



VR Presentation Save Gotham!

Done By: Team One

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Objectives

Raise Awareness

About the importance of recycling



Cultivate

Proper and correct recycling habits



Educate

Users on different recycling procedures

Aligned with Singapore's goal of achieving **30%** domestic recycling rate by 2030

“That's what games are, in the end. Teachers. Fun is just another word for learning”

—Author: Raph Koster





Theme

**RECYCLING TO
COMBAT CLIMATE
CHANGE!**

Theme - Recycling



According to 2020's national recycling data from NEA, the domestic recycling rate stands at **13 per cent** - a 10-year low (NEA, 2021)



3 in 5 Singaporean households recycle (NEA, 2021)

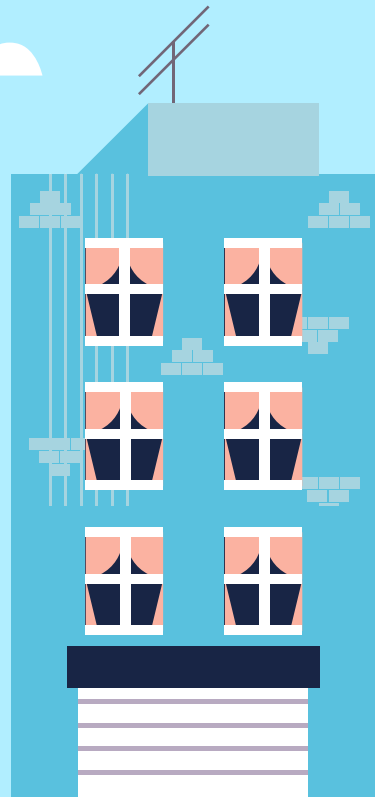


40% of all items placed in the recycling bins cannot be repurposed due to food and waste leakage or are simply non-recyclable





Saving Gotham!



How to Play

Navigate around the city
using the controllers

Detailed controls
provided in-game



1. Use the left thumbstick to navigate your surroundings
2. Use the right thumbstick to change your camera angle
3. Pick up objects using the grips on the controller





How to Play

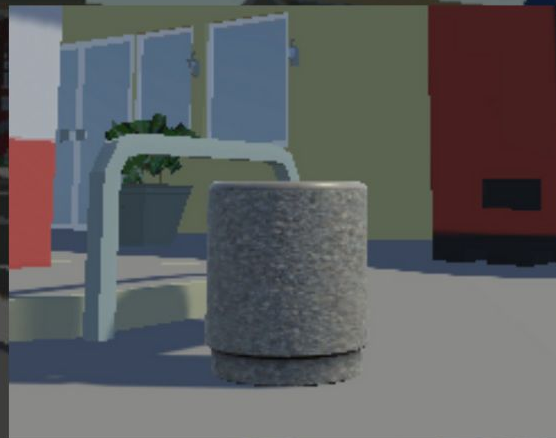
There will be 3 types of recycling bins: Plastic, Metal and Paper

Take the trash to the right bin and throw it in.

PLANTING FLOWERS



pick up a flower from the ground



Head towards an empty pot

PLANTING FLOWERS



A green indicator will appear when you are close enough to a pot to plant the flower

PLANTING FLOWERS



Tada!

Scoring System

Starts with **0 points** and given a time limit of **5 mins**

- **Gain 10 points** for every trash disposed **correctly**
- **Gain 20 points** for every **flower planted**
- **Lose 10 points** for every trash disposed **incorrectly**

