arboviral Disease Outbreak	Provides key messages and communication materials for community awareness and participation in larval control activities.
LSM Field Guide	Provides practical guidance on larval habitat identification, sampling, source reduction and larvicide application techniques, with illustrations.

Key Message:

This SOP describes what to do, the supporting communication resources explain how to engage communities, and the Technical Notes provide product-specific larvicide guidance.

3. Planning For LSM

LSM should only be undertaken where it is appropriate, feasible, acceptable, and supported by surveillance, epidemiological, environmental, and operational information. Planning should define the objectives, timelines, roles and responsibilities, and resources required to safely and effectively implement the activity (see Figure 1).

LSM activities should prioritise source reduction and habitat management, with larviciding used only where habitats cannot be effectively managed through other means. Community engagement should continue throughout planning, implementation, and follow-up activities.

Figure 1 provides an overview of the LSM process. Selection of the most appropriate intervention for each identified larval habitats should be guided by the LSM Decision Tree (Figure 2) in Section 11.

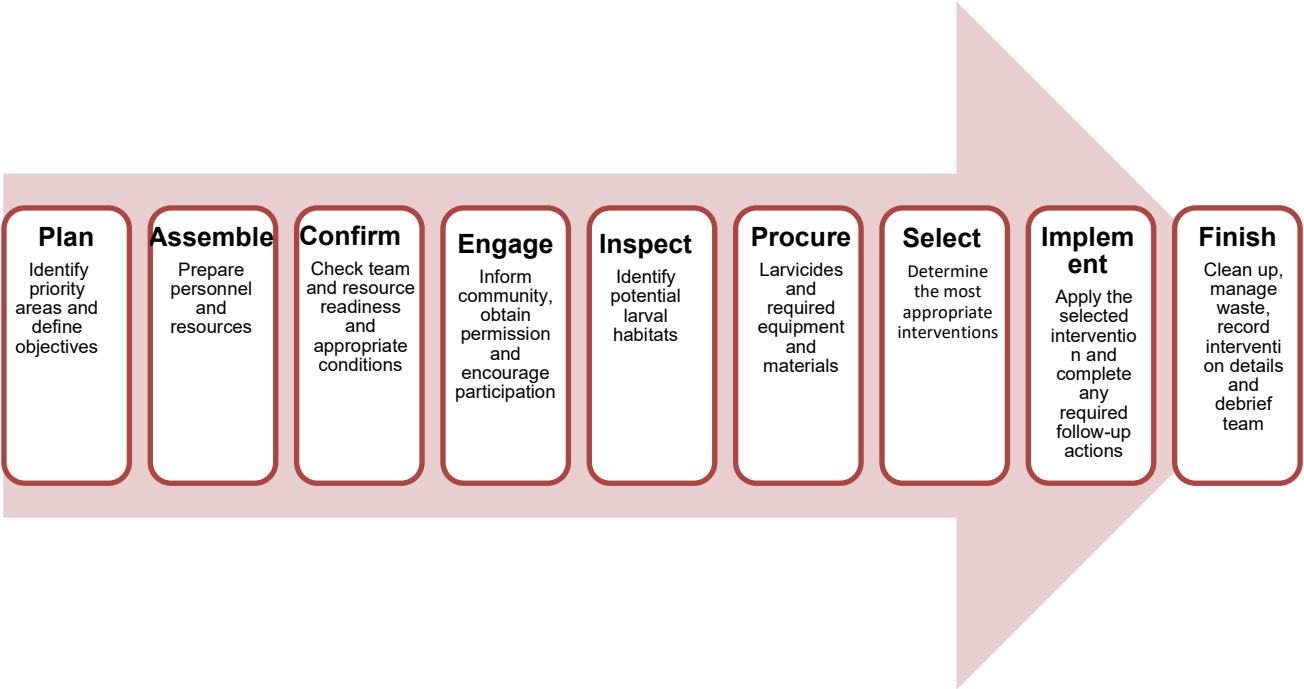


Figure 1. Overview of the LSM Process

Key Message

LSM is a stepwise process that prioritises source reduction and habitat management before larviciding. Community participation and accurate documentation are essential throughout all stages of implementation.

4. Roles and Responsibilities

Below are the key roles and responsibilities for personnel involved in implementing LSM activities. All personnel should be appropriately trained and familiar with this SOP, relevant Technical Notes, product labels, Safety Data Sheets (SDS), and applicable health, safety and environmental requirements.

Role	Responsibilities
Program Manager	Approve and oversee LSM activities, ensure personnel, equipment and resources are available, support training, and review program performance.

Operations / Field Supervisor	Coordinate field operations, allocate personnel and equipment, ensure compliance with this SOP, supervise field teams, review operational records and provide corrective feedback where required.
Team Leader	Lead daily field activities, conduct briefings, support community engagement, monitor field work, and report operational issues.
Vector Control Officer / Field Operator	Inspect larval habitats, undertake source reduction activities, apply larvicides where required, use PPE correctly, maintain equipment, complete operational records and report hazards or incidents
All Personnel	Follow this SOP, work safely, use PPE correctly, protect the environment, treat community members respectfully, and report hazards, incidents and near misses.

Key Message:

There should be adequate numbers of trained personnel, appropriate equipment, approved larvicides, and supporting technical resources available to safely and effectively implement LSM activities. Operational records should be completed accurately and submitted according to program requirements.

5. Principles of Larval Source Management

Larval Source Management (LSM) is an important component of integrated vector management (IVM), and it aims to reduce mosquito populations by targeting the aquatic stages of the mosquito life cycle before adult mosquitoes emerge. LSM should be implemented alongside surveillance, community engagement, environmental management and other appropriate vector control interventions.

Hierarchy of Control

LSM activities should follow the hierarchy of control, with interventions selected in the following order of preference:

1. **Source reduction** – Remove unnecessary water-holding containers or eliminate larval habitats wherever possible.
2. **Habitat modification or container management** – Empty, clean, drain, repair, screen or securely cover containers that must remain in use.
3. **Larviciding** – Apply approved larvicides only to larval habitats that cannot be removed, modified or effectively managed through other means. Biological control agents (e.g., larvivorous fish or copepods) may be considered for suitable permanent habitats, such as wells and large water storage, where approved nationally.

