

Landscape Based Mitigation Design for Addressing the Human Elephant Conflict in Katupotha Area in Puttalam District

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Abstract

The connection between Human elephant conflict (HEC) is quite old in Sri Lanka. Elephants and people have some similar ecological needs therefore, conflict between the two species is unavoidable when they coexist in the same area. Katupotha is one of the villages that has HEC in Sri Lanka belonging to the Puttalam district and located 29.2 and 4 kilometers away from the Anamaduwa and Pallama respectively. Mainly, elephants enter the village through a place in Rathambala stream where there is less depth and width. According to the villagers, elephants are coming there in every year during the month of August, when the rain is very low. Therefore, the landscape solution was designed mainly to fulfill the elephants' water and food requirements. To avoid the entering of elephants to the village, the landscape of the Rathambala oya area was changed by creating water features, fruiting areas, and bio fences.

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Introduction

Sri Lanka is home to at least 4,400 elephants, regardless of its small size (65,610 km²) and large human population (more than 20 million), and accounts for 10% of all Asian elephants living in the wild worldwide (Kempf and Santiapillai, 2000). But lately, the existence of the elephant in the wild has become a matter of concern in our country. Elephant habitat is constantly being lost because of the rising human population and the expansion of agricultural lands by cutting down forested areas. Because of this, the Department of Wildlife Conservation acknowledges that roughly 70% of the elephant's home area is outside the network of national parks and natural reserves.

When elephants and humans coexist in the same area, elephants destroy farms, houses, and occasionally even kill people to fulfill their needs and requirements such as water and food. In response, furious farmers use homemade weapons to shoot, injure, or kill elephants as retaliation. As a result, elephants and farmers are killing one another in agricultural regions. In Sri Lanka, habitat degradation and fragmentation are the main contributors to the current conflict between humans and elephants. Because of habitat fragmentation, elephant groups become geographically isolated and there is insufficient genetic exchange among local populations. This condition is known as the "pocketed herd phenomenon". The Sri Lankan elephant metapopulation is "nearly

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fully continuous," according to a new statewide survey done in 2019, and no scattered herds are thought to exist. The increase in Sri Lanka's human population from 6.65 million in 1946 to 22.16 million in 2021 is usually correlated with the loss of elephant habitat.

Objective of the Study

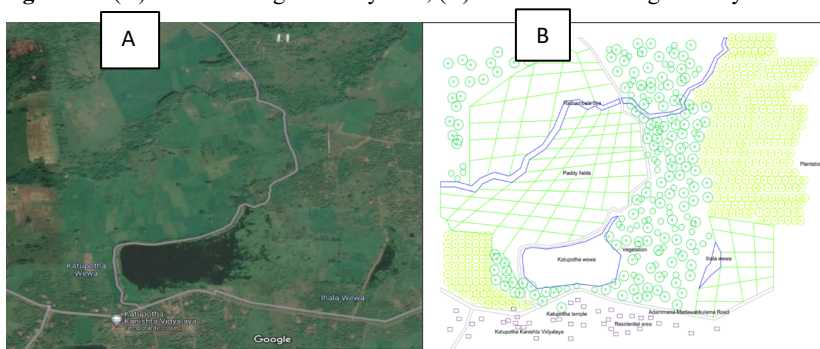
1. To evaluate the ecological and behavioral factors contributing to the human-elephant conflict (HEC) in Katupotha, Puttalam district, Sri Lanka.
2. To design and implement a landscape-based mitigation strategy to reduce HEC incidents and promote coexistence between elephants and the local community in Katupotha.

Introduction of the Selected Site

Katupotha is one of the villages which is in the intermediate dry zone area belonging to the Puttalam district in Sri Lanka, located 29.2 and 4 kilometers away from the Anamaduwa town and Pallama town respectively. The human population of this area is 2252 with 373 families. Farming is the life occupation of most people, and some villagers engage in freshwater fishing. Therefore, Katupotha lake is closely connected with their life occupations. This lake is about 40 acres and located in the middle of the village. The northern side of the lake is mainly paddy fields, the eastern side is forest, the southern side is the village, and the western side have plantations. This is one of the catchment areas of the Deduru Oya basins and connected with the Rathambala Oya. Due to the connectivity of Rathmabala Oya, the water level of the Katupotha lake does not decrease even during the less rainy season (mainly the Yala season which is starting from May to the end of August). Therefore, the people of the village can carry on their professions without any hindrance even during dry seasons.

