In Task 6-1, the team learned about different management options. These are all things a community can do to manage mosquitoes and mosquito-borne diseases. However, every location is different. It is important to create a management plan that is specific to your location. It is also important to create a management plan that combines a variety of methods. Combining multiple methods helps to address all of the different perspectives of the problem (social, economic, environmental, ethical). A plan that combines many different methods is called an integrated management plan.

**Objective**

In this task, the team will practice making integrated management plans. The team will be provided a variety of city scenarios and budgets (which we’ll express in wealth units). From these scenarios and budgets, groups will make suggestions for how each city should develop their integrated management plan.

In this task, the team will be focusing on the following question from the question map.

- What are the social, environmental, economic, and ethical considerations of various mosquito management and control plans?

1. Go to the Task 6-2 folder and get the Meet the Team reading and the list of city scenarios and management options. There is only one version of this task, but there are many ways to customize it. Think about how you could break up the reading or scenarios, if needed.
2. As a team, read the Meet the Team reading.
3. From the reading, make a list of important things to consider when making a mosquito management plan.
4. Read through each city scenario and the list of management options.
5. Note the wealth units each management option costs and how many each city has in its budget.

6. Using the information in the scenario and the budget (wealth units), create a suggested integrated management plan from the list of options. Remember to add up the wealth units for each method. You cannot have a plan with more wealth units than the budget allows.

7. Consider how your plan will address all perspectives of the problem (social, economic, ethical, environmental).

8. As a team, discuss the following:
   - Share and discuss your integrated management plan for each city scenario.
   - Provide the reasoning for why you selected those methods for each city. Compare and contrast plans from different groups.
   - Identify and share how your plan addresses each perspective of the problem (social, economic, ethical, environmental).
   - Based on your plans, how could this information be useful when thinking about creating an integrated management plan for your community?
   - How could this information be useful when thinking about the problem question: How can we ensure health for all from mosquito-borne diseases?

Hooray! You completed Task 6-2. Check it off the task list. Go to Task 6-3!
Task 6-2 Developing Integrated Management Plans

City Scenarios

City One Scenario

Our city currently has a large mosquito problem. Many people in all parts of the city are getting sick from mosquito-borne diseases each year. The city is near the equator, so it is warm throughout the year. The city has only two seasons during the year. One season is very wet and one is very dry. Also, the majority of the residents in our city have religious beliefs that do not promote killing animals. This religion teaches that any wrong behavior to animals will be paid for in a future life, so cruel acts to animals should be avoided. This includes mosquitoes. As the city government, we would like to reduce the number of people getting sick in our city. Can you develop a management plan for our city that does not include killing mosquitoes at any stage of their life? We are also interested in helping people learn more about managing mosquitoes. This will help us create an integrated management plan that respects the local culture while working toward a solution that will help everyone. Our city has 80 wealth units to spend on this project. Thank you for the help developing a suggested integrated management plan!

City Two Scenario

Our city has a large mosquito population but we are not currently dealing with any mosquito-borne diseases. The city also has big changes in temperature throughout the year. It gets very cold in the winter and very hot in the summer. Mosquitoes are only out during the summer. Recently, cities near us have reported new cases of mosquito-borne diseases in their communities. We are concerned that these diseases will move into our city in the future. Can you suggest an integrated management plan to help prevent mosquito-borne diseases from moving into our city? We have 60 wealth units to spend on this project. Thank you for the help developing a suggested integrated management plan!

City Three Scenario

Our city has a large mosquito population. Areas of high poverty are currently experiencing high numbers of people with mosquito-borne diseases. Outside of these areas of poverty there are a small number of cases. In addition, since the climate in our city is warm all year, mosquitoes are always a problem. Many residents who live outside the areas that are experiencing the problem are very opposed to the use of chemicals (larvicides and adulticides) to reduce mosquitoes in any part of the city. They think these chemicals are harmful to people, drinking water, and the environment of the entire city. We are concerned about the diseases continuing to effect these areas of poverty in our city, but we are also interested in making people in other parts of the city happy. Can you suggest an integrated management plan for our city that addresses these concerns? We have 75 wealth units to spend on this project. Thank you for the help developing a suggested integrated management plan!
City Four Scenario

Our city currently has many mosquito management strategies in place. However, the local government has informed us that the budget for mosquito management will be decreasing next year from 75 wealth units down to 45. The reason for this decrease is that we currently do not have a mosquito problem. Mosquitoes are also very seasonal here. This means they are only out at certain times of the year. The local government wants to spend the money on other things. In a recent vote, 60 percent of the local people said they are not concerned about mosquitoes. Since 40 percent of the local people are still concerned about mosquitoes, we still want to have a management plan in place. Can you help us develop an integrated plan for our city that only uses 45 wealth units? Thanks!

