



# RoboMission

Junior Game Rules  
Season 2024



Earth Allies  
Green City



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## Important information for reading this document:

- These game rules are made for local and national competitions.
- National Organizers in WRO countries are allowed to simplify the missions.
- For the International Final, one extra mission will be released on October 8<sup>th</sup> 2024. The extra challenge will work with the same game mat and brick set. It is not mandatory to do this extra mission to participate in the event.
- Because of possible surprise rules and the extra mission for the International Final, the game field may contain areas and markings that are not used at local or national events.
- For greater clarity, the robot missions are explained in multiple sections. But the teams can decide which missions they will do and which order.
- The game missions have easy and more complicated tasks. This makes the competition suitable for beginning and more experience teams. It is not obligated to solve all missions to enjoy a WRO participation.
- General information on game table setup and fixing of game objects on the field you find in the WRO RoboMission General Rules, chapter 6.

We wish everyone much success and a lot of fun with our WRO 2024 challenges!

Your team of World Robot Olympiad Association

## 1. Introduction

Green cities are urban areas that are designed to be more sustainable and environmentally friendly. They have several advantages that help to improve the quality of life for their residents and live more in harmony with nature. Some of the advantages of green cities are:

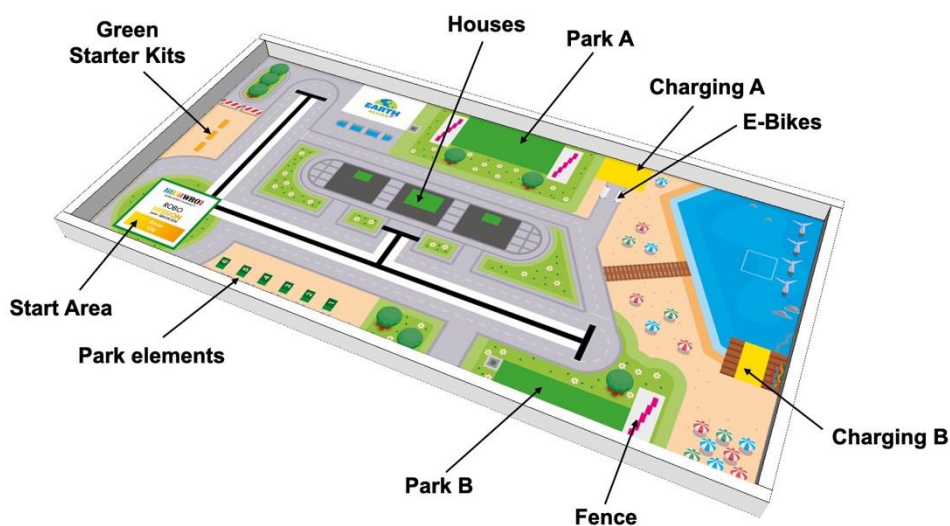
- Green cities have cleaner air, which is better for our health.
- Green cities have more parks and gardens, which are great places to play and explore.
- Green cities use renewable energy, which is better for the environment.

Examples of modern and transforming green cities are Singapore or Paris where more trees and green areas have been installed to transform the cities into a green city.<sup>1</sup>

**On the Junior game field, the robot will help transforming a city to a greener place by setting up new parks, helping people make a (roof top) garden and making use of renewable energy.**

## 2. Game Field

The following graphic shows the game field with the different areas.