Game ends when the **time limit is up**

Player wins by accumulating **200 points** before the time limit is up



Innovation & Creativity



01

**Rain, Smoke &
Lighting
reflects
Environment
Change**



02

**Interactable
Objects
(Plastic,
Paper &
Metal)**



03

**Planting to
beautify city**



04

**Open Closed
Principle &
Liskov
Substitution
Principle**

Innovation & Creativity



05

**Leaderboard
encourages
social aspect of
the game**



06

Easter eggs

Environment Change

1st Stage Points: Low

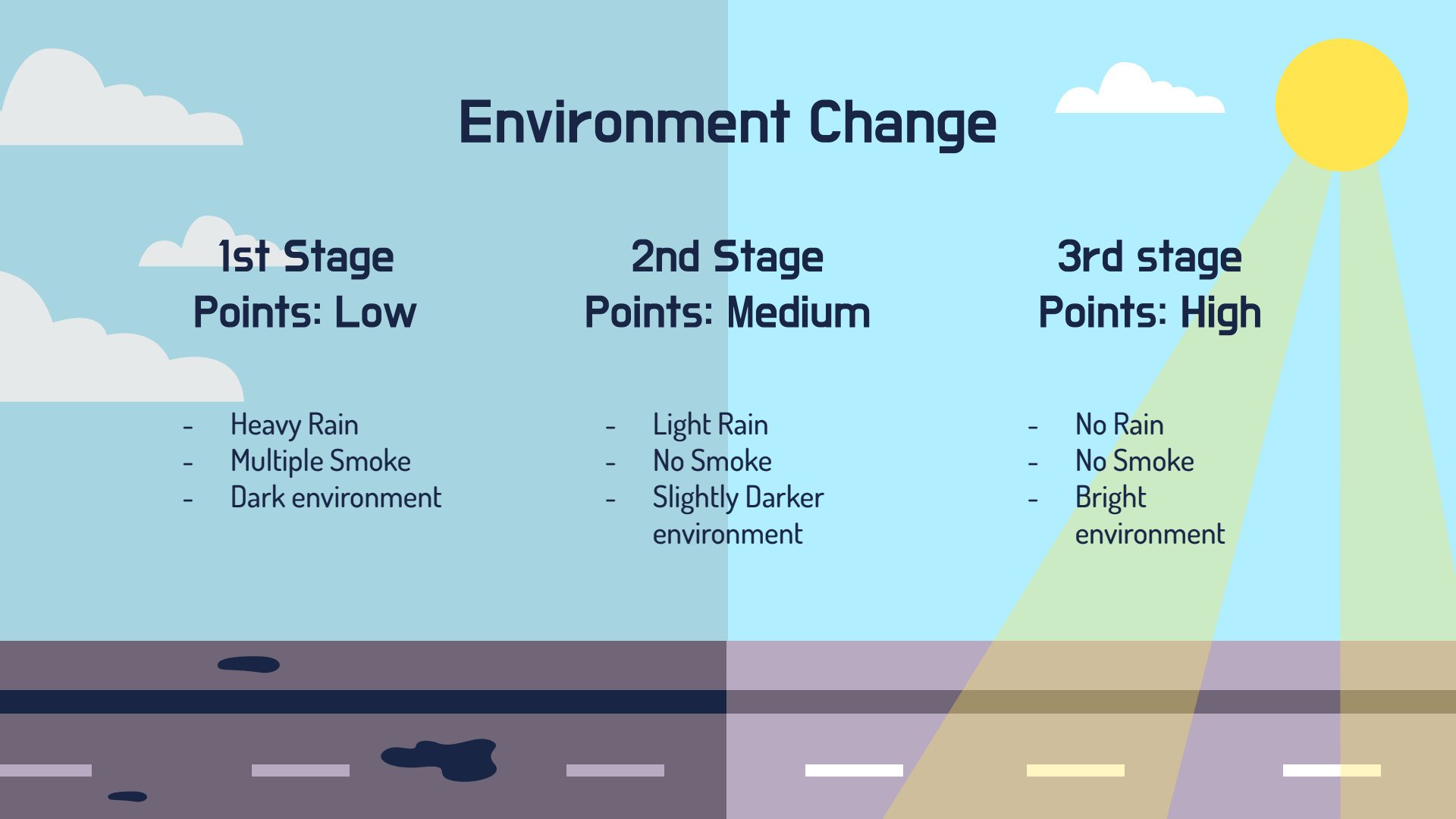
- Heavy Rain
- Multiple Smoke
- Dark environment

2nd Stage Points: Medium

- Light Rain
- No Smoke
- Slightly Darker environment

3rd stage Points: High

- No Rain
- No Smoke
- Bright environment



Rain Implementation

Rainfall Particle System

- Made to follow vr camera
- Render mode set to stretched billboard (**Long cylindrical rain particles**)
- Collision set and applied every layer (**Realistic**)

RainMist Particle System

- Similar to rainfall particle system but particles is much smaller to simulate the mist effect



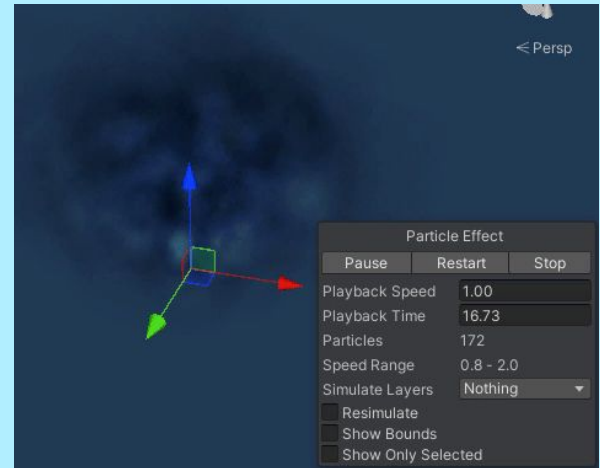
Smoke & Lighting Implementation

Smoke Particle System

- Particles emitted from a hemisphere (**Outward emission**)
- Color over lifetime is set such that particles start off grey and fades in opacity over time

