

# Missions Description

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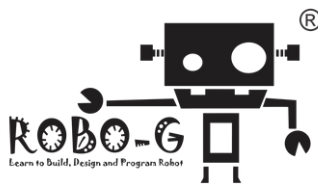


## ROBO Adventures

EXPLORERS | INNOVATORS | TECHIES

SEASON 2025

Organized By





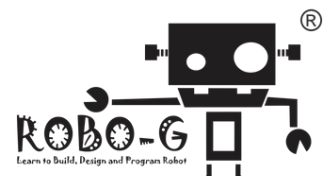
# Indian Robotics Olympiad 2025

# Missions Description



## ROBO Adventures

EXPLORERS | INNOVATORS | TECHIES  
SEASON 2025







# Table of Contents

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|                    |   |
|--------------------|---|
| About the IRO..... | 6 |
|--------------------|---|

|                     |   |
|---------------------|---|
| IRO 2025 Theme..... | 7 |
|---------------------|---|

## 1. Explorers (Aged 5 - 7 Years)

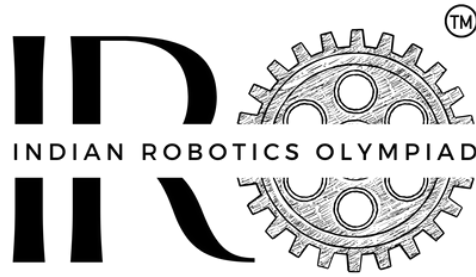
|  |    |
|--|----|
| 1.1 Challenge Introduction.....            | 8  |
| 1.2 Challenge Mat.....                     | 8  |
| 1.3 Challenge Objects and Positioning..... | 9  |
| 1.4 Robot Missions.....                    | 11 |
| 1.5 Scoring.....                           | 12 |

## 2. Innovators (Aged 7 - 10 Years)

|  |    |
|--|----|
| 2.1 Challenge Introduction.....            | 13 |
| 2.2 Challenge Mat.....                     | 13 |
| 2.3 Challenge Objects and Positioning..... | 14 |
| 2.4 Robot Missions.....                    | 17 |
| 2.5 Scoring.....                           | 18 |

## 3. Techies (Aged 10 - 15 Years)

|   |    |
|---|----|
| 3.1 Challenge Introduction.....                         | 19 |
| 3.2 Challenge Mat.....                                  | 19 |
| 3.3 Challenge Objects, Positioning & Randomisation..... | 20 |
| 3.4 Robot Missions.....                                 | 24 |
| 3.5 Scoring.....  | 25 |



The **Indian Robotics Olympiad (IRO)** is a prestigious competition that showcases the innovation and technical prowess of young minds across India. It serves as a platform for students to demonstrate their skills in robotics, programming, and problem-solving.

IRO, an initiative pioneered by **ROBO-G**, is exclusively organized by ROBO-G itself. Additionally, ROBO-G serves as the official training partner for IRO.

# IRO 2025 Theme – Lake Conservation

The theme for IRO 2025 is "**Lake Conservation**"

In IRO 2025, students will embark on an exploration of the diverse challenges encountered in lake conservation and discover the myriad ways in which robotics can offer solutions. Can robots help monitor water quality and detect pollution to keep lakes clean? Can robots remove invasive plants and waste from lakes, helping to restore the natural ecosystem? Can robots assist in tracking and protecting aquatic life, ensuring a balanced and thriving habitat?



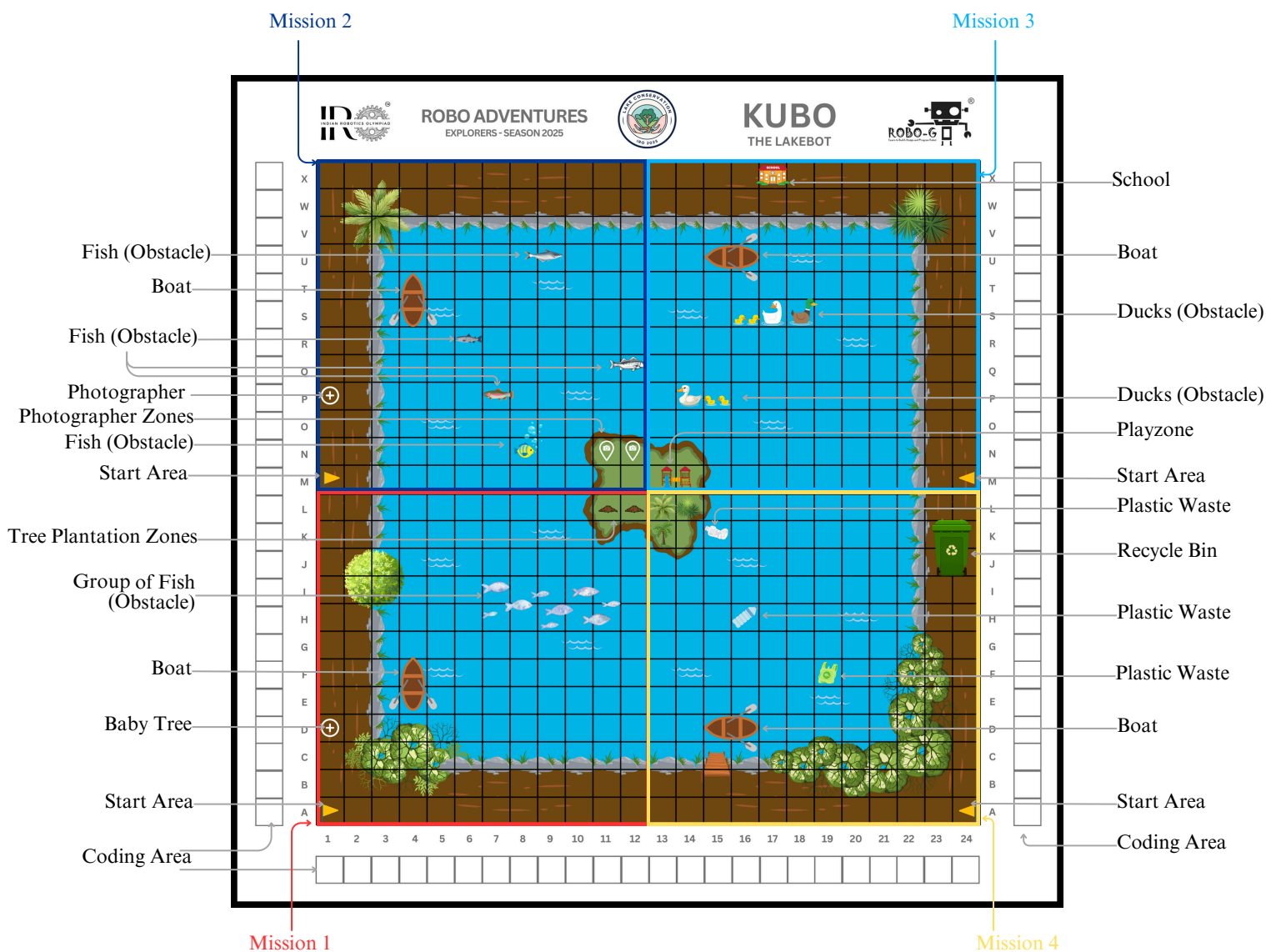
# 1. Explorers (Aged 5 - 7 Years)

