SUCCESS ACADEMY EDUCATION INSTITUTE

Designing Solutions

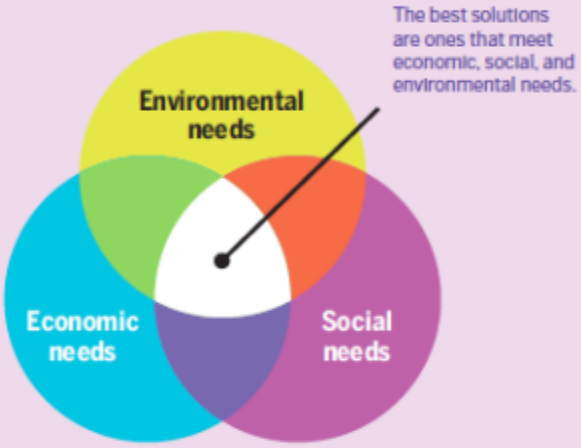
Life Science (Lower Middle)
Unit 4

Designing a solution to an environmental problem

Engineers design solutions to problems. However, the aim of engineering is not just to design a solution, but to design the best solution. Before designing a solution, engineers will identify criteria and constraints. Criteria are the desired features of the solution. Constraints are limits that apply to solving the problem. For the insect problem in Activity 1, a constraint might be that the family does not have to move away from their home. Such a constraint would mean that Solution B, "Relocate the Farm," would not be acceptable. If another constraint was that no native creatures were harmed, then none of the proposed solutions would work. Criteria can be a little more flexible. Criteria for the insect problem might include that the solution kills the least number of native species. In such a case, estimating the effects on native species could provide the data to help choose the best solution. A solution can have many criteria and constraints. This can make designing the solution complicated.

As you saw in the previous activity, it can be difficult to satisfy the needs of people and those of the environment. When considering criteria related to people, it is useful to look at the social and economic impacts. Economic impacts are often related to money. They can be positive, such as earning more money. They can also be negative, such as reduced income or higher costs for people in an area. Social impacts are often related to the quality of life. They can include factors

such as the health and safety of residents, the standard of living, and opportunities for work and leisure. An important social consideration is whether a solution is fair to different groups of people. One way of analyzing solutions to environmental problems is to consider how well they meet economic, social, and environmental needs.



Designing, or deciding on, the best solution may require making trade-offs between criteria. A trade-off is when something that is a benefit or advantage is given up in return for a different benefit or advantage. For example, an environmental criterion might be to protect all of the land in an area. However, a social criterion might be to provide enough housing for the people living near the area. Since housing requires land, it would be difficult to meet both of these criteria. In such a case, a trade-off might mean that one of the criteria is selected over the other. In another case, maybe one or both of the criteria would need to be changed. With competing criteria, it is not unusual to have disagreements about what is the "best" solution to a problem.