TARGET MALARIA

ESHIA – Factsheet 3

Key potential impact assessment areas for genetically modified mosquito research

Environmental, Social, and Health Impact Assessment (ESHIAs) play an important role in supporting the research developments and engaging local communities and relevant stakeholders in the decisions that could affect them. ESHIA findings can help optimise project design to avoid or minimise negative impacts, and optimise positive ones. Depending on the mosquito strain, study design under consideration and research phase, an ESHIA can explore different questions across a range of environmental, social, health, and economic areas. These questions are informed by national regulatory frameworks, international guidance (such as the World Health Organization's guidance on GMOs and International Finance Corporation's Performance Standards), the methodologies applied by ESHIA consultants, and community and stakeholder feedback gathered during the scoping phase.

Environmental dimensions

For this area, there is a strong interplay with biosafety risk assessment processes conducted under analysis frameworks for genetically modified organisms. Such areas may include:

- Changes to mosquito numbers and effects on other insects or animals in the ecosystem. For example, the assessment might investigate questions like: "Will reducing *Anopheles* mosquito populations significantly affect insect-eating birds or bats that feed partially on these mosquitoes?" or "How might changing mosquito populations affect pollination of local crops?"
- Potential effects on animals that feed on mosquitoes or compete with them. Assessment questions might include: "Could reducing one mosquito species create significant opportunities for other mosquito species to increase?" or "What proportion of local predators' diets consists of the target mosquito species, and how adaptable are these predators to diet changes?"
- Impacts on local wildlife and plant life in areas where releases occur. Investigations might explore: "Are there any protected or culturally significant species that interact with malaria mosquitoes in the release area?" or "How might changes in mosquito populations affect water ecosystems where mosquito larvae develop?"
- Genetic changes spreading to other mosquito populations. Investigations might ask: "How far might mosquitoes carrying modified genes spread from release sites?" or "What mating barriers exist that would prevent the modified genes from spreading to other mosquito species?"

Environmental dimensions in ESHIA may also examine potential impacts related to project operational activities such as increased use of roads, water and infrastructure to ensure various sources of potential impact are well characterised.

Increased waste, dust, or noise may be considered as well, depending on the nature of the project. For the release of gene drive mosquitoes, these may not be obvious but would none-the-less be considered in early scoping phases for the ESHIA to understand if further investigation is warranted.

Social dimensions

Social dimensions may include:

- Effects on household privacy and daily routines due to research activities. The ESHIA may investigate: "How might regular mosquito monitoring inside homes affect family comfort and privacy?" or "What social or cultural sensitivities exist around researchers entering different areas of households?" or "How can monitoring schedules be adapted to minimise disruption to daily household activities?"
- Changes to community perceptions and practices regarding malaria prevention. Key questions include: "How might communities adapt their understanding of malaria transmission if mosquito numbers decrease?", or "Will traditional preventive methods for mosquito control remain valued by communities?"
- Community dynamics during research activities. Investigations explore: "How might the presence of research teams affect community power structures or decision-making processes?" or "Could the project create or exacerbate existing divisions within communities?", "Could mosquito trap placement affect how community spaces are used?", and "Are there seasonal ceremonies or gatherings that might be affected by research activities?"
- Gender dimensions. Assessment questions might include: "What are the implications if mosquito capturing roles are primarily filled by men due to cultural norms or safety considerations?" or "How might differential employment opportunities for men and women in the project affect household dynamics and economic power balance?" or "Are there gender-specific impacts related to who typically cares for malaria patients in households?"
- Governance and decision-making. "What mechanisms ensure community voices continue to influence project decisions throughout implementation?" or "How can the project ensure that marginalised groups within communities have meaningful input into decisions that affect them?"

Economic dimensions

Economic dimensions may include:

- Implications for local economies and livelihoods. ESHIA questions may explore: "How might project employment opportunities affect local income distribution?" or "Could changes in disease patterns affect existing economic activities like traditional medicine or mosquito net selling?" or "What agricultural productivity gains might result from fewer sick days during farming seasons?"

Health dimensions

The health assessment varies significantly depending on the research phase, with different questions appropriate for different stages of technology development.

- For early research phases, questions may include: "What psychological impacts might result from increased awareness of mosquitoes due to research presence?", "What information channels are most trusted for health messages in affected communities?", "How can technical information about modified mosquitoes be communicated accurately but accessibly?", "How might expectations of rapid malaria reduction influence community adherence to current prevention and treatment measures?" or "How do different community groups perceive the project's expected timeline for reducing malaria transmission?"
- For advanced research phases involving gene drive mosquitoes, questions may include "What health-related benefits might arise from partial reduction of mosquito populations?", "Could changes in the mosquito population affect transmission of other diseases?" or "How do community members perceive potential health risks and benefits from the technology?"