## 1.1 Challenge Introduction

Kubo the LakeBot has taken on the mission of conserving lakes, and he needs your help with various environmental tasks. Let's assist Kubo in his journey by tree planting, island drop, playzone ferry and lake cleanup.

## 1.2 Challenge Mat

The following graphic shows the challenge mat with the different areas.



## 1.3 Challenge Objects and Positioning

### Baby tree (1×)

There is one baby tree on the mat. It will be placed on the “+” icon near the start area in Mission 1.



Baby tree (1)



Start position of object on the field

### Photographer (1×)

There is one photographer on the mat. It will be placed on the “+” icon near the start area in Mission 2.



Photographer (1)



Start position of object on the field

### Student (1×)

There is one student on the mat. It will be placed at the school in Mission 3.



Student (1)



Start position of object on the field



## Plastic wastes (3×)

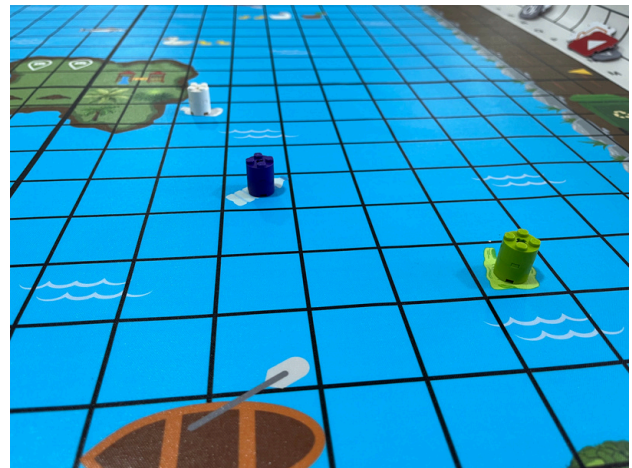
There are three plastic wastes on the mat. They will be placed on the three plastic waste icons, one on each, in Mission 4.



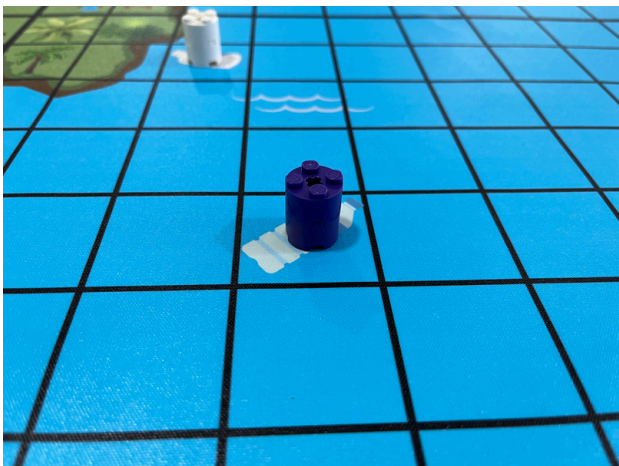
Plastic wastes (3)



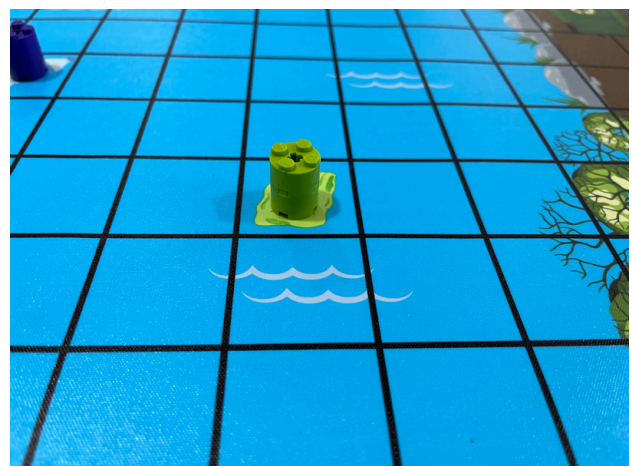
Start position of object on the field



Start position of objects on the field



Start position of object on the field



Start position of object on the field

## 1.4 Robot Missions

**For a better understanding, the missions will be explained in multiple sections. The team can decide in which order they will do the missions.**

### 1. Tree Planting

Kubo, the Lakebot, must collect a tree near to the start area, board the boat, and plant the tree in one of the designated plantation zones. The robot must avoid disturbing the fish while navigating the lake. In other words, it should not move over the fish images printed on the mat.