But, due to the HEC, villagers are facing a lot of problems. These elephants come from the Wilpattu area searching for water during the dry season. Mainly, elephants enter the village through a place in Rathambala stream where there is less depth and width. According to the people of Katupotha village, elephants come to the village every year during the Yala season, especially in the month of August, when the rain is very low. At the same time, the paddy fields begin to ripen. Elephants come from the forest area and enter the village and meet the water requirement from the lake and damage the paddy fields as well. Elephants can enter the paddy fields, plantations, and as well as the residential areas easily because the lake is in the middle of the village. According to the experience of the villagers, only five or six elephants come every time and they stay by the lake for four or five days and go back to the forest the same way they came.

Figure 01: (A) Satellite image of study area; (B) AutoCAD drawing of study area



Theoretical position

In countries where elephants are found, human-elephant conflict is a serious conservation issue. To prevent and reduce HEC, numerous management techniques have been created and are applied on different scales.

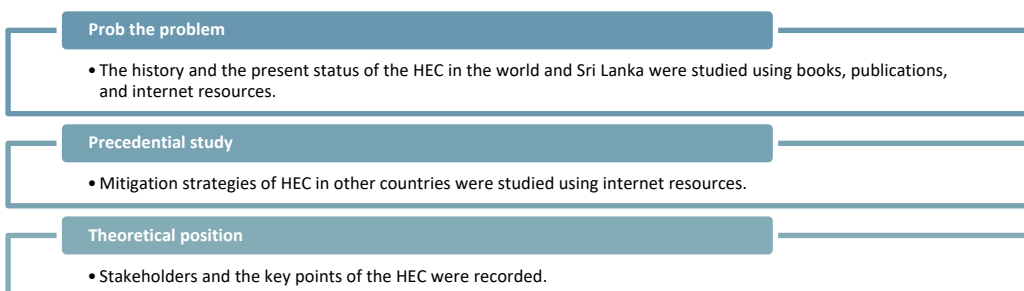
Mitigation actions that are fair for both elephants and humans:

- Maintenance of ecological corridors
- Establishment of protected areas and bio fences
- Designing of landscape based solutions
- Radio collaring for elephants

Mitigation actions that are unfair for well-being of elephants:

- Unplanned translocation of elephants
- Unnecessary firecrackers
- Culling of elephants
- Shooting
- Establishment of electric fences

Methods



Site selection and site confirmation

Pallama- Katupotha area was selected as the site and satellite image of the site area was taken. Details of the public places, plantations, vegetation cover, water features, residential areas, and socio-economic of the site were gathered.

Table 01: Main occupations of the people in the Katupotha area

Occupations	No of families
Farming	252
Fresh water fishing	12
Coconut plantation	42
Corn cultivation	9
Livestock	11
Vegetable farms	15
Other jobs	29
Total	373

Table 02: Human-made and natural infrastructure in Katupotha area.

Infrastructures	Amounts
Lakes (Katupotha wewa and Ihala wewa)	2
Schools	1
Pre-schools	1
Temples	1
Houses	373
Tube wells	56
wells	294

Landscape design solution

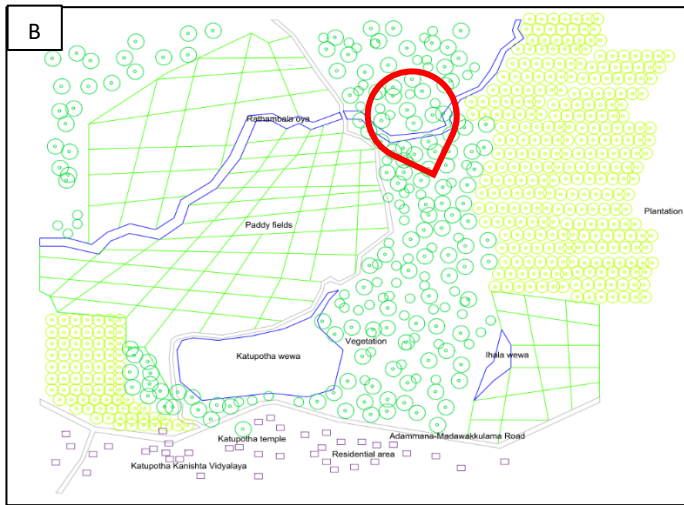
The Landscape design solution was designed using realtime landscaping architect software. Basically, the landscape solution is related to the fulfillment of elephants’ water and food requirements. And also, to develop the economic status of the people of Katupotha area by attracting other people to the village some recreational places were designed.