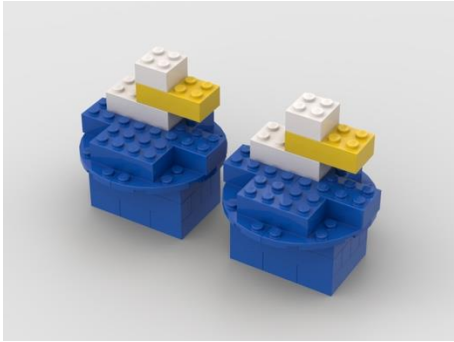

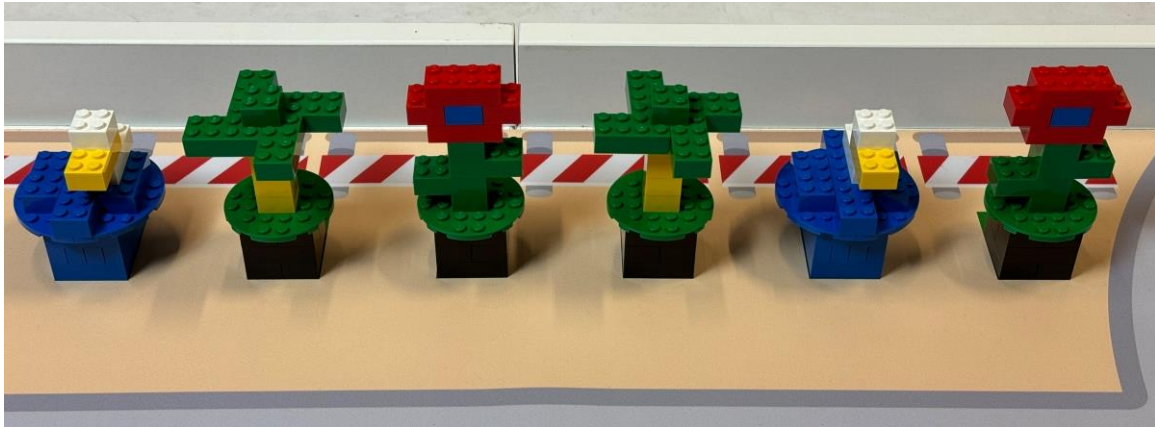
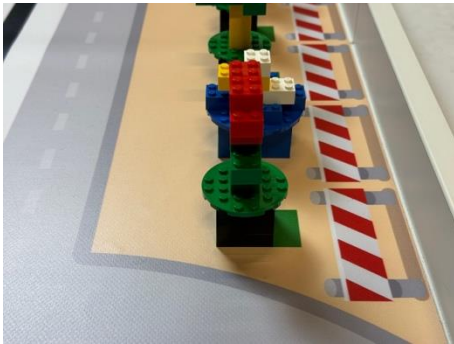
If the table is larger than the game mat, place the mat against the wall with the sides of the park A and the water area.

<sup>1</sup> For example, see those YouTube videos on Singapore (<https://www.youtube.com/watch?v=QCZ8jlnO7UY>) or Paris (<https://www.youtube.com/watch?v=3kZ3rWHs9wU>).

### 3. Game Objects, Positioning, Randomization

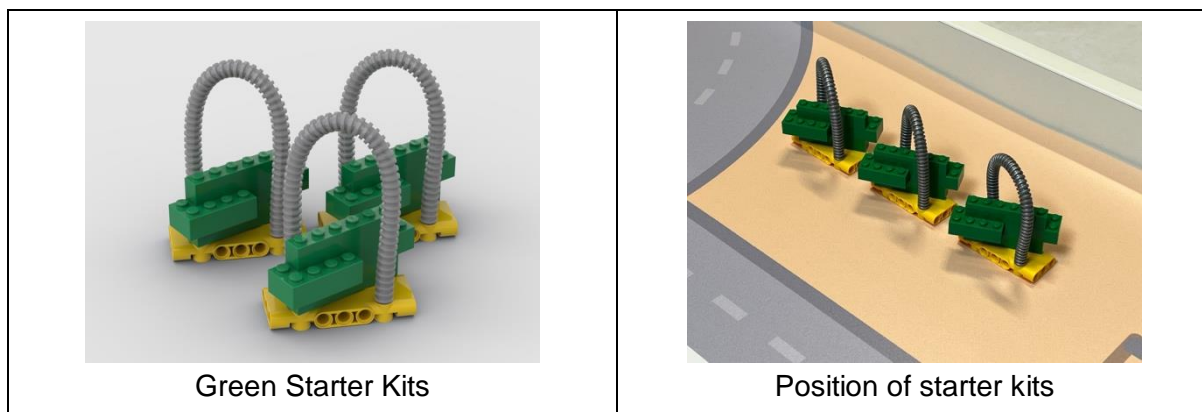
#### Park elements

There are **2 blue lake elements** and **4 green elements (2 trees, 2 flowers)** on the field. All elements are **randomly placed** on the green rectangles that are numbers 1-6 on the bottom of the game field.