### 2. Island Drop

The next task for the robot is to pick up the photographer near to the start area, board the boat, and drop him off at one of the photographer zones on the island. The robot must avoid disturbing the fish while navigating the lake. In other words, it should not move over the fish images printed on the mat.

### 3. Playzone Ferry

Another task for the Lakebot is to pick up the student from the school, board the boat, and drop them off at the play zone on the island. The robot must avoid disturbing the ducks while navigating the lake. In other words, it should not move over the duck images printed on the mat.

### 4. Lake Cleanup

The robot's final mission is to board the boat, collect all the plastic waste from the lake, and dispose of it in the recycle bin.

**Note:** The robot can move only along the brown mud path surrounding the lake. It can pass over trees that fall within the grid spaces of the mud path. If the robot needs to enter the lake, it must first move onto the boat image printed on the mat (indicating that the robot has boarded the boat). Once on the boat, the robot can navigate the lake according to the challenge requirements.

For each challenge the robot should start from the Start Area (yellow flag).

## 1.5 Scoring

| Tasks  | Each | Total | # | Total |
|--|------|-------|---|-------|
| <b>Tree Planting</b>   |      |       |   |       |
| Collecting the tree  |      | 5     |   |       |
| Boarding the boat  |      | 5     |   |       |
| Avoiding the fishes  |      | 5     |   |       |
| Dropping the tree completely or partially in one of the plantation zones           |      | 10    |   |       |
| <b>Total Score in this mission</b>   |      |       |   |       |
| <b>Time in full seconds</b>  |      |       |   |       |
| <b>Island Drop</b>   |      |       |   |       |
| Picking up the photographer  |      | 5     |   |       |
| Boarding the boat  |      | 5     |   |       |
| Avoiding the fishes  |      | 5     |   |       |
| Dropping the photographer completely or partially at one of the photographer zones |      | 10    |   |       |
| <b>Total Score in this mission</b>   |      |       |   |       |
| <b>Time in full seconds</b>  |      |       |   |       |
| <b>Playzone Ferry</b>  |      |       |   |       |
| Picking up the student   |      | 5     |   |       |
| Boarding the boat  |      | 5     |   |       |
| Avoiding the ducks   | 2.5  | 5     |   |       |
| Dropping the student completely or partially at the playzone                       |      | 10    |   |       |
| <b>Total Score in this mission</b>   |      |       |   |       |
| <b>Time in full seconds</b>  |      |       |   |       |
| <b>Lake Cleanup</b>  |      |       |   |       |
| Boarding the boat  |      | 5     |   |       |
| Collecting the plastic wastes  | 5    | 15    |   |       |
| Dropping the plastic wastes in the dustbin (completely or partially)               | 5    | 15    |   |       |
| Dropping all three plastic wastes in the dustbin (completely or partially)         |      | 10    |   |       |
| <b>Total Score in this mission</b>   |      |       |   |       |
| <b>Time in full seconds</b>  |      |       |   |       |
| <b>Maximum Score</b>   |      | 120   |   |       |
| <b>Total Score (Addition of all four missions)</b>                                 |      |       |   |       |
| <b>Time in full seconds (Addition of all four missions)</b>                        |      |       |   |       |