Results and Discussion

The designing of the landscape solution

Figure 02: (A) The plan of the landscape-based solution; (B) The place where the designed landscape solution is applied.



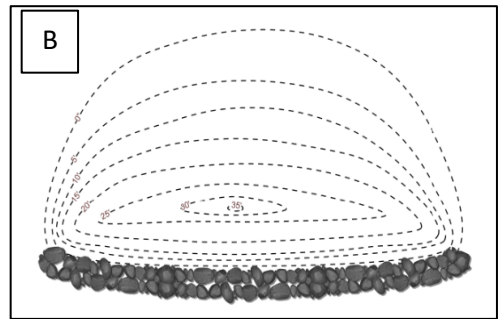
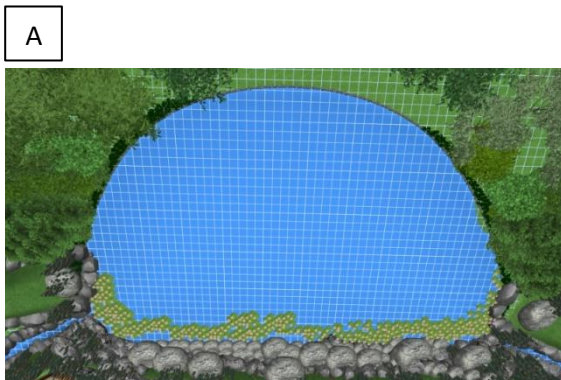


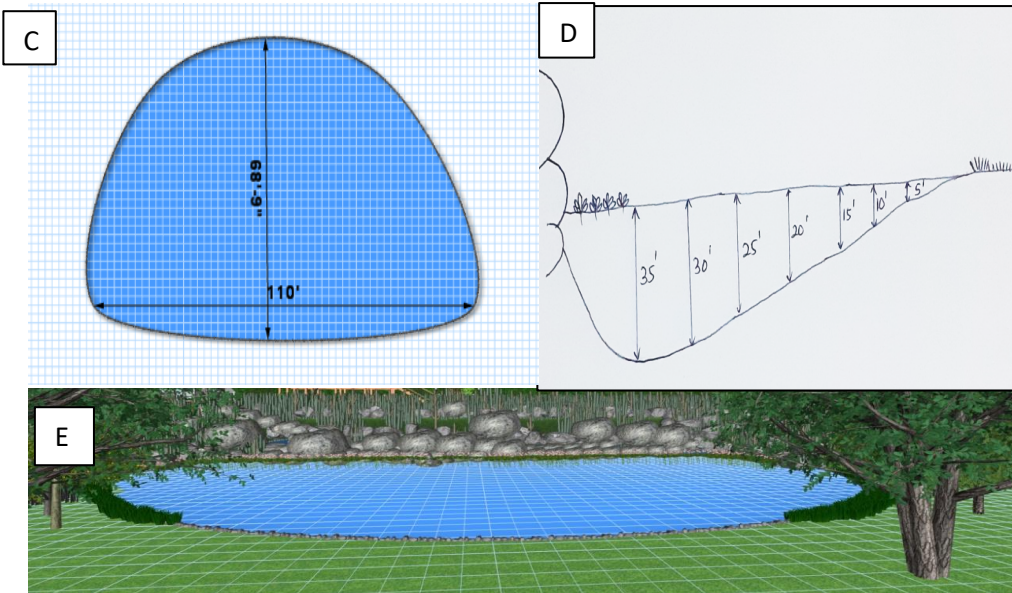
Components of the design

The lake

The lake is designed to meet the water requirement of elephants with 0.75 acres and 4 ML water storing capacity. Two separate canals are designed according to the slope of the land to receive the water from the Rathambala Oya and to remove the excess water to the Rathambala Oya itself. Therefore, the water in the lake will remain even in the dry season. The deep side of the pond is covered with lotus. Lotus has a scratchy stem with thorns therefore elephants refuse to move in that direction.