Monitoring and follow-up: Regularly inspect treated areas to assess effectiveness, identify new larval habitats and determine whether additional action is required.

Operational Principles

- Prioritise source reduction and habitat management before considering larvicide application.
- Target interventions towards productive larval habitats identified through surveillance, inspections or outbreak investigations. Where data allow, prioritise key larval habitats: the container types that produce the most pupae, and therefore the most adult mosquitoes, in a given setting.
- Use only nationally approved larvicides and follow the product label, Safety Data Sheet (SDS) and relevant Technical Notes.
- Treat drinking-water containers only with products approved for potable water use and in accordance with national guidance.
- Minimise risks to people, animals and the environment by using appropriate PPE and preventing

- contamination of food, water and non-target habitats.
- Engage householders, premise managers, community leaders and other relevant stakeholders to support sustainable mosquito control and community participation.
- Document inspections, interventions and treatments to support program monitoring, quality assurance and reporting.

Key Message

Source reduction is the preferred LSM intervention. Larviciding should only be used when mosquito larval habitats cannot be effectively removed, modified or managed by other means.

6. Safety Requirements

All LSM activities shall be conducted in a manner that protects personnel, community members, animals, and the environment. All personnel must comply with national occupational health and safety requirements, this SOP, the manufacturer's product label, and the Safety Data Sheet (SDS) for the larvicide being used.

Before commencing field activities, the Team Leader shall ensure personnel have been briefed on the operational hazards, required control measures, and emergency procedures. The **Safety and Risk Assessment Matrix (Annex 1)** shall be reviewed before field deployment and additional site-specific controls implemented where required.

Safety Requirement	Minimum Requirements
General safety	- Ensure personnel are trained and authorised to undertake LSM activities. - Conduct a pre-deployment safety briefing covering hazards, emergency procedures, first aid arrangements, and site-specific risks. - Review the product label and SDS before use. - Ensure the product label and SDS are readily available during field operations.
Personal Protective Equipment (PPE)	- Wear PPE appropriate to the larvicide and application method as specified by the product label and SDS. - As a minimum, wear long-sleeved clothing or coveralls, enclosed footwear or waterproof boots, chemical-resistant gloves, eye protection where required, respiratory protection where specified, and a wide-brimmed hat for outdoor work. - Replace or clean damaged or contaminated PPE before further use.
Safe handling of larvicides	- Use only nationally approved larvicides within their expiry date. - Follow the product label and SDS. - Measure and apply the correct dosage using appropriate equipment. - Avoid skin, eye and respiratory exposure, and accidental ingestion. - Do not eat, drink or smoke while handling larvicides. - Wash hands thoroughly after handling chemicals. - Keep larvicides away from food, drinking water, animal feed and cooking utensils.
Storage and transport	- Store larvicides in their original labelled containers in a secure, dry, well-ventilated location. - Keep away from direct sunlight, heat, food, medicines, animal feed, children and unauthorised persons. - Transport larvicides in sealed containers to prevent leaks or spills.

	• Transport separately from food and drinking water wherever practicable.
Environmental and community protection	• Apply larvicides only to intended larval habitats. • Avoid over-application and incorrect dosing. • Prevent contamination of food, drinking water, waterways, fish ponds and environmentally sensitive areas. • Treat potable water containers only with products approved for that purpose. • Inform premise managers and occupants before larvicide application and explain any relevant safety precautions. • Dispose of waste in accordance with Section 14.
Spill and exposure response	Chemical spills: • Stop work, isolate the area, contain the spill where safe to do so, dispose of contaminated materials according to the product label and national regulations, and report significant spills. Accidental exposure: • Follow first aid instructions on the product label and SDS, wash affected skin or eyes immediately with clean water, remove contaminated clothing, seek medical attention if required, and report the incident.
Incident reporting	Report all incidents, near misses, injuries, chemical exposures, spills, equipment failures, environmental incidents and community complaints to the Field Supervisor as soon as practicable and document them according to program procedures.

7. Equipment and Materials

All equipment shall be inspected before deployment to ensure it is clean, functional, and suitable for the planned activities. Damaged or defective equipment shall not be used until repaired or replaced.

Category	Equipment and Materials
Personal Protective Equipment (PPE)	• Long-sleeved shirt and long trousers or coveralls • Chemical-resistant gloves • Enclosed footwear or waterproof boots • Safety glasses or goggles where required • Respiratory protection where specified by the product label or SDS • Wide-brimmed hat • Sunscreen and drinking water
Larvicide Application Equipment	• Measuring spoons, scoops, or graduated measuring cups • Pipettes or syringes for liquid formulations • Granule applicators where required • Mixing containers or buckets where specified by the product label • Product-specific applicators, dispensers, tablets or briquette deployment tools
Inspection Equipment	• Larval dipper • Pipette or turkey baster for sampling small containers • Fine mesh net where appropriate • Torch • Inspection mirror for hard-to-reach areas • Magnifying glass or hand lens (optional) • Forceps

	● Labelled collection vials for specimens ● Survey bag ● Tape measure (to estimate container volume or water surface area)
Field Equipment	● Maps, premise lists, or site registers ● GPS unit or mobile device with mapping capability ● Mobile phone or radio ● Clipboard ● Pens, pencils and permanent marker ● Waste collection bags ● Camera or mobile device for documentation ● First aid kit ● Drinking water
Data Collection Materials	● Premise inspection and control form (Annex 2) ● Daily summary form (Annex 2) ● Daily activity logs ● Electronic data collection applications ● GPS-enabled mobile devices where applicable
Larvicides	● Approved by the relevant national authority ● Applied according to the manufacturer's label and Safety Data Sheet (SDS) ● Where available, WHO-prequalified products should be considered, subject to national registration requirements ● Other products used in accordance with national vector control guidance

Operational Note: Equipment requirements may vary depending on the larvicide, application method, and local operational requirements. Field teams should ensure all required PPE, inspection equipment, application equipment, and data collection materials are available and functional before deployment.