 <p style="text-align: center;">Lake elements</p>	 <p style="text-align: center;">Green elements</p>
 <p style="text-align: center;">One possible position of the elements</p>	
	<p>Please note:</p> <p>The green elements are always placed in the front of the green marking on the field (because their base is 4x4) and the lake elements use the full space of the green marking (because their base is 4x6). The lake elements are always oriented so that the yellow beaks of the ducks point towards the centre of the game field. The flowers are oriented parallel to the border, with the higher leaf of the flowers pointing towards the start area</p>

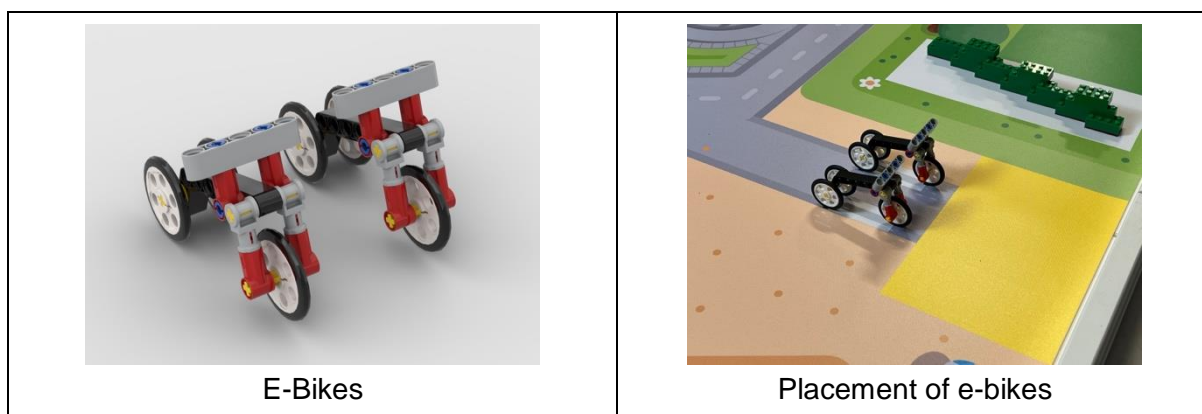
### Green Starter Kits

There are **3 green starter kits** that are always placed on the yellow rectangles on the left side of the game field.



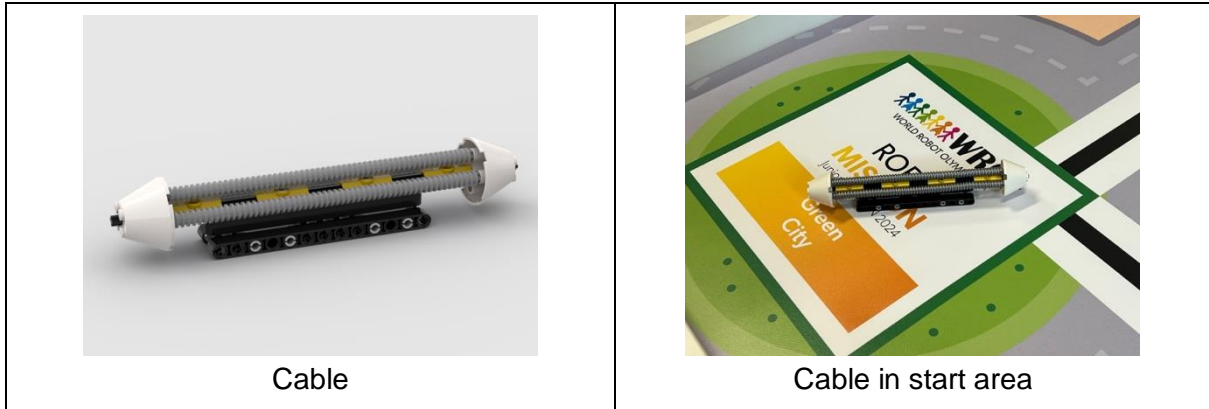
### Electric Bikes (E-Bikes)

There are **2 e-bikes** on the field that are placed in front of the charging area A on top-left of the game field. There are small black markings that fit the wheels of the e-bike.