Figure 03: (A) Top view of the lake; (B) Contour lines of the lake; (C) Units; (D) Section; (E) Front view of the lake for elephants.

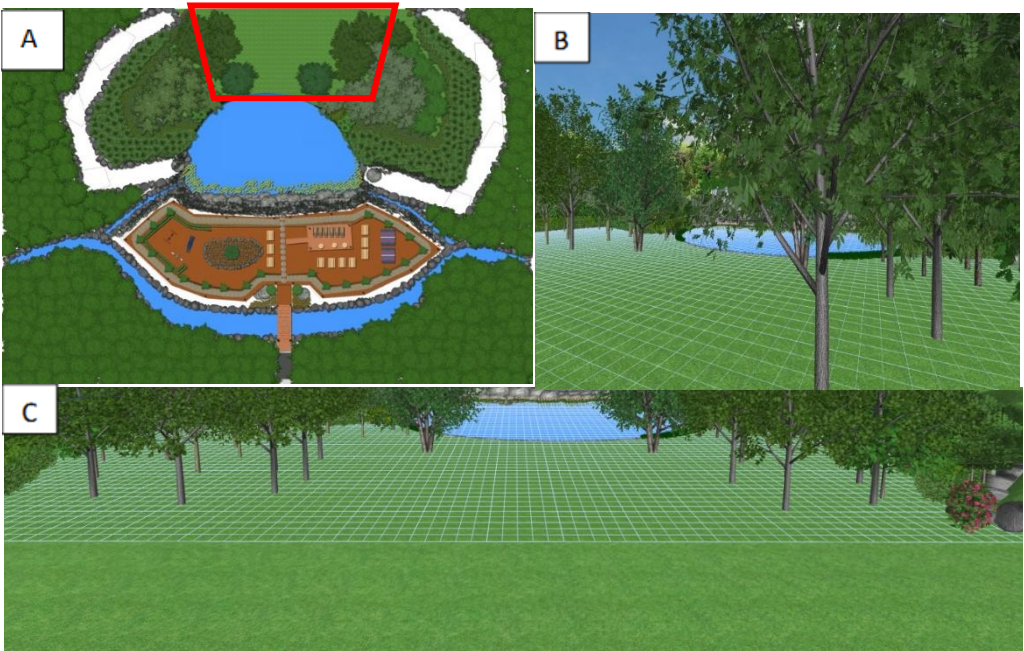




Grassland

Grasses are the fast food of elephants and, from 30% - 60% of their diet is grasses. Grasses require less effort to consume than the bark of trees.

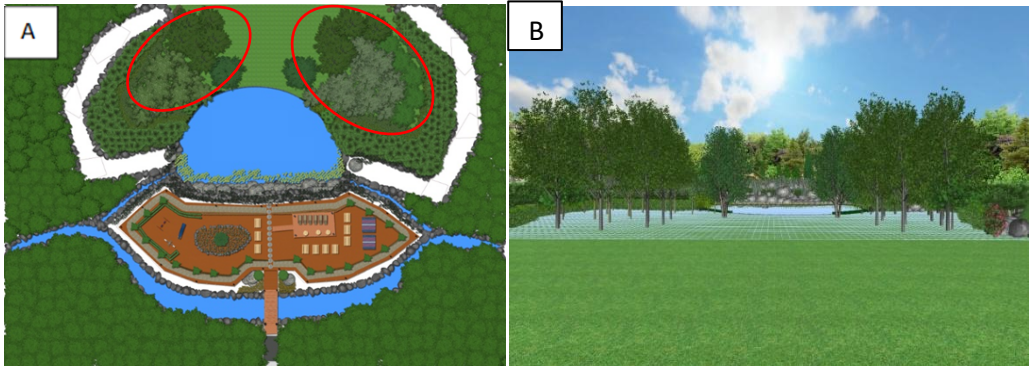
Figure 04: (A) Area of grassland in the map; (B) View of grassland through canopies; (C) Front view of grassland for elephants.