## 2. Innovators (Aged 7 - 10 Years)

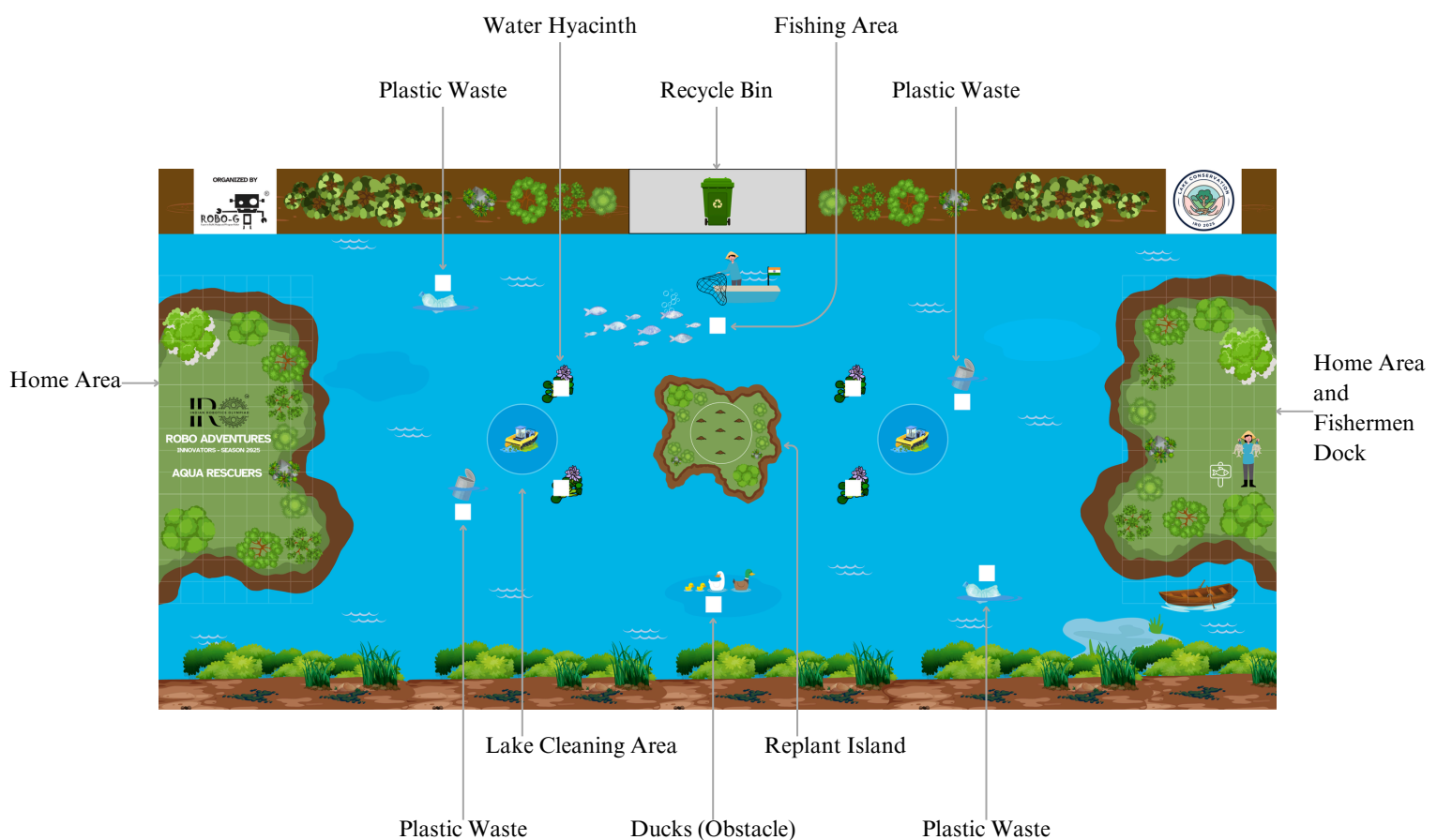
### 2.1 Challenge Introduction

Bangalore's lakes are undergoing major restoration efforts to tackle pollution and ecological degradation. Plastic waste cleanup drives, like BBMP's removal of 400 tonnes of garbage from Bellandur Lake, and community-led initiatives are reducing pollution. Water hyacinths, which deplete oxygen and choke lakes, have been manually and mechanically cleared from lakes like Kaikondrahalli and Bellandur, improving water flow. Additionally, tree replantation projects in lakes like Puttenahalli and Kaikondrahalli are enhancing biodiversity and restoring the natural ecosystem.

Your mission is to design, build, and program a robot to collect and remove plastic waste from designated lake zones, clear invasive water hyacinths to improve water flow, and transport tree saplings to specific replantation areas. Additionally, the robot must assist fishermen by safely transporting fish to an island.

### 2.2 Challenge Mat

The following graphic shows the challenge mat with the different areas.



## 2.3 Challenge Objects and Positioning

### Plastic waste (4×)

There are four plastic wastes in total. They will be placed on the white squares at the plastic waste positions.



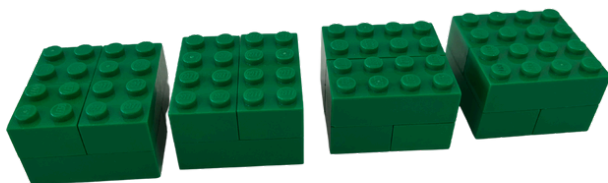
Plastic waste (4)



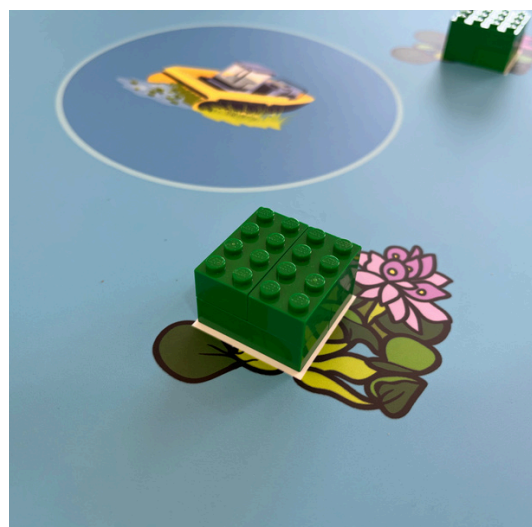
Start position of object on the field  
(on white square)

### Water hyacinth (4×)

There are four water hyacinths on the challenge mat. They will be placed on the white squares at the water hyacinth positions.



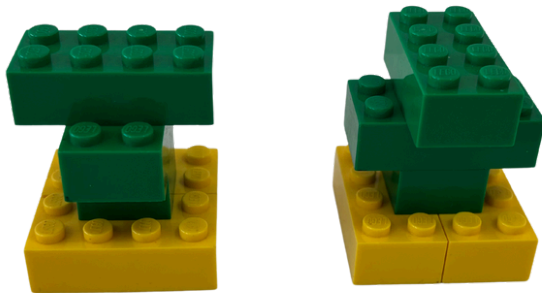
Water hyacinth (4)



Start position of object on the field  
(on white square)

## Tree Sapling (2×)

There are two tree saplings in the two home areas, one in each area. The tree saplings are standing inside the areas in any location and orientation.