Images of inspection and application equipment are provided in the LSM Field Guide and Annex 5.

8. Preparation Before Field Activities

Effective preparation is essential to ensure LSM activities are conducted safely, efficiently, and consistently. Prior to field deployment, the Team Leader shall confirm that all operational, safety, and logistical requirements have been completed.

8.1 Pre-Deployment Preparation Checklist

Preparation Area	Actions
Operational Planning	☐ Confirm priority operational areas based on surveillance data, outbreak information, community reports or program priorities. ☐ Confirm the objectives of the activity (e.g. routine control, outbreak response, follow-up treatment or monitoring). ☐ Develop a daily work plan, including operational areas, team assignments and anticipated larval habitats. ☐ Obtain any required permissions or approvals.
Personnel	☐ Confirm personnel are trained and authorised to undertake LSM activities. ☐ Conduct a pre-deployment briefing covering daily objectives, work assignments, community engagement, safety requirements, hazards, emergency procedures and reporting requirements.

	☐ Ensure personnel are familiar with applicable product labels and Safety Data Sheets (SDS).
Equipment and Materials	☐ Inspect equipment to ensure it is clean, functional and fit for purpose. ☐ Confirm inspection equipment, application equipment, forms or electronic devices, communication materials and waste collection bags are available. ☐ Confirm availability of first aid supplies, drinking water and communication devices. ☐ Replace or repair damaged equipment before deployment.
Larvicides	☐ Confirm the correct larvicide has been selected for the intended habitat. ☐ Check product labels, expiry dates and packaging integrity. ☐ Ensure sufficient product is available for planned activities. ☐ Confirm measuring and application equipment is available where required.
PPE	☐ Confirm appropriate PPE is available, serviceable and correctly fitted for all personnel.
Weather and Environmental Conditions	☐ Check weather forecasts and local conditions. ☐ Consider rainfall, flooding, tides or other environmental factors that may affect safety or effectiveness. ☐ Postpone activities if conditions present unacceptable risks.
Transport and Communications	☐ Confirm transport arrangements. ☐ Confirm emergency contact information is available. ☐ Ensure mobile phones, radios or other communication systems are operational.

8.2 Pre-Deployment Verification

Before leaving for the field, the Team Leader shall confirm:

- ☐ Operational area defined
- ☐ Required permissions or approvals obtained
- ☐ Personnel briefed
- ☐ Data collection tools available
- ☐ Communication materials available
- ☐ Emergency contact information available
- ☐ Transport arrangements confirmed

If larviciding:

- ☐ Larvicides available and within expiry date
- ☐ Application equipment inspected and functional
- ☐ PPE available and correctly sized

Key Message

Do not commence field activities until personnel, equipment, PPE, larvicides, transport and documentation requirements have been checked and confirmed.

9. Community Engagement

Successful LSM depends on the active participation of householders, premise managers, community leaders and other stakeholders. Community engagement should promote understanding of mosquito life cycle, encourage source reduction, and support community ownership of mosquito control activities. Engagement

should be inclusive, reaching women, men, young people, older people and people with disabilities, and recognising their different roles in household water storage and yard maintenance.

Personnel shall behave professionally, respectfully and in accordance with local customs throughout all community interactions.

Stage	Actions
Before Entering a Premise	● Introduce yourself and the field team. ● Present identification if requested. ● Explain the purpose of the visit and planned activities. ● Obtain permission before entering the premise. ● Respect decisions to refuse access.
If Access is Refused	● Do not enter the premise. ● Record the refusal according to program requirements. ● Notify the Team Leader or Supervisor if follow-up is required.
Explain Planned Activities	● Explain that the team will inspect for mosquito larval habitats. ● Describe any source reduction, habitat management or larviciding activities that may be undertaken. ● Explain any treatment of drinking-water containers, including the product used and any relevant precautions. ● Where insect growth regulators such as methoprene are used, explain that it stops adult mosquitoes emerging rather than killing larvae, so larvae may still be seen in treated water. ● Allow occupants an opportunity to ask questions.
Encourage Community Participation	● Encourage removal of unnecessary water-holding containers. ● Promote cleaning, emptying, covering or screening of water storage containers. ● Encourage proper disposal or storage of tyres and other waste materials. ● Promote routine maintenance of yards, drains and gutters. ● Demonstrate practical actions where appropriate.
Respect Property and Privacy	● Respect privacy, property and cultural practices. ● Avoid unnecessary disturbance to household belongings. ● Leave the premise clean and safe. ● Report any accidental damage immediately.
Safety Assessment	● Assess for hazards such as aggressive animals, unsafe structures, deep water, electrical hazards, chemical hazards or restricted access areas. ● Do not enter areas that present unacceptable risk.
Before Leaving the Premise	● Inform occupants of activities completed. ● Advise if larvicides have been applied and provide relevant information. ● Reinforce key mosquito prevention messages. ● Thank occupants for their cooperation. ● Record any follow-up actions required.

Key Message

Every premise visit is an opportunity to educate and engage the community. Promote source reduction first, encourage community participation, and leave occupants with clear actions they can take to prevent mosquito proliferation.

Good Practice

Work with the community, not just in the community. Sustainable mosquito control depends on household and community participation in managing mosquito larval habitats.

10. Inspection of Larval Habitats

The purpose of the inspection is to systematically identify and assess potential and productive *Aedes* mosquito larval habitats and determine the most appropriate LSM intervention. Inspections should prioritise source reduction and habitat management before considering larvicide application.

Field teams should inspect all accessible areas of a premise using a consistent and systematic approach to ensure potential larval habitats are not overlooked.