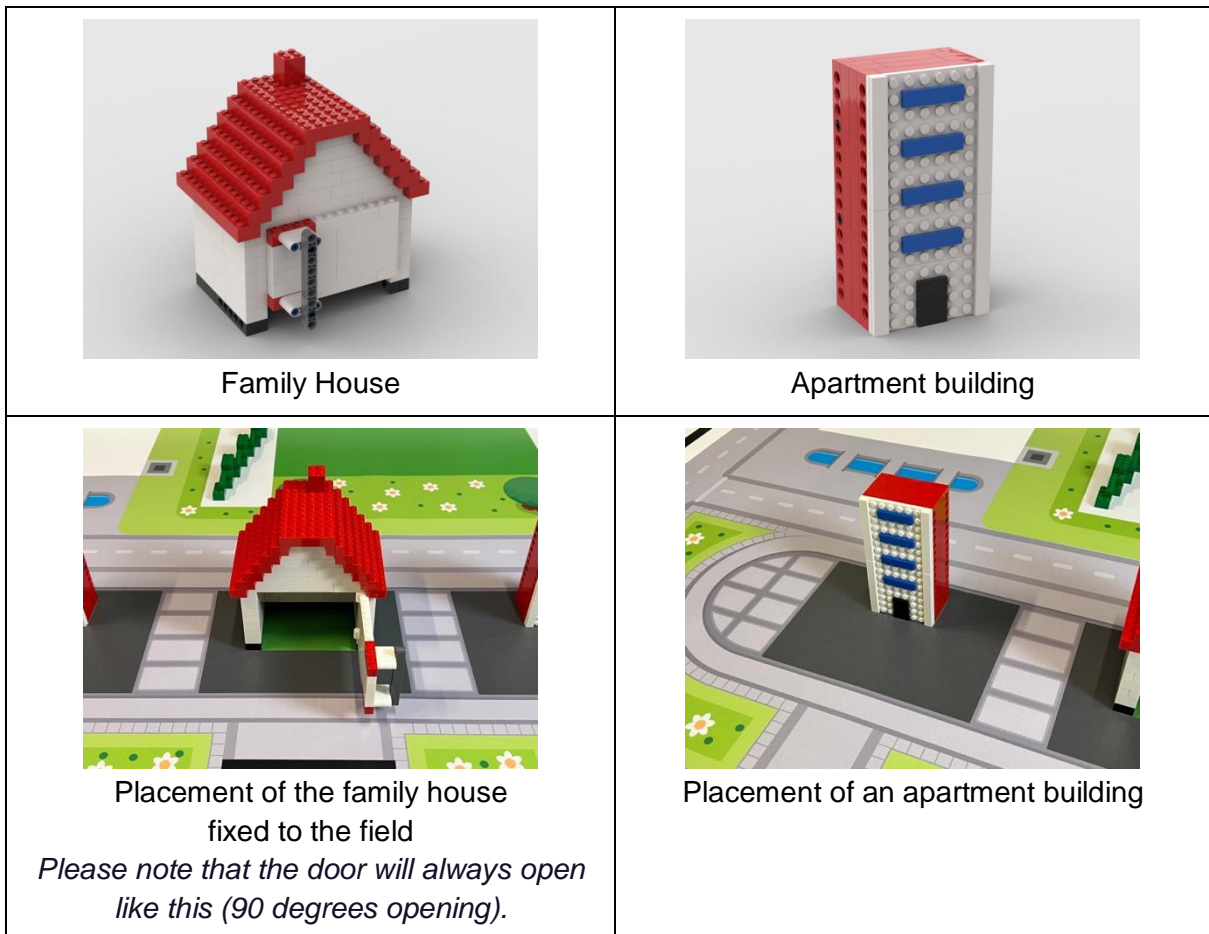
### Cable

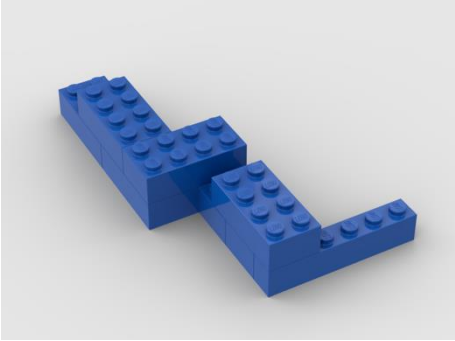
There is **one cable** on the field that is always placed in the start area.



## Houses

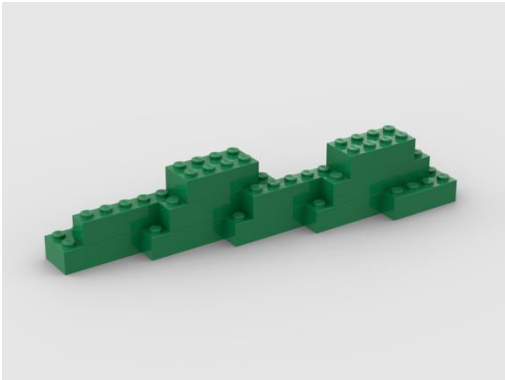



There are **3 houses**, two apartment buildings and one family house. They are placed on the positions in the house areas in the middle of the game field. The family house in the middle will be fixed to the game mat. In addition, there is a little scoring helper object that is only used to score if the door of the family house is closed or not. It will not be on the field and may only be used by the judges.