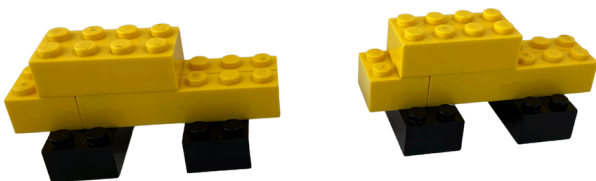
Tree sapling (2)



Start position of object on the field

## Water Hyacinth Harvester (2×)

There are two Water hyacinth harvesters in the two home areas, one in each area. The Water hyacinth harvesters are standing inside the areas in any location and orientation.



Water hyacinth harvester (2)



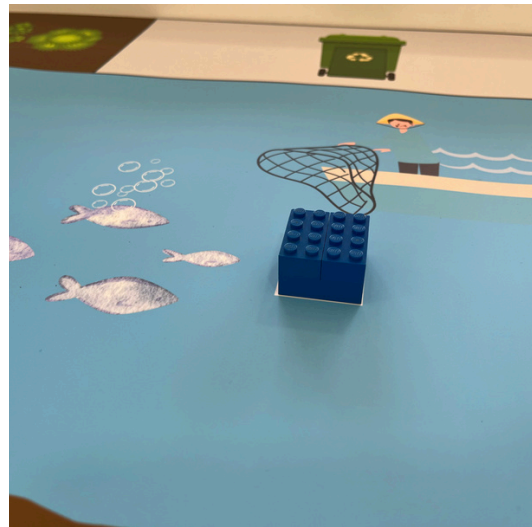
Start position of object on the field

### Fish (1×)

There is one fish on the challenge mat. It will be placed on the white square near the fishing area.



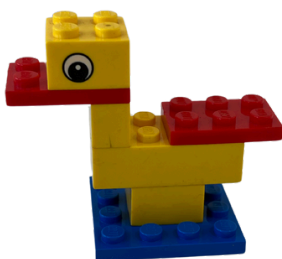
Fish (1)



Start position of object on the field

### Duck (Obstacle) (1×)

There is one duck (obstacle) on the challenge mat.



Duck (Obstacle) (1)



Start position of object on the field

## 2.4 Robot Missions

**For a better understanding, the missions will be explained in multiple sections. The team can decide in which order they will do the missions.**

### 1. Transport Plastic Wastes

The robot has to transport plastic wastes from the designated lake zones to the recycle bin.

### 2. Deploy Water Hyacinth Harvesters

The next task for the robot is to transport the water hyacinth harvesters from the home area to the lake cleaning area. A water hyacinth harvester is considered correctly transported if it is placed completely within the lake cleaning area.

When the water hyacinth harvester is placed completely inside the lake cleaning area, the two water hyacinths near the lake cleaning area will be removed from the challenge mat by the judge.

If the water hyacinth harvester is placed partially inside the lake cleaning area, the two water hyacinths near the lake cleaning area will not be removed from the challenge mat by the judge and the two water hyacinths will act as free objects on the challenge mat.

### 3. Transport Fish

The robot has to transport the fish from the fishing area to the fishermen dock.

### 4. Plant Tree Saplings

The robot must transport the tree saplings from the home area to the replant island, placing them completely inside the circle.

### 5. Avoid the Duck (obstacle)

Drive safely, avoiding moving the Duck (obstacle) to get the bonus points.

### 6. Park the Robot

Finish the run by parking the robot completely or partially inside either of the two home areas.

#### **Note:**

- The home area includes the green area and the brown area surrounding it.
- If an object is required to be completely inside an area, it means that no part of the challenge object extends beyond the border of that area or touches the border line.

## 2.5 Scoring

| Tasks  | Each | Total | # | Total |
|--|------|-------|---|-------|
| <b>Transport Plastic Wastes</b>  |      |       |   |       |
| A plastic waste is completely removed from its starting position (not touching the white square) | 2.5  | 10    |   |       |
| A plastic waste is completely inside the recycle bin   | 5    | 20    |   |       |
| A plastic waste is partially inside the recycle bin  | 2.5  | 10    |   |       |
| <b>Deploy Water Hyacinth Harvesters</b>  |      |       |   |       |
| A water hyacinth harvester is fully deployed within the lake cleaning area                       | 10   | 20    |   |       |
| A water hyacinth harvester is partially deployed within the lake cleaning area                   | 5    | 10    |   |       |
| <b>Transport Fish</b>  |      |       |   |       |
| A fish is completely inside the fishermen's dock   |      | 10    |   |       |
| A fish is partially inside the fishermen's dock  |      | 5     |   |       |
| <b>Plant Tree Saplings</b>   |      |       |   |       |
| A tree sapling is fully inside the circle on replant island                                      | 10   | 20    |   |       |
| A tree sapling is partially inside the circle on replant island                                  | 5    | 10    |   |       |
| <b>Avoid the Duck (obstacle)</b>   |      |       |   |       |
| The duck has not been moved from its initial starting position                                   |      | 10    |   |       |
| <b>Park the Robot</b>  |      |       |   |       |
| Robot completely or partially stops within the home area   |      | 10    |   |       |
| <b>Maximum Score</b>   |      | 100   |   |       |
| <b>Total Challenge Mat Score</b>   |      |       |   |       |
| <b>Time in full seconds</b>  |      |       |   |       |