Inspection Step	Actions
Conduct the Inspection	- Inspect the premise systematically to ensure all accessible areas are assessed. - Inspect both indoor and outdoor environments. - Look for water-holding containers and other potential larval habitats, whether water is present or not. - Where required, inspect containers for mosquito larvae or pupae using appropriate sampling equipment. - Collect specimens only where required by program procedures.
Indoor Areas	- Inspect water storage containers, tanks, drums, buckets, flower vases, plant trays, bathroom containers, refrigerator drip trays, pet water bowls and other containers capable of holding water. - Where appropriate, empty, clean, cover or manage containers and record any habitats requiring further action.
Outdoor Areas	- Inspect water tanks, drums, buckets, discarded tyres, coconut shells, tarpaulins, roof gutters, boats, trailers, construction materials, plant pots, natural containers (tree holes, bamboo stumps, leaf axils of plants such as taro, banana and pandanus, and crab holes), discarded rubbish, drains and other water-holding habitats. - Pay particular attention to shaded areas close to buildings where <i>Aedes</i> larvae are commonly found.
Select Appropriate Action	- Remove or eliminate larval habitats where possible. - Empty, clean, repair, cover or screen containers that remain in use. - Consider larviciding only where habitats cannot be effectively managed by other means.
Record Findings	Record habitat type, estimated size or water volume (where required), presence of larvae or pupae (if inspected), and any action taken on the Premise Mosquito Inspection & Control Form (Annex 2).
Assess Premise Hazards	Assess for hazards such as aggressive animals, slippery surfaces, sharp objects, deep water, electrical hazards, unsafe structures, hazardous chemicals or restricted access areas. Do not enter areas that present an unacceptable risk.

Key Message

Inspect first, act second. Prioritise source reduction and habitat management before considering larvicide application. Focus efforts on productive mosquito larval habitats and record all actions taken.

Operational Note

If conditions become unsafe during the inspection, stop work immediately and notify the Team Leader. Routine operational inspections do not require larval sampling unless specified by program requirements.

11. Selecting the Appropriate Larval Source Management Intervention

Following the inspection, assess each identified larval habitat using the **LSM Decision Tree (Figure 2)** to determine the most appropriate intervention. Interventions should follow the hierarchy of control, prioritising source reduction and habitat management before considering larvicide application

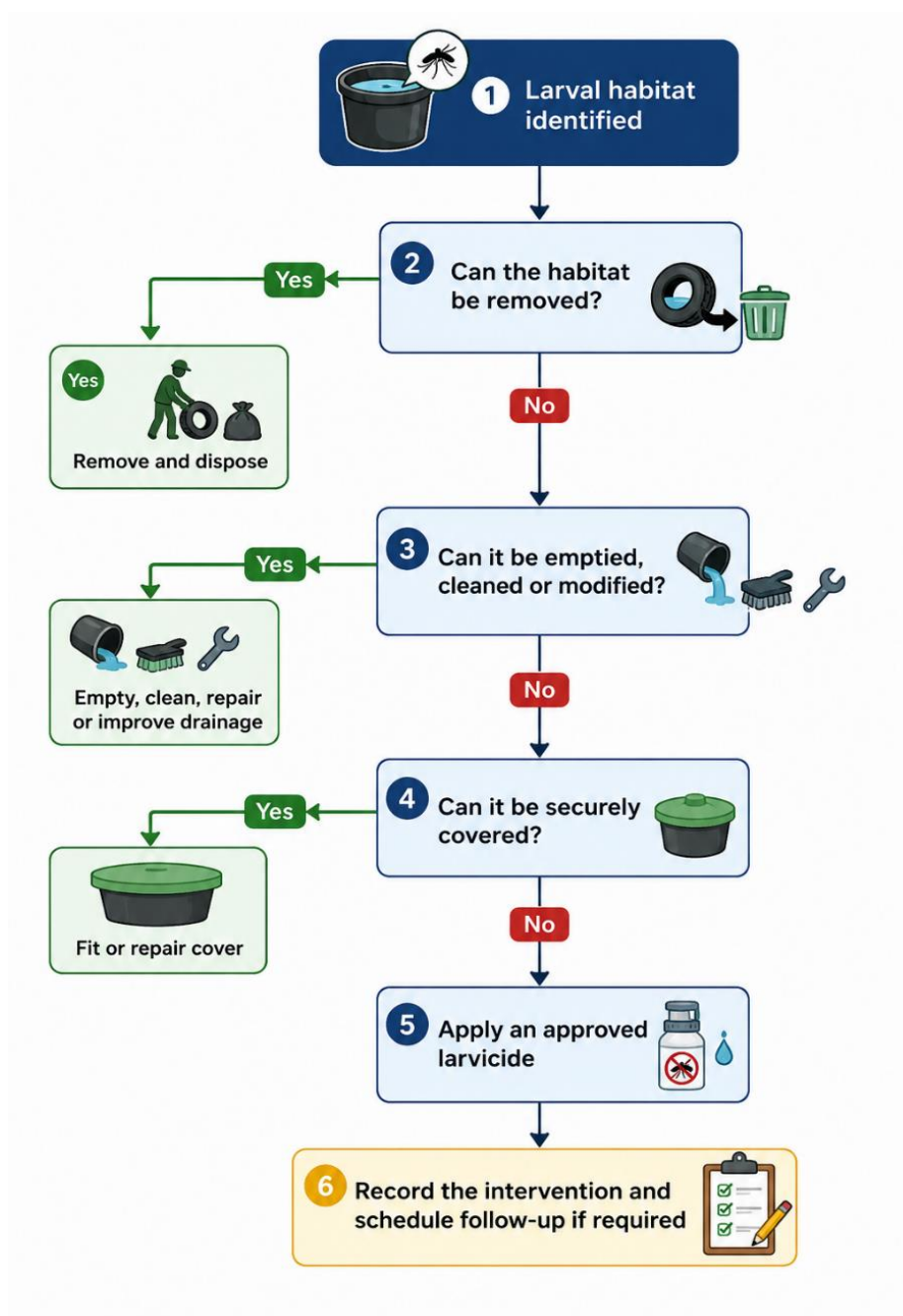


Figure 2. Larval Source Management (LSM) Decision Tree

Use this decision tree to select the most appropriate intervention for each potential and productive mosquito larval habitat identified during inspection. Wherever possible, prioritise source reduction, habitat modification, or container management before considering larvicide application.