Fruiting area for elephants

The fruiting area is designed to meet the food requirements of elephants. This area comprises of wood apple trees, daminna, thimbiri and siyambala. And elephants can use this canopy area as a shade.

Figure 05: (A) Area of the fruiting trees in the map; (B) Front view of the fruiting area for elephants.



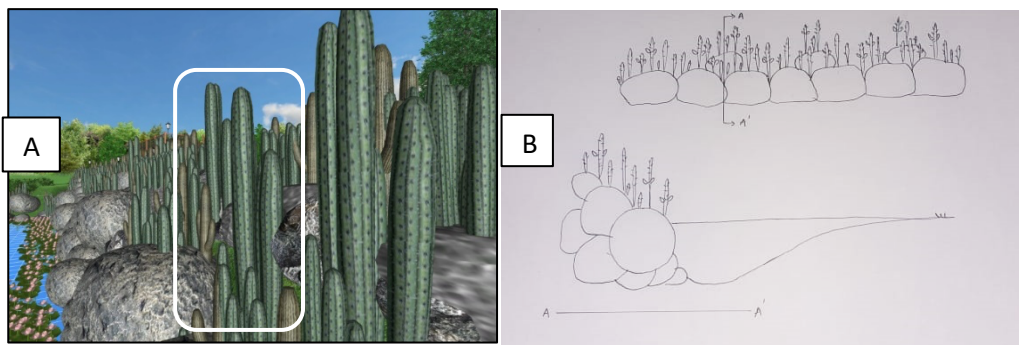
Barriers for elephants

These are mainly designed to avoid the entering of elephants to the village.

Rock barrier

Dry zone elephants are not familiar with climbing rocks. Even if they swim from the lake to the side of stage, they will not be able to go further because of the rock barrier. Cacti plantations are there to ensure the avoidance of elephants to pass that area.

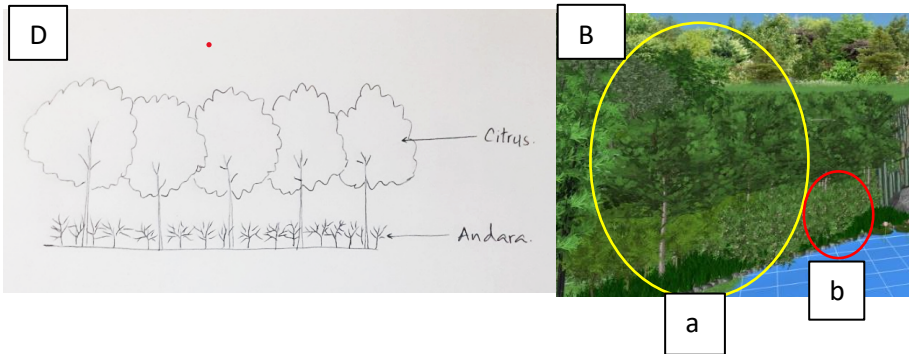
Figure 06: (A) Cacti; (B) Section view of the rock barrier



Bio fence

Bio fence consists of Citrus plants and Andara bushes. Both two species have spikes in their stems and branches therefore elephants avoid those areas. Andara plants are designed to be planted between Citrus plants therefore elephants cannot sneak through the Citrus plants.