### 3. Techies (Aged 10 - 15 Years)

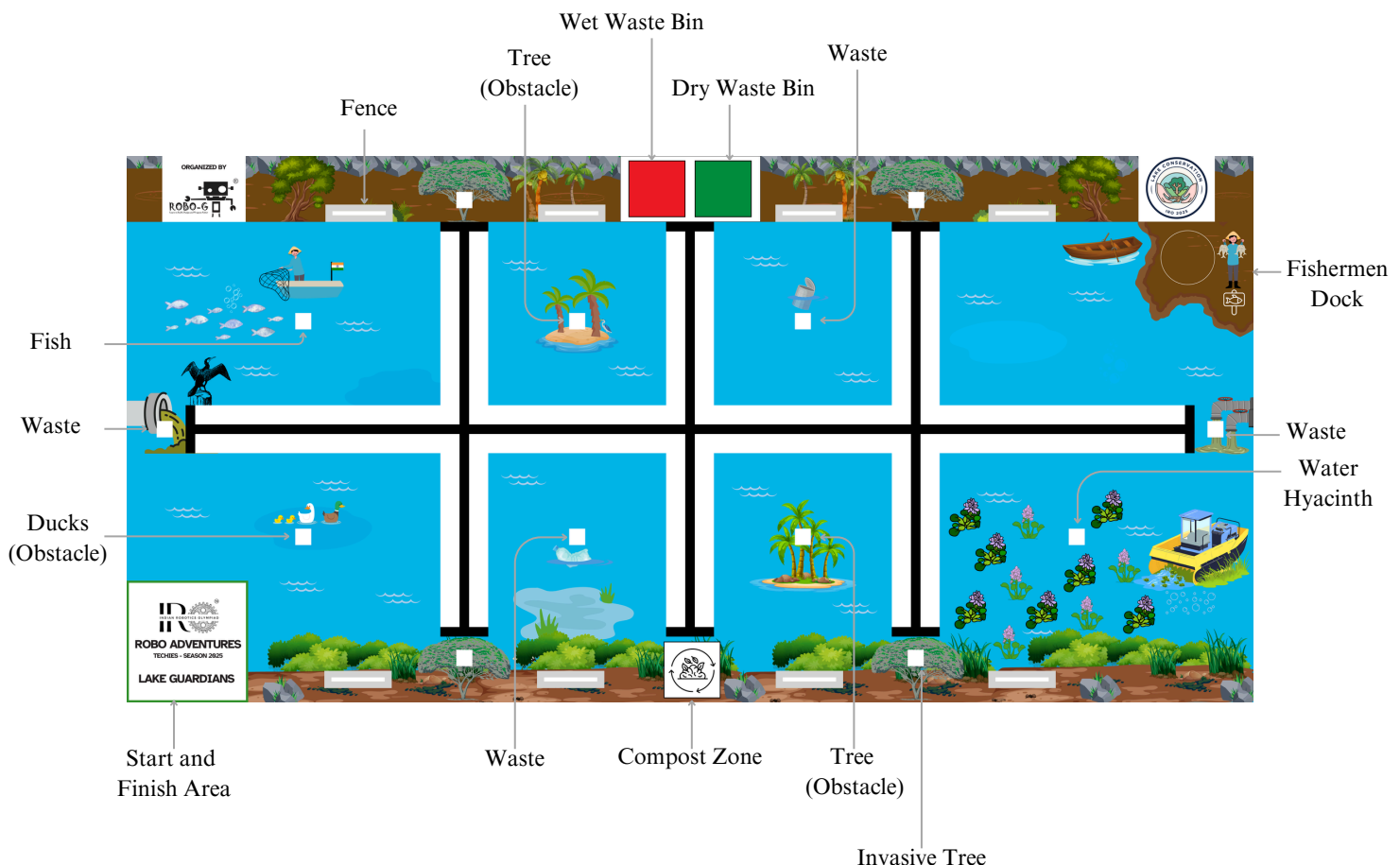
#### 3.1 Challenge Introduction

Bangalore's lakes are heavily polluted due to sewage inlets, with lakes like Bellandur and Varthur receiving untreated wastewater, causing toxic foam and contamination. Illegal dumping of wet and dry waste in lakes such as Ulsoor and Kalkere worsens pollution, despite cleanup efforts. Invasive trees like Acacia and Eucalyptus deplete groundwater, accelerating lake degradation, while restoration projects focus on replanting native species. However, water hyacinths, a major nuisance, are now being repurposed into compost and biofertilizers in lakes like Jakkur and Rachenahalli, promoting sustainable waste management.

Your mission is to design, build, and program a robot to detect and segregate wet and dry waste, and clear invasive trees that harm the ecosystem. Additionally, the robot should harvest water hyacinths and transport them to a composting station for eco-friendly disposal. To support local fishermen, the robot must also safely transport fish to an island.

#### 3.2 Challenge Mat

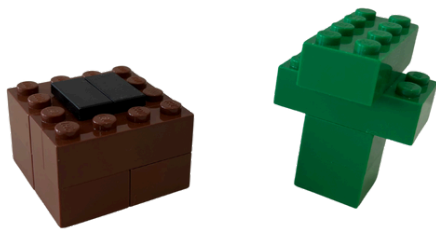
The following graphic shows the challenge mat with the different areas.



### 3.3 Challenge Objects and Positioning

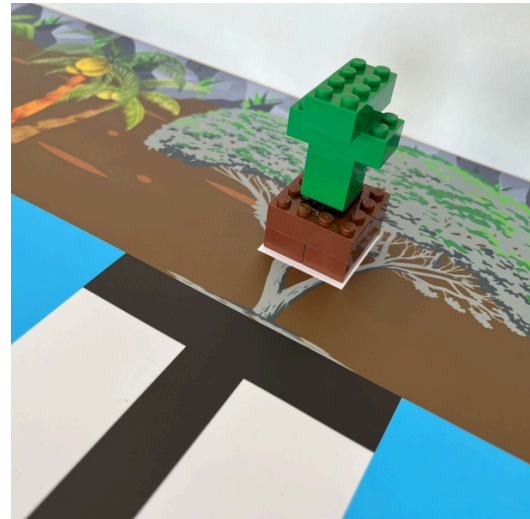
#### Invasive Tree (4×)

There are four invasive trees on the challenge mat. They will be placed on the white square on the invasive tree area.