11.1 Intervention Selection Guide

Question	Intervention (Preferred Action)	Examples
Can the habitat be removed?	Remove and safely dispose of, recycle, or repurpose the container. Ensure it cannot collect water again.	Discarded bottles, cans, plastic containers, coconut shells, unused tyres, general rubbish.
Can the habitat be emptied, cleaned or modified?	Empty water, scrub surfaces, improve drainage, repair leaks, remove debris, or store containers under cover or upside down.	Buckets, wheelbarrows, boats, tarpaulins, construction materials.
Can the container be covered or screened?	Fit or repair lids, covers, screens, or other barriers to prevent mosquito access.	Water tanks, rainwater drums, domestic water storage containers.
Is larviciding required?	Apply an approved larvicide only if the habitat cannot be removed, modified, emptied, or effectively covered.	Permanent water-holding containers, tanks, pits, or other habitats requiring ongoing treatment.

11.2 Selecting a Larvicide

If larviciding is selected, refer to Section 12, Annex 3, Annex 4 and the relevant PacMOSSI Technical Note before application.

Key Message:

Use the most effective non-chemical option first. Remove, empty, clean, modify or cover larval habitats before considering larvicide application.

12. Larvicide Application

Larvicides should only be applied where source reduction, habitat modification, container management, covering or screening are not practical or sufficient to prevent mosquito proliferation.

All larvicide applications shall comply with national regulations, the product label, Safety Data Sheet (SDS), relevant PacMOSSI Technical Notes, and the guidance provided in **Annex 3 (Larvicide Selection Guide)** and **Annex 4 (Practical Larvicide Dosing Guide)**.

12.1 Before Applying a Larvicide

Before treatment, confirm that:

- ☐ Source reduction and habitat management options have been considered.
- ☐ The selected larvicide is approved for the intended use.
- ☐ The product is suitable for the habitat and intended water use.
- ☐ The correct dosage has been determined.
- ☐ The premise or occupant has been informed of the treatment.
- ☐ Appropriate PPE is available and being used.

12.2 Larvicide Application

When applying a larvicide:

Step	Action
1	Confirm the larval habitat requires larviciding.
2	Select the appropriate product using Annex 3 and the relevant Technical Note.

3	Determine the correct dose using Annex 4 , the product label or Technical Note.
4	Explain the treatment to the premise manager or occupant.
5	Apply the product according to the label instructions and Technical Note.
6	Avoid contamination of food, drinking water, household items and non-target environments.
7	Record the treatment on the Premise Mosquito Inspection & Control Form (Annex 2) .
8	Treated habitats should be monitored and retreated where required in accordance with the product label, relevant Technical Note, and program requirements. For insect growth regulators, assess effectiveness by pupal mortality or adult emergence inhibition, not by the presence of larvae.

12.3 Potable Water Containers

Only larvicides specifically approved for use in drinking-water containers shall be used in potable water. Products and doses used in drinking water should also be consistent with the WHO Guidelines for drinking-water quality.

Before treatment:

- confirm the product is approved for potable water;
- explain the treatment to the householder;
- follow the approved dosage exactly; and
- provide any relevant precautions contained on the product label.

12.4 Do Not Apply Larvicides

Do not apply larvicides:

- to habitats that can be effectively removed, emptied, modified or covered;
- where the product is not approved for the intended use;
- at rates higher than those specified on the product label;
- in habitats unsuitable for the selected product; or
- where application may contaminate food, drinking water, animal feed or sensitive environments.

Key Message

Larvicides are a supplementary control measure. Always prioritise source reduction and habitat management, and apply larvicides only in accordance with the product label, Technical Notes, and approved program procedures.

13. Documentation and Data Collection

Accurate documentation is essential for operational monitoring, quality assurance, program evaluation and future planning.

All inspections, interventions and treatments shall be recorded on the **Premise Mosquito Inspection & Control Form (Annex 2)** or an approved electronic data collection system.

13.1 Completing Records

Field personnel shall ensure that all required information is recorded accurately and completely, including:

- premise and inspection details;
- larval habitats identified;
- interventions undertaken;
- larvicide treatments applied; and
- follow-up actions required.

Follow-up inspections and subsequent interventions should be recorded on the Premise Mosquito Inspection & Control Form (Annex 2).

13.2 Data Quality

Personnel shall ensure that:

- records are complete and legible;
- information is entered accurately;
- corrections are made using approved procedures; and
- electronic data are synchronised according to program requirements.

Field Supervisors should periodically review completed records and observe field activities to verify compliance with this SOP and identify opportunities for improvement.

13.3 Submission of Records

Completed records shall be submitted to the Team Leader or Field Supervisor at the end of each operational day. Electronic data should be uploaded as soon as practical following field activities.

Monitoring impact: Where entomological data are collected, calculate standard indices before and after LSM (House, Container and Breteau indices, and pupae per person where pupal counts are done) to evaluate impact, as described in the *Manual for Surveillance and Control of Aedes Vectors in the Pacific*.

Key Message:

Complete Annex 2 for every premise inspected and ensure records are submitted according to program requirements.

14. Waste Management and Decontamination

LSM activities shall be conducted in a manner that protects personnel, the community and the environment. Waste shall be managed in accordance with national requirements, product labels, Safety Data Sheets (SDS), and relevant PacMOSSI Technical Notes.

14.1 Waste Management Requirements

Item	Requirement
Larvicides	Keep larvicides in their original labelled containers and store, transport and use them according to the product label and SDS.
Operational Waste	Remove all waste generated during field activities and dispose of it appropriately. Do not leave waste, packaging or used materials at the treatment site.
Empty Containers	Dispose of empty containers according to the product label and national requirements. Never reuse larvicide containers for food, water, fuel or other household products.
Unused Product	Retain unused larvicides in their original containers for future approved use or dispose of them according to the product label and national requirements.
Contaminated Materials	Manage contaminated materials, including absorbent spill materials, disposable PPE and damaged packaging, according to national waste management procedures.