City Five Scenario

Our city is currently experiencing very high levels of mosquito-borne diseases in all parts of the city. Malaria is the primary disease affecting our city. Due to the warm weather part of the year and the wet climate the rest of the year, we need to monitor the problem all the time. The city is very poor in terms of money, so we have not had management plans in place before. However, the city recently received money from the government and other humanitarian programs from around the world to help us deal with the problem. A majority of the people in the city are in extreme poverty with low levels of education. We are concerned the public will not understand why they all need to help. We currently do not have any mosquito controls in place. Can you help us develop an integrated management plan? We now have 100 wealth units to spend on this work.

City Six Scenario

Our city is on a small island with no mosquito vector populations currently, due to successful eradication campaigns in the past. Many people visit the island as tourists, and some come from places where mosquito-borne diseases are common. The government recently built several major seaports across the country to begin importing manufactured goods such as used tires, water storage basins, and disposable plastic containers. The island is located near the equator, so it is warm throughout the year and has one very wet and one is very dry season. As the community, we would like to reduce the potential introduction of mosquito vector populations on the island and therefore reduce the likelihood of people getting sick with mosquito-borne diseases. Can you suggest an integrated management plan to help prevent mosquito-borne diseases from moving into our country? We have 65 wealth units to spend on this project. Thank you for the help developing a suggested integrated management plan!
Mosquito Management Options

*(Create your integrated management plan from the items on this list.)*

**Spray Pesticides**

- Use larvicides to target mosquito larvae in water storage containers and other manufactured and natural habitat sites (cost = 15 wealth units)
- Use adulticides to target adult mosquitoes (cost = 15 wealth units)

**Conduct Surveillance**

- Regularly monitor water storage containers and identified mosquito habitats throughout city (10 wealth units)
- Regularly monitor mosquito population numbers and types throughout city (5 wealth units)
- Regularly monitor mosquito eggs on imported manufactured goods (such as used tires, water storage basins, and disposable plastic containers) across major seaports of the country (10 wealth units)
- Regularly monitor water storage containers and identified mosquito habitats throughout human neighborhoods located near major seaports of the country (10 wealth units)

**Disrupt the mosquitoes’ ability to breed**

- Improve street cleaning and garbage services throughout the city (5 wealth units)
- Improve water storage and supply services throughout the city (15 wealth units)
- Regularly clean identified mosquito habitats throughout the city (10 wealth units)

**Use biological controls**

- Introduce mosquito-eating fish and copepods into water storage containers (10 wealth units)
- Introduce genetically modified mosquitoes into the city (15 wealth units)
- Introduce *Wolbachia*-infected mosquitoes into the city (10 wealth units)
Trap mosquitoes

- Set out and maintain mosquito traps throughout the city (10 wealth units)
- Set out and maintain mosquito traps throughout the major seaports (10 wealth units)

Individual and household control

- Install window and door screens on all buildings (10 wealth units)
- Cover all beds with mosquito netting (15 wealth units)

Education and public outreach

- Increase public education programs throughout the city to teach about personal protection and city-wide management strategies being used to control mosquitoes (15 wealth units)
- Increase communication with the public throughout the city using educational billboards, social media campaigns, and public service announcements to build mosquito awareness (5 wealth units)

Government and Policy Updates

- Create new government policies to help poverty-stricken areas affected by mosquito-borne diseases in the city (5 wealth units)
- Develop tax incentives for people, organizations, and companies that help clean up mosquito habitats around their properties (10 wealth units)
- Create or update policies on education and research about mosquitoes in the local community (10 wealth units)

Research

- Fund new research on mosquitoes and new mosquito management technology for the city (5 wealth units)
- Fund increased research on the social and economic components of the mosquito problem in the city (5 wealth units)

Go back to Research Guide now
Mosquito! Task 6-2 Developing Integrated Management Plans

What things should people consider when making an integrated management plan?