 <p>Scoring helper: This object only helps to score if a door is closed or not. It will not be on the field and may be used by the judges.</p>	
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## Fence

There are **3 fences** that are placed around the two park areas. They are always placed on the same positions on the game field and are not allowed to be moved or damaged.

 <p style="text-align: center;">Fence</p>	 <p>Short fence next to park area B, all fences are always placed that the lower part of the fence is at the front of the park area.</p>
 <p style="text-align: center;">Fences next to park area A</p>	



	<p><b>WRONG placement</b> of the fence with the higher part to the front</p>
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## 4. Robot Missions







### 4.1 Create new green areas

The robot should help to create new green areas in the city. Two new parks (park A and park B) should be created. It is the task of the robot to bring:

- One lake element to each park
- Two green elements to each park (flower or tree element, does not matter which)

The following table shows the scoring of this task and the photos show scoring situations apply for both the lake and green elements. Please note the following aspects for this task:

- Maximum one lake element and two green elements count per park area (no matter if touching or completely in). Points for are only awarded if the elements still stand upright.
- Definition “completely in”: Completely means that the game object is touching the corresponding area only.

	Each	Max.
Lake or green element partly in a green park area	4	
Lake or green element completely in a green park area	8	48
		
4 points (partly in)		
		
8 points (completely in)		
		
4 points (partly in)		
		
0 points (element not standing anymore)		
		
24 points (3x8 for completely in the area)		
		
24 points (only one lake and two green elements count)		

 <p>16 points (max. one lake element per area counts)</p>	 <p>24 points (two green and one lake element, all good)</p>	 <p>24 points (two green and one lake element count and the ones with higher points)</p>
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## 4.2 Greening houses







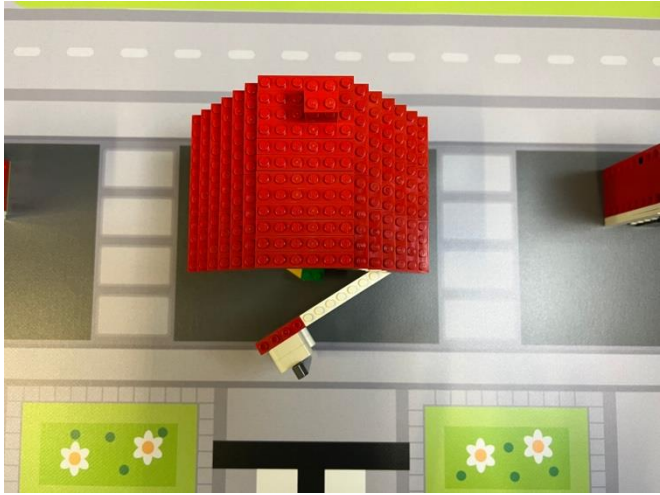
The city government has decided that house owners can apply for green starter sets to create their own (roof top) garden. It is the task of the robot to bring:

- One green starter set to each apartment house.
- Additional points for a green starter set inside the family house.

The following table shows the scoring of this task and the photos show scoring situations. Please note for this task:

- Maximum one starter set per area counts.
- A starter set is considered inside the house if it is behind the door and the door is closed. The door is considered closed if the door (including the grey door handle) is above the grey area in top-view.
- Definition “completely in”: Completely means that the game object is touching the corresponding area only.

	Each	Max.
Green starter set partly in grey area of a house	4	
Green starter set completely in a grey area of a house <i>(the green area inside the middle house belongs to the grey area)</i>	8	24
Additionally: Green starter set is inside the house and door closed		8

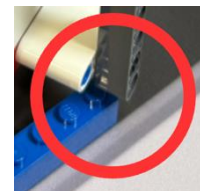
 <p>4 points (partly in)</p>	 <p>8 points (completely in)</p>	 <p>4 points (only touching)</p>
 <p>8 points (max. one per area counts and the one with higher points, the one that is completely in)</p>	 <p>8 points (completely in the area, not inside the house because the door is not closed)</p>	 <p>16 points (completely in the area (8 points) and inside the house (8 points), see below for scoring of “door closed”)</p>
 <p>8 points, element is completely in grey area but the door is <u>not closed</u> because it is in top-view outside of the grey area.</p>		



16 points (element is behind the door and the door is closed because it is in top-view inside of the grey area, all parts need to be inside (including the grey door handle).