14.2 Cleaning and Decontamination

After field activities:

- Clean and inspect equipment according to the product label and relevant Technical Note.
- Allow equipment to dry before storage.

- Store equipment in a clean, dry and secure location.
- Clean reusable PPE according to the manufacturer's instructions and replace damaged items.
- Wash hands and any exposed skin thoroughly with soap and clean water after handling larvicides and before eating or drinking.

Key Message:

Prevent contamination, manage waste responsibly, and always follow the product label, SDS and relevant PacMOSSI Technical Notes for cleaning, decontamination and disposal requirements.

15. Definitions

The definitions below are adapted from *WHO Operational manual on larval source management: Control of Anopheles and Aedes mosquito vectors (2026)*

Term	Definition
Aedes mosquito	A mosquito of the genus <i>Aedes</i> , including <i>Aedes aegypti</i> and <i>Aedes albopictus</i> , capable of transmitting dengue, chikungunya, Zika and other arboviruses.
Larval habitat	Any natural or artificial water-holding site where mosquitoes lay eggs and larvae develop.
Container management	Actions taken to prevent mosquito proliferation by emptying, cleaning, covering, modifying or maintaining water-holding containers.
Key larval habitats	Types of containers or water bodies that sustain the most immatures and are expected to produce the greatest number of adult vectors in a given setting. Note: The estimated or actual number of late instars or pupae can be used as a proxy for adult productivity.
Biological control	One type of larval source management that involves the introduction of natural agents (e.g., larvivorous fish or copepods) into specific water bodies.
Formulation	The combination of various ingredients (insecticide active ingredient, formulants, additives, emulsifiers, etc.) designed to render the product useful and effective for the purpose claimed and for the envisaged method of application.
Environmental (habitat) manipulation	One type of larval source management that involves a recurrent activity to make temporary alterations to the environment that disrupt vector development.
Environmental (habitat) modification	One type of larval source management that involves a permanent or long-term alteration to the environment to eliminate larval habitats.
Larvicide	Substance used to kill mosquito larvae or prevent their development into adults (e.g., insect growth regulators).
Insect growth regulator (IGR)	A larvicide that disrupts mosquito development so that larvae or pupae fail to develop into adults, rather than killing larvae directly (e.g., methoprene).
Larviciding	One type of larval source management that involves periodic and often repeat application of biological or chemical insecticides in appropriate water bodies. Note: The timing of larvicide application is usually based on either detection of immatures or historical or ecological information indicating a high likelihood of production of adult mosquitoes.
Larval Source Management (LSM)	The management of water receptacles or water bodies that are potential or productive habitats for mosquito immatures (eggs, larvae, pupae) to prevent the production of adult mosquitoes by stopping water accumulation, preventing oviposition or egg-hatching, reducing immature densities or otherwise preventing

	their development into adult mosquitoes.
Operational area	The geographic area designated for LSM activities during a vector control program.
Personal Protective Equipment (PPE)	Protective clothing and equipment worn to minimise exposure to hazards during LSM activities.
Potable water	Water intended for drinking or domestic consumption that meets national drinking-water quality standards.
Source reduction	Any measure that aims to prevent the proliferation of mosquitoes or alter or eliminate their aquatic habitats. This includes environmental modification, environmental manipulation and other actions for container and waste management, such as destruction, disposal, emptying, cleaning, filling, draining, modifying or otherwise preventing water accumulation in artificial or natural containers.
Water-holding container	Any natural or artificial container capable of retaining water long enough for mosquito development.

16. References and Further Reading

The following documents should be used in conjunction with this SOP. PacMOSSI documents can be found at <https://pacmossi.org/technical-guidance>:

- *PacMOSSI Larvicide Technical Notes* for selected products
- *PacMOSSI Information for Key Messages: Aedes Larval Control During an Arboviral Disease Outbreak.*
- *WHO Operational manual on larval source management: Control of Anopheles and Aedes mosquito vectors (2026)*
- Pacific Community (SPC) & WHO Division of Pacific Technical Support. Manual for Surveillance and Control of Aedes Vectors in the Pacific (2020).
- World Health Organization. (n.d.). Prequalified vector control products. <https://extranet.who.int/prequal/vector-control-products>
- World Health Organization. (2022). Guidelines for drinking-water quality: Fourth edition incorporating the first and second addenda. World Health Organization.
- National Vector Control Guidelines.
- Larvicide Product Label Instructions.
- Safety Data Sheets (SDS).

Key Message

Ensure all personnel are familiar with this SOP, the relevant PacMOSSI Technical Notes, community engagement resources, product labels and Safety Data Sheets (SDS) before undertaking LSM activities.

Citation

This Standard Operating Procedure may be used for training and reference purposes. Users are responsible for ensuring any edits to this document are produced and approved in accordance with all relevant legal and ethical requirements governing the vector control operation.

17. Annexes

Annex 1. Safety and Risk Assessment Matrix

Annex 2. Operational Forms

Annex 3. Larvicide Selection Guide

Annex 4. Practical Larvicide Dosing Guide

Annex 5. Common *Aedes* Larval Habitats in the Pacific

Annex 6: Key Community Messages

Annex 1. Safety and Risk Assessment Matrix

This risk assessment identifies the principal hazards associated with Larval Source Management (LSM) activities and the minimum control measures required to minimise risks to personnel, community members, animals, and the environment.

The Team Leader shall review this matrix with all personnel before field deployment and implement additional controls where local conditions require.