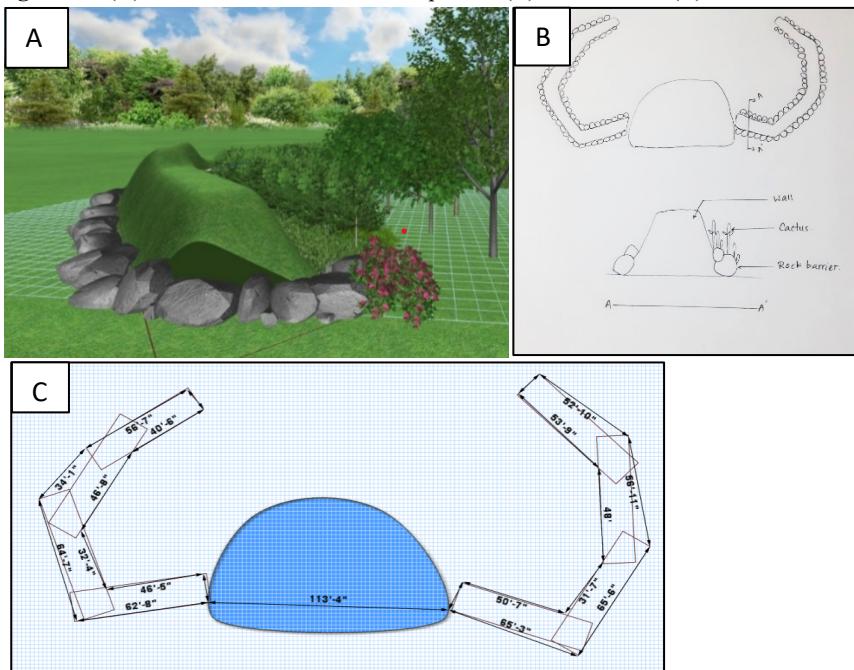
Figure 07: (A) Side section view of bio fence; (B)a. Citrus plants; b. Andara plant.



The wall

The wall is designed using clay soil. To avoid soil erosion from the wall, it is covered with grasses.

Figure 08: (A) Front view of the wall for elephants; (B) Side section; (C) Units.



Recreational places

Figure 09: (A) Front view of the elephant watching station for people; (B) Units of station and the fence.

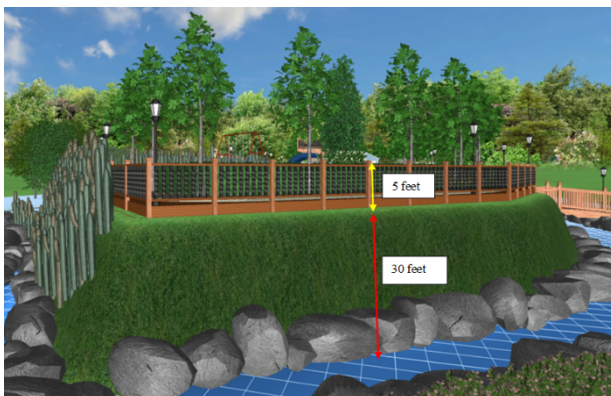
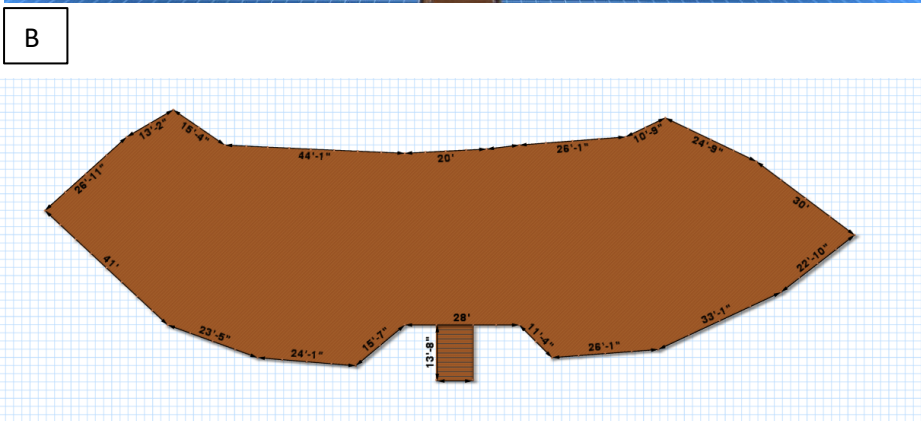


Figure 10: (A) View of the balcony; (B) Units.