Scoring with scoring helper: Door handle is above the blue object → door closed.



Scoring with scoring helper: Door handle is not above blue object → door not closed.




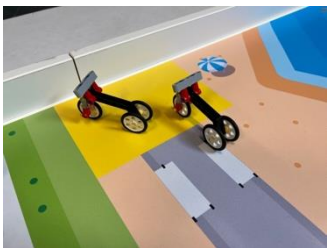
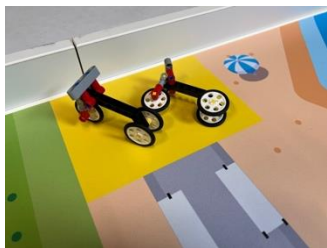

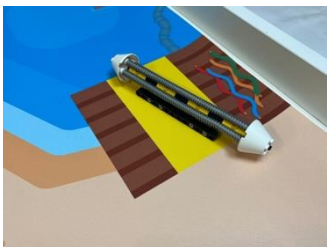
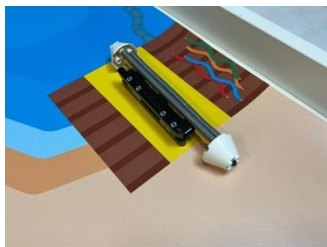
### 4.3 Electrical charging and connection

In the city, more renewable energy is used for transport and general electricity. It is the task of the robot to help by:

- Bringing the electrical bikes to the charging area A. For that, the e-bikes need to be pushed into the charging area A.
- Bringing the cable to the charging area B.

The following table shows the scoring of this task and the photos scoring situations. Please note that “completely” means that the game object is only touching the corresponding area.

	Each	Max.
E-Bike is completely inside the charging area A	7	14
Cable is touching the charging area B	5	
Cable is completely in the charging area B		11

 <p>0 points (no bike completely inside the area)</p>	 <p>7 points (one bike completely inside the area)</p>	 <p>14 points (both bikes inside, lying is OK).</p>
 <p>5 points (touching)</p>	 <p>11 points (completely in, only touching the area)</p>	 <p>5 points (because the cable is lying on the side and then the white part is touching outside of the area)</p>

### 4.4 Bonus for fences & Apartment houses

It is not allowed to move (outside of light or dark grey areas) or damage the fences and houses.

If those objects are not damaged and moved, you will always get bonus points.

The following table shows the scoring of this task and the photos show scoring situations that apply for both the fences and the houses. Please note for this task:

- Definition “damaged”: Any situation that means that the game object is not exactly like at the start of the run, e.g. a brick fell off.
- Definition “moved”: The game object is considered as moved if a part of the game object is touching the mat outside of the grey area (light grey area for the fences, dark grey area for the houses).

	Each	Max.
Apartment house is not damaged or moved	3	6
Fence is not damaged or moved	3	9





## 5. Scoring Sheet

Team name: \_\_\_\_\_

Round: \_\_\_\_\_

Tasks	Each	Max.	#	Total
<b>Create new green areas</b> <i>Maximum one lake element and two green elements count per park area. Objects must stand upright.</i>				
Lake or green element partly in a green park area	4			
Lake or green element completely in a green park area	8	48		
<b>Greening houses</b> <i>Maximum one green starter set per area counts. Door is considered closed if it is in top-view inside the grey area.</i>				
Green starter set partly in grey area of a house	4			
Green starter set completely in a grey area of a house <i>(the green area inside the middle house belongs to the grey area)</i>	8	24		
Additionally: Green starter set is inside the house and door closed		8		
<b>Electrical charging and connection</b>				
E-Bike is completely inside the charging area A	7	14		
Cable is touching the charging area B	5			
Cable is completely the charging area B		11		
<b>Bonus for Fences &amp; Apartment houses</b>				
Apartment house is not damaged or moved	3	6		
Fence is not damaged or moved	3	9		
<b>Maximum Score</b>		120		
<b>Surprise Rule</b>				
<b>Total Score in this run</b>				
<b>Time in full seconds</b>				