David Pecor - Research Technician - Walter Reed Biosystematics Unit (WRBU)

All mosquito problems are local problems. This is because each location and population of mosquitoes is different. Mosquito behavior varies greatly across the globe. So it is important to learn about the mosquitoes living in your local area when developing an integrated management plan. Knowing what species are present is the first step in managing mosquitoes. So collecting mosquitoes is a good starting point. Then you can identify the vectors of disease and compile what is known about each. Common questions about the mosquitoes should include, what type of habitat will they use to lay eggs? Does this mosquito prefer to bite humans or will it feed on other animals as well? When this species does take a blood meal, does it prefer to bite inside or outside, at dusk or the middle of the night? Our motto here at WRBU is, ‘Know the vector, know the threat.’ This means that to fully understand the problem and develop a solution, we need to know exactly what we are dealing with. Then we can make a plan using this information.

Meera Venkatesan - Malaria Technical Advisor - President’s Malaria Initiative - United States Agency for International Development (USAID)

We are lucky to have some solid evidence on what types of solutions work against different mosquitoes and diseases. However, integrated management plans need to be adapted to the local context. Some things to consider are mosquito behavior as well as human behavior, and the social and ethical factors that influence people’s exposure to potentially infectious bites. Some solutions will not work if they have requirements for things like roads or are only effective in certain types of water. You must think about whether the methods will work in that location. Will they be acceptable to the people living there and be cost-effective? With limited resources and money, we always need to make sure they are being applied to have the maximum impact on reducing disease and saving lives.
Rusty Low - Senior Earth Scientist - Institute for Global Environmental Strategies

Solutions are not one size fits all when making an integrated management and action plan. This is why it is necessary to understand the kinds of mosquitoes and where they are found in a community. This environmental and social knowledge enables each community to develop a targeting approach for their unique situation.

Kelly Bennett - Biologist - Smithsonian Tropical Research Institute

Whether solutions to a mosquito-borne problem works in one location over another depends on many different things. This is because of the specific differences of the mosquitoes and people in that area. Therefore, any integrated management plan to control mosquitoes needs to be modified to address the local differences. Different mosquito populations around the world can have different behaviors. In many places they adapt to their local environments. Depending on the plan, such factors must be considered for success. Furthermore, the opinions of different cultures toward particular control methods should be considered. Getting the support of the local communities will be required for any plan to succeed.

Bridget Giles - Research Assistant Professor - Virginia Modeling Analysis & Simulation Center (VMASC) at Old Dominion University

The same integrated management plans for mosquito-related problems do not work in every location around the world. Here in the United States, for example, we are very fortunate to have sanitation programs and access to clean water. However, there are communities around the world that lack proper sanitation, access to safe drinking water and a wastewater system. As a result, drinking water may be left sitting in buckets or containers. So measures to address those situations may be different than what is being done in another place. Creating an integrated management plan with diversity may help it be more successful.
Lee Cohnstaedt - Research Entomologist - United States Department of Agriculture (USDA)

There is no silver bullet or single solution that will halt all mosquito-borne diseases. This is why making an integrated management and action plan is needed. Vaccines for diseases are excellent, but expensive and slow to develop. Sterile insects are safe and effective, but to date difficult to deploy efficiently with mosquitoes. Chemical control is efficient, but expensive and time consuming, not to mention unsustainable. Habitat removal is extremely useful and the most basic, but the most costly initially and difficult to maintain. Community action can reduce larval mosquito habitats, but it’s difficult to coordinate. Therefore, no single solution can address mosquito problems in a single location, let alone the limitless variety of communities. All solutions are tools that can be used to solve the problem of mosquito control and all tools have their purpose. Similarly, a carpenter cannot build a house with only a hammer. The carpenter needs many tools and possibly special tools to work in a variety of locations, such as a city, the suburbs, or out in the country. However, a carpenter must be smart and adaptable to build in some conditions. Therefore, if given the knowledge and materials, the carpenter can undoubtedly make or achieve what is needed to construct any house in any situation. Mosquito control is a similar situation, where one tool is not sufficient for all situations. Hopefully, individuals can introduce or create other tools needed for the local community and situation to best address mosquito-borne diseases.