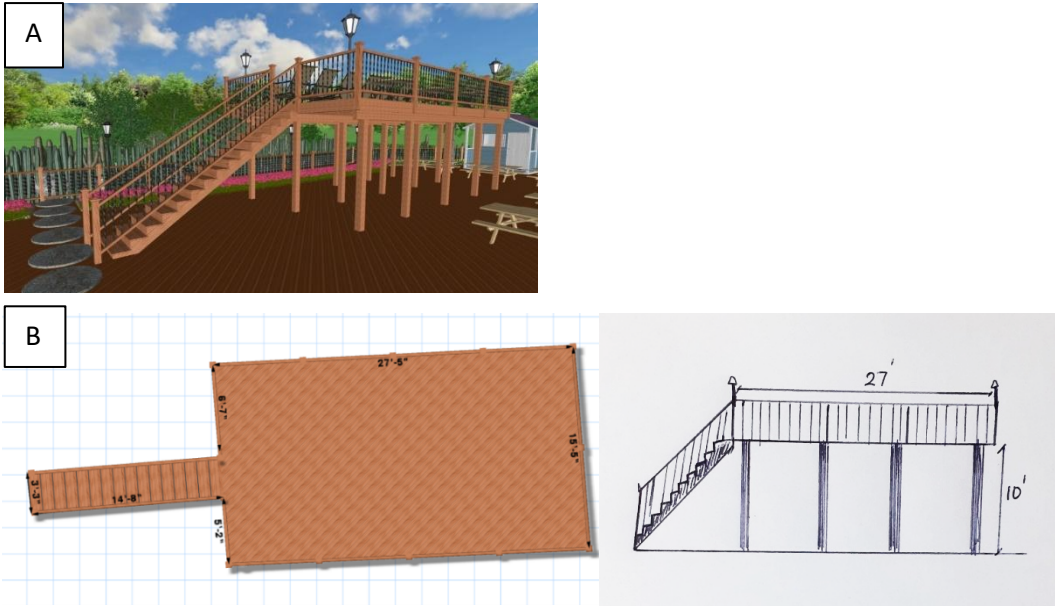


Figure 11: (A) a. Magulkarada tree; b. Night lights; (B) The pathway.