Lighting

- Implemented with a grey UI canvas in front of player
- Lighting intensity set by adjusting alpha values of UI canvas



Interactive Objects (Recyclables)

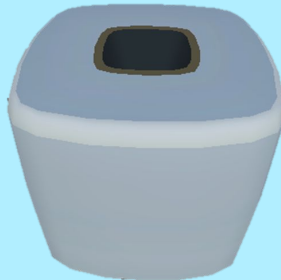
Plastic

- Specular Workflow
- Smoothness: 0.5



Paper

- Metallic Workflow
- Metallic: 0
- Smoothness: 0



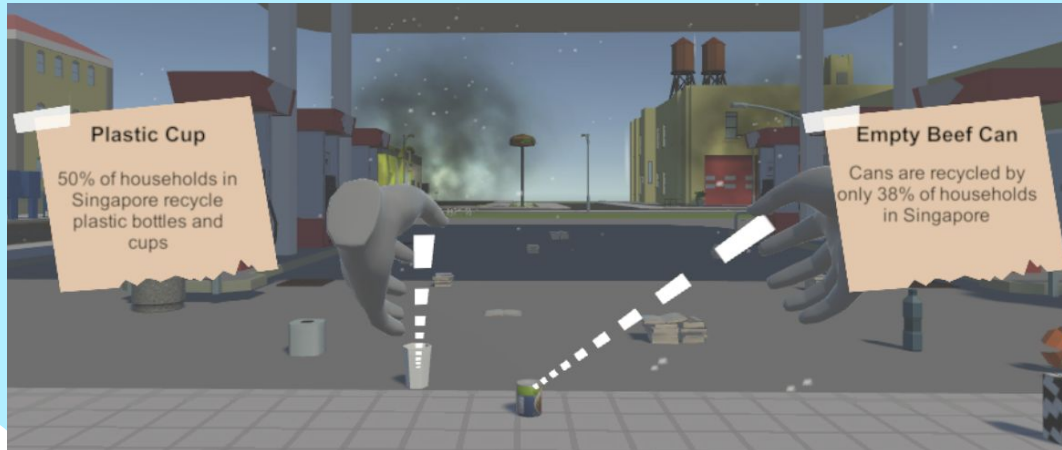
Metal

- Metallic Workflow
- Metallic: 0.5
- Smoothness: 0.5



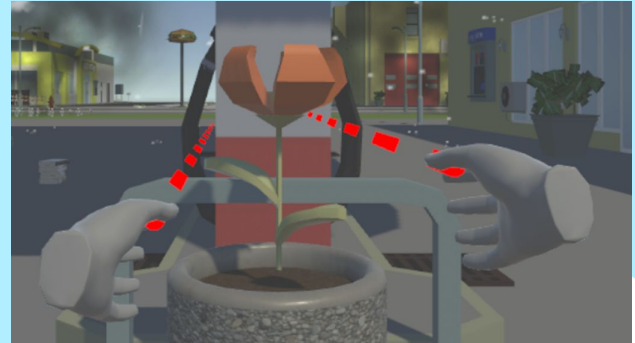
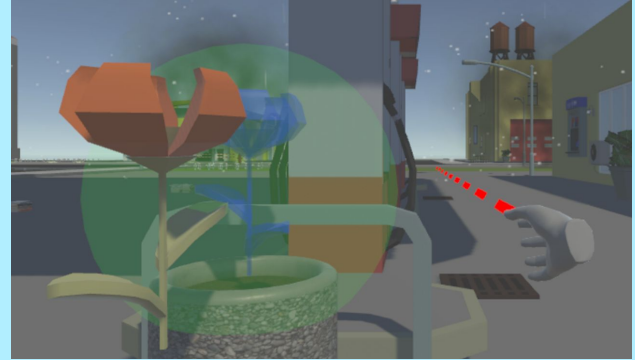
Interactable Objects (Tooltip)

- On hover, a tooltip is shown to player
- Tooltip consists of
 - Object's name
 - Object's information/trivia



Planting flowers

- **More variations to the gameplay**
 - Flowers scattered around the city can be brought to an empty pot to plant
 - Interactive planting



Open Closed Principle & Liskov Substitution Principle

```
public class RecycleBinController : MonoBehaviour
{
    public GameObject gameplayCanvas;

    @ Unity Message | 0 references
    private void OnTriggerEnter(Collider other)
    {
        InteractableObject interactableObject = other.GetComponent<InteractableObject>();
        interactableObject.AddPoints(this.tag);
    }
}
```

```
public abstract class InteractableObject : MonoBehaviour
{
    public PointsController pointsController;
    4 references
    public abstract void AddPoints(string tag);
}
```

```
public class Plastic : InteractableObject
{
    private int pointsToAdd = 5;