Hazard	Potential Risk / Consequence	Initial Risk Rating	Control Measures	Residual Risk Rating
Chemical exposure (skin, eyes, inhalation or accidental ingestion)	Skin or eye irritation, respiratory irritation, poisoning	High	Follow the product label and SDS. Wear appropriate PPE. Avoid eating, drinking or smoking while handling larvicides. Wash hands after handling chemicals.	Low
Incorrect larvicide application	Reduced effectiveness, over-application, environmental contamination	Medium	Measure and apply the correct dosage using approved measuring equipment. Follow the product label and program procedures.	Low
Transport and storage of larvicides	Chemical leaks, spills or accidental exposure	Medium	Transport larvicides in sealed, labelled containers. Store securely away from food, medicines, children, animals, heat and direct sunlight.	Low
Chemical spill	Personnel exposure and environmental contamination	Medium	Stop work immediately. Contain the spill where safe to do so. Dispose of contaminated materials according to the product label and national regulations. Report significant spills.	Low
Contamination of drinking water	Human exposure to insecticides	High	Treat potable water only with products approved for that purpose. Follow label directions and avoid over-application.	Low
Environmental contamination	Harm to aquatic organisms and other non-target species	High	Apply larvicides only to productive larval habitats. Prevent contamination of waterways, fish ponds and sensitive environments.	Low
Improper disposal of larvicide containers or contaminated waste	Environmental pollution or accidental reuse of containers	Medium	Dispose of containers and contaminated materials according to the product label and national regulations. Never reuse empty larvicide containers.	Low
Aggressive animals	Bites or physical injury	High	Request owners to secure animals before entering. Do not enter if animals cannot be safely controlled.	Low
Community refusal	Verbal abuse,	Medium	Introduce the team, explain	Low

or conflict	confrontation or unsafe working conditions		the purpose of the visit, obtain permission before entering, and leave if the situation becomes unsafe.	
Slips, trips and falls	Sprains, fractures or other injuries	Medium	Wear enclosed footwear and remain alert to uneven ground, wet surfaces, drains and obstacles.	Low
Sharp objects	Cuts or puncture wounds	Medium	Wear enclosed footwear and gloves where appropriate. Avoid handling waste directly and use tools where available.	Low
Manual handling	Muscle strain or back injury	Medium	Use correct lifting techniques and seek assistance when lifting heavy containers or equipment.	Low
Heat and sun exposure	Heat stress, dehydration or sunburn	High	Wear a hat and sun-protective clothing, apply sunscreen, drink water regularly and take rest breaks in shaded areas.	Low
Heavy rain, storms or flooding	Reduced visibility, slips, unsafe access	High	Monitor weather conditions and suspend field activities when conditions become unsafe.	Low
Mosquito bites and other insect bites	Discomfort, allergic reactions or exposure to mosquito-borne diseases	Medium	Wear long-sleeved clothing and apply insect repellent where appropriate. Avoid reaching into vegetation or containers without checking first.	Low
Biological hazards (contaminated water or sewage)	Skin infections or gastrointestinal illness	Medium	Avoid direct contact with contaminated water. Wear gloves where appropriate and wash hands after field work.	Low
Traffic hazards	Injury from moving vehicles	High	Wear high-visibility clothing where required and remain alert when working near roads or car parks.	Low
Unsafe structures	Falls or structural collapse	High	Do not enter unsafe buildings or unstable structures. Report inaccessible properties to the Field Supervisor.	Low
Deep water, wells, open pits or drains	Drowning or falls	High	Do not enter deep water. Inspect wells and pits from a safe position using long-handled dippers, and work in pairs.	Low
Working at height (roof gutters, elevated tanks)	Falls	High	Inspect from the ground where possible. Use a stable ladder with a second person holding it; do not climb onto roofs.	Medium
Fatigue	Reduced concentration	Medium	Schedule regular rest breaks, rotate tasks where practical,	Low

	leading to operational errors or injury		and maintain adequate hydration.	
Working alone or communication failure	Delayed emergency response	High	Work in pairs or teams where practicable. Maintain communication with the Team Leader using a mobile phone or radio.	Low

Stop Work Immediately If:

Field activities shall cease immediately if:

- Aggressive animals cannot be safely controlled.
- Severe weather creates unsafe working conditions.
- There is a significant chemical spill or equipment failure.
- A team member experiences symptoms of chemical exposure, heat illness, or injury.
- Access to a premise becomes unsafe due to conflict or security concerns.
- Any situation arises that presents an unacceptable risk to personnel, community members, or the environment.

All incidents, injuries, near misses, spills, and unsafe conditions shall be reported to the Field Supervisor as soon as practicable and managed in accordance with program procedures.

Site-Specific Hazards

(Examples: cyclones, flooding, security issues, special local circumstances)

Hazard	Initial Risk Rating	Control Measures	Residual Risk Rating

Risk Assessment Outcome

- ☐ Controls implemented
☐ ORS can proceed safely
☐ Additional controls required

Assessor Signature: _____

Date: _____

Risk Rating Guide

Rating	Description
Low	Minor injury or impact. Routine controls are adequate.
Medium	Moderate injury or impact. Additional controls may be required.
High	Serious injury, environmental impact or operational disruption. Controls must be implemented before work proceeds.

Key Message

If risks cannot be reduced to an acceptable level, do not proceed with spraying

Annex 2. Operational Forms

Click the links below to access the forms. For editable versions of the forms, email pacmossi@jcu.edu.au

Form A. Premise mosquito inspection and control form <i>(Note: an updated version may be needed if data on pupae presence is needed for guiding insect growth regulator deployment or assessment)</i>	https://pacmossi.org/resource/premise-inspection-aedes-form/
Form B. Daily summary form	https://pacmossi.org/resource/daily-summary-form-aedes/

Annex 3. Larvicide Selection Guide

This guide provides a summary of larvicides that are most likely to be available for larval control activities in the Pacific. Detailed instructions on dosage, application, safety, storage, monitoring and disposal are provided in respective product labels and PacMOSSI Technical Notes. Methoprene briquettes are intended for use in standing water where source reduction, covering, screening or regular emptying of containers is not feasible. Other nationally registered larvicides (e.g., Bti, spinosad, pyriproxyfen or temephos) may be used in accordance with national guidance and local insecticide resistance data; WHO-prequalified products are preferred where available

Product	Active Ingredient	Larvicide Group	Indicative Residual Activity*	Technical Reference
ProLink XR Briquets®	(S)-Methoprene (18 g/kg)	Insect Growth Regulator (IGR)	Up to 150 days (approximately 5 months) depending on water quality and conditions	<i>PacMOSSI Technical Note: Methoprene Briquettes (ProLink XR Briquets®)</i>

**Residual performance may vary depending on water quality, container type, rainfall, water turnover, organic matter and local environmental conditions. Confirm current information through the relevant product label and PacMOSSI Technical Note*
Note: Methoprene is an insect growth regulator. Larvae in treated water continue to develop but adults fail to emerge, so larvae may still be seen after treatment. Assess efficacy by pupal mortality or adult emergence inhibition.