Invasive Tree (4)

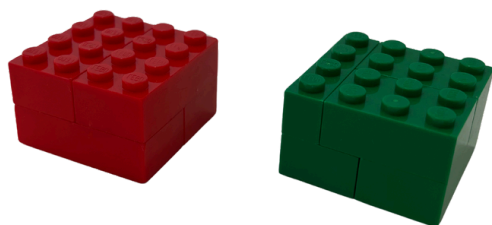
The invasive tree element consists of a base (left) and a top (right)



Start position of object on the field  
(on white square)

#### Wet Waste (2×) and Dry Waste (2×)

There are two wet wastes (red) and two dry wastes (green) on the challenge mat. They will be placed randomly on the white squares at the waste positions.



Wet Waste (2)

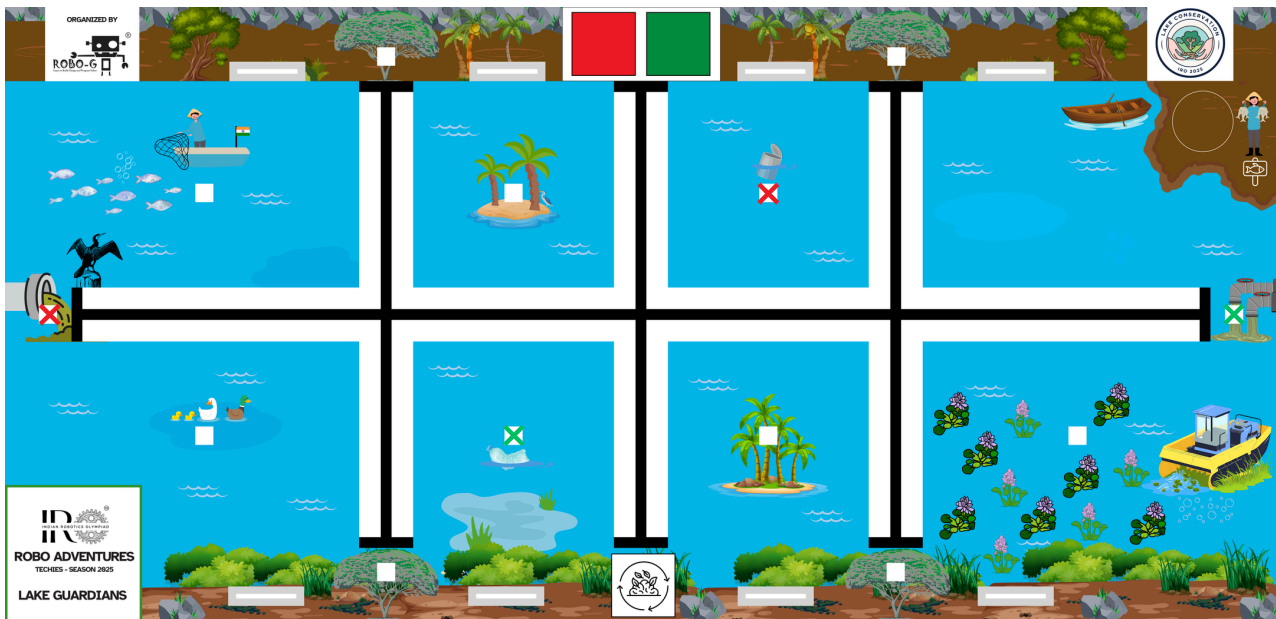
Dry Waste (2)



One possible start position of the  
object on the field (on white square)



One possible randomization you can see here (red X for wet waste and green X for dry waste):

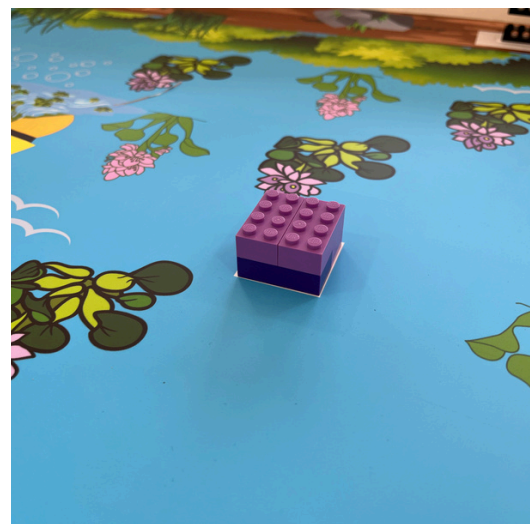


### Water Hyacinth (1×)

There is one water hyacinth on the challenge mat. They will be placed on the white square in the hyacinth area.



Water Hyacinth (1)



Start position of object on the field  
(on white square)

### Fish (1×)

There is one fish on the challenge mat. It will be placed on the white square near the fishing area.



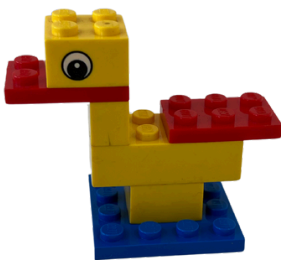
Fish (1)



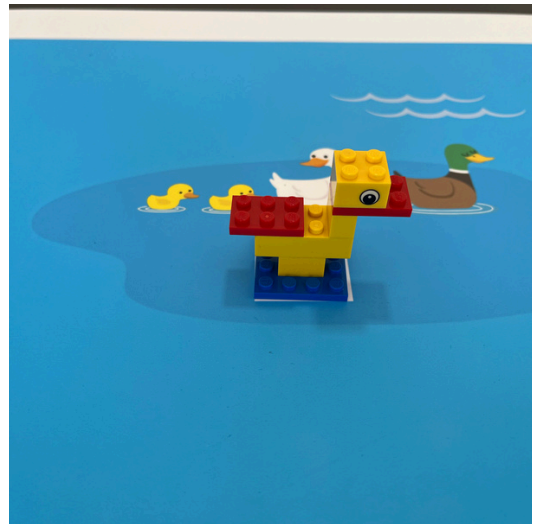
Start position of object on the field

### Duck (Obstacle) (1×)

There is one duck (obstacle) on the challenge mat.