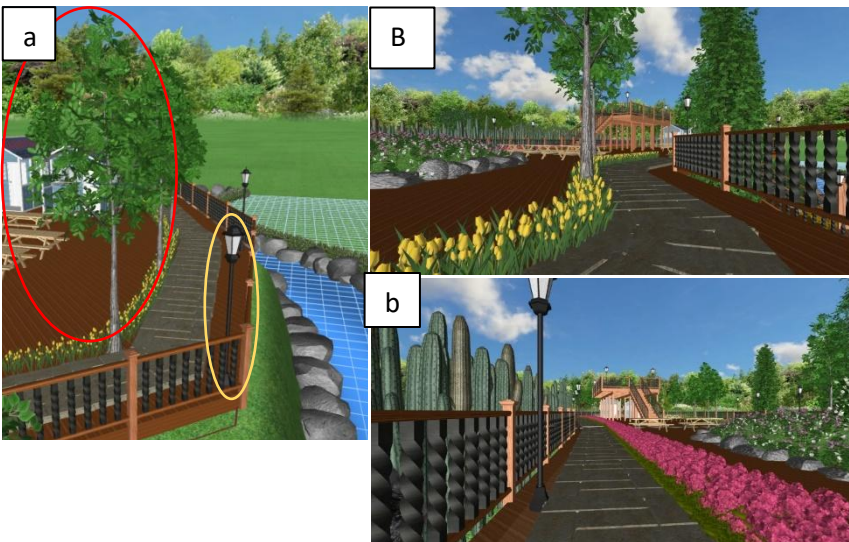
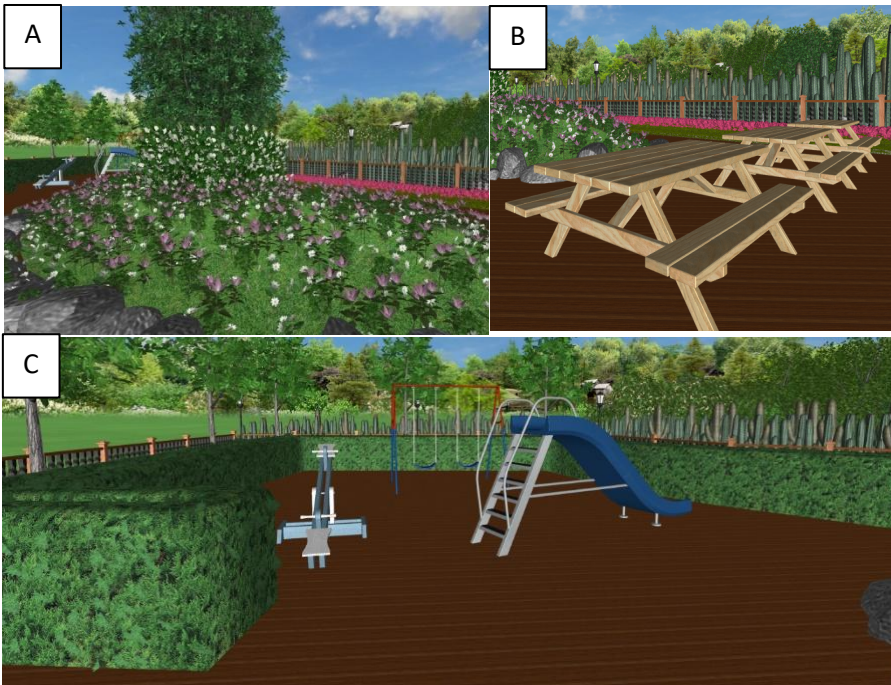
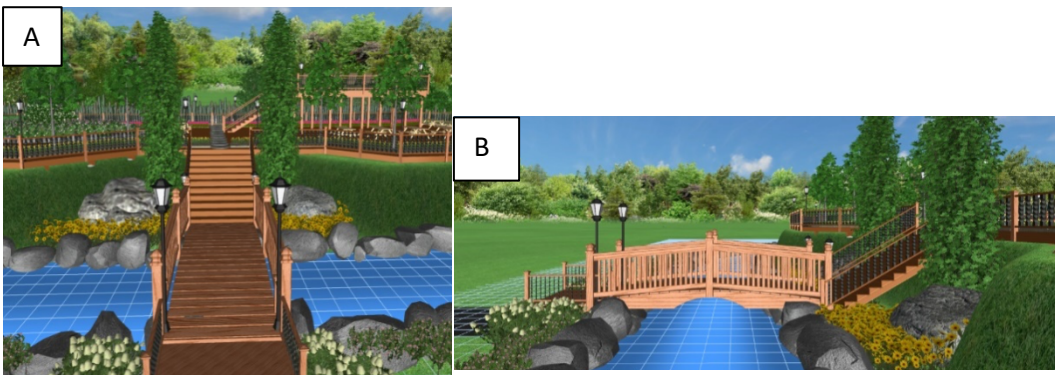


Figure 12: (A) Flower garden; (B) Benches; (C) Children's Park.



The bridge



Discussion

Elephants come to the Katupotha lake to fulfill their water requirement in the month of August (dry season). These elephants enter the village from the vegetation area through the Rathambala oya and due to the water flow of water stream, it cannot give a solution to stop the entering of elephants to the village by that point.

Therefore, from the resulting landscape solution specially designed to avoid the entering of elephants to the village. To observe the plan and the perspective easily, Realtime Landscaping Architect 2020 software was used to design the model. Basically, elephants can meet their water needs from the resulting lake and they can fulfill their food requirement through the fruiting area.

Because there are only around five to six elephants, the amount of food and water is quite enough for them. Therefore, elephants are stopped from crossing the oya and entering to the village.

Since elephants do not attack villages, conflicts between elephants and villagers are minimized. Villagers do not have to bear the unnecessary expenses of driving away the elephants. They get the opportunity to protect their crops, houses, and estates easily. The presence of rock barriers, bio fences, and walls ensure the safety of the visitors and as well as the people in the village by stopping the elephants at the point itself.

Through this design, the water and food requirements of the elephants will be met, and the living standards of the villagers will be raised. The visitors who come to see elephants will provide an opportunity to earn income for the villagers. The flower garden, children's park, balcony, sitting areas, jogging tracks, and the bridge will help to attract more visitors to the area.

Conclusion

The HEC in Katupotha area can be reduced by creating the water feature with a fruiting area and ecofriendly barriers by avoiding the entering of elephants to the village.

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