Larvicide Selection Considerations

When selecting a larvicide, consider:

- whether the habitat can be eliminated, emptied, cleaned, covered or screened before considering larviciding;
- the type, size and permanence of the water-holding container;
- whether the water is used for drinking or domestic purposes;
- expected duration of control required;
- accessibility for monitoring and retreatment;
- local environmental and regulatory requirements; and
- availability through approved procurement systems.

Suitable Situations for Larviciding

Methoprene briquettes may be considered for:

- rainwater tanks and other large water storage containers that cannot be fully covered or screened (if register for this use);
- ponds, artificial pools and other permanent artificial water bodies;
- tyres or containers that cannot be removed or managed through source reduction; and
- situations where long-term residual larval control is required.

Not Recommended

Do not use methoprene briquettes in:

- running water;
- rapidly flushed habitats; or
- locations where the product is not approved by relevant authorities.

Key Message:

Larviciding should be used only when source reduction and environmental management are not feasible. Use only products approved by local authorities and always follow the product label, SDS and relevant PacMOSSI Technical Note before application.

Annex 4. Practical Larvicide Dosing Guide

This guide provides a quick reference for calculating larvicide doses for common water-holding containers. Always use the dosage specified on the product label and in the relevant PacMOSSI Technical Note. Application rates vary between products and formulations.

General Calculation Formula

For products applied according to water volume:	Amount of product required = Recommended dose × Water volume
For products applied according to surface area:	Amount of product required = Recommended dose × Surface area

Example Calculations for Methoprene Briquettes (ProLink XR Briquets®)

Application rate: 1 briquette per 5,000 L of water for rainwater tanks and large containers.

Water Volume (L)	Calculation	Briquettes Required
1,000	$1,000 \div 5,000 = 0.2$	Follow label instructions*
5,000	$5,000 \div 5,000 = 1$	1 briquette
10,000	$10,000 \div 5,000 = 2$	2 briquettes
15,000	$15,000 \div 5,000 = 3$	3 briquettes
20,000	$20,000 \div 5,000 = 4$	4 briquettes

*For smaller containers, use only as directed by the product label and relevant Technical Note.

Example Calculations for Artificial Water Bodies

Application rate: 1 briquette per 10 m² of surface area.

Surface Area (m ²)	Calculation	Briquettes Required
10	$10 \div 10 = 1$	1 briquette
20	$20 \div 10 = 2$	2 briquettes
30	$30 \div 10 = 3$	3 briquettes
50	$50 \div 10 = 5$	5 briquettes
100	$100 \div 10 = 10$	10 briquettes

Key Message

Always calculate the treatment rate using either water volume (L) or surface area (m²), depending on the product instructions. Use only approved larvicide products and follow the product label, SDS and relevant PacMOSSI Technical Note before application.

Annex 5. Common *Aedes* Larval Habitats in the Pacific

Some of these images are from the STRIVE Larval Habitat Pocket Data Dictionary.

Water tank		Plastic bag	
Drum		Coconut shell	
Bucket		Tree hole	
Boat		Bamboo stump	

Tyre		Discarded bottle or can	
Roof gutter or drain		Leaf axil	

Annex 6: Key Community Messages and Information for Larval Source Management

Purpose

This annex provides key messages for community engagement activities before, during and after larval source management operations. Messages should be adapted to local languages and community contexts. Detailed communication resources are available in the companion document *Information for Key Messages: Aedes Larval Control During an Arboviral Disease Outbreak*.

Key Message	Supporting Information
Reducing mosquitoes helps reduce disease	Dengue, chikungunya and Zika are spread by <i>Aedes</i> mosquitoes. Reducing mosquito larval habitats helps reduce mosquito numbers and disease risk.
Remove standing water wherever possible	Remove, empty, drain, clean, cover or screen water-holding containers such as tanks, drums, buckets, tyres, roof gutters and other containers that collect water.
Larviciding is used when water cannot be removed	Some water containers cannot be emptied, covered or removed. In these situations, approved larvicides may be used to prevent mosquito larvae developing into adults.
Larvicides are safe when used correctly	Larvicides are applied by trained personnel according to product labels and approved procedures. Some products are approved for use in drinking-water containers.
Larvae may still be seen after treatment	Some larvicides, such as methoprene briquettes, stop adult mosquitoes emerging rather than killing larvae. Larvae may still be seen in treated water; please do not remove the briquettes.
Support mosquito control activities	Allow access to water-holding containers for inspection and treatment. Inform field teams if water is used for drinking or household purposes and ask questions if you need more information.
Help prepare for LSM activities	Remove rubbish, improve access to water containers and assist field teams where safe and practical.
Continue mosquito control after treatment	Continue removing or managing water-holding containers around homes and workplaces. Larviciding does not replace routine source reduction.
Seek advice if concerns arise	If you experience an adverse reaction or have concerns about products used, contact the local health authority or the LSM team.

Key Message:

Larval source management is most effective when communities and public health teams work together. Remove or manage water-holding containers wherever possible and support larval control activities in areas where mosquito proliferation cannot be eliminated.

Note: For detailed community information, FAQs and communication materials, refer to the companion PacMOSSI document *Information for Key Messages: Aedes Larval Control During an Arboviral Disease Outbreak*