Duck (Obstacle) (1)



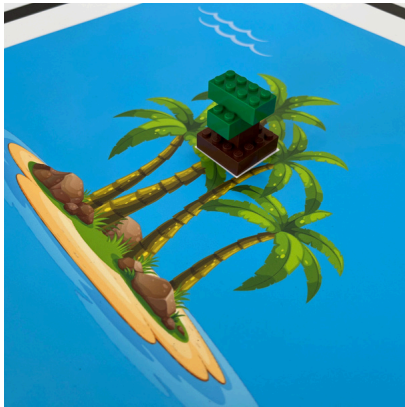
Start position of object on the field

## Tree (Obstacle) (2×)

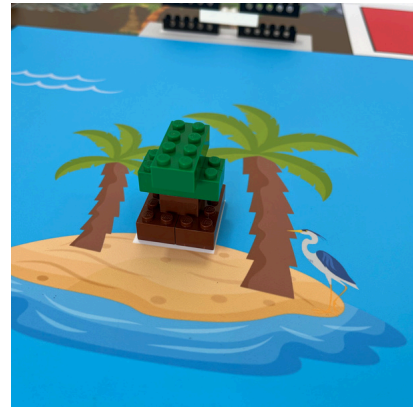
There are two trees (obstacle) on the challenge mat. It will be placed on the white square near the tree area.



Tree (Obstacle) (2)



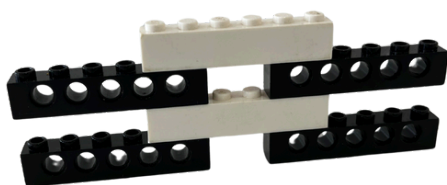
Start position of object on the field



Start position of object on the field

## Fences (8×)

There are 8 fences on the field that should not be moved or damaged. A fence is placed on the white line inside a grey area.



Fence (8)



Start position of object on the field

## 3.4 Robot Missions

**For a better understanding, the missions will be explained in multiple sections. The team can decide in which order they will do the missions.**

### 1. Cut Invasive Trees

The robot must cut only the top part of the invasive tree. The base (lower part) of the tree must remain at least partially touching the white square, which marks its initial position.

- After cutting, the top part must not come into contact with the base.
- If the base is completely moved out of the white square, no points will be awarded.

### 2. Sort Waste

The robot must collect both wet and dry waste, sort them correctly, and drop each type into its respective bin.

### 3. Remove Water Hyacinth

The robot must remove the water hyacinth and drop it into the compost zone, where it will be used to create compost.

### 4. Transport Fish

The robot has to transport the fish from the fishing area to the fishermen dock inside the circle.

### 5. Avoid Obstacles

The robot must drive safely, avoiding both the duck and the trees (obstacles) to earn bonus points. No points will be awarded if any obstacle is moved from its original position.

### 6. Park the Robot

The mission is complete when the robot returns to the Start & Finish area, stops, and the projection of the robot is partly (top-view) within the Start & Finish area.

### 7. Get Bonus Points

Bonus points will be awarded for not moving or damaging the fences.

#### **Note:**

- If an object is required to be completely inside an area, it means that no part of the challenge object extends beyond the border of that area or touches the border line.

## 3.5 Scoring

| Tasks   | Each | Total | # | Total |
|---|------|-------|---|-------|
| <b>Cut Invasive Trees</b>   |      |       |   |       |
| The top of the tree is no longer touching the base, and the base is still touching the white square | 10   | 40    |   |       |
| <b>Sort Waste</b>   |      |       |   |       |
| The wet waste is completely inside the correct bin  | 10   | 20    |   |       |
| The wet waste is partially inside the correct bin   | 5    | 10    |   |       |
| The dry waste is completely inside the correct bin  | 10   | 20    |   |       |
| The dry waste is partially inside the correct bin   | 5    | 10    |   |       |
| <b>Remove Water Hyacinth</b>  |      |       |   |       |
| The water hyacinth is completely inside the compost zone  |      | 10    |   |       |
| The water hyacinth is partially inside the compost zone   |      | 5     |   |       |
| <b>Transport Fish</b>   |      |       |   |       |
| A fish is completely inside the fishermen's dock circle   |      | 10    |   |       |
| A fish is partially inside the fishermen's dock circle  |      | 5     |   |       |
| <b>Avoid Obstacles</b>  |      |       |   |       |
| The duck has not been moved from its initial starting position                                      |      | 5     |   |       |
| The tree has not been moved from its initial starting position                                      | 5    | 10    |   |       |
| <b>Park the Robot</b>   |      |       |   |       |
| Projection of the robot is partly in the Start & Finish Area  |      | 15    |   |       |
| <b>Get Bonus Points</b>   |      |       |   |       |
| Fence that is not moved or damaged  | 5    | 40    |   |       |
| <b>Maximum Score</b>  |      | 170   |   |       |
| <b>Total Challenge Mat Score</b>  |      |       |   |       |
| <b>Time in full seconds</b>   |      |       |   |       |

[illegible]



# Indian Robotics Olympiad 2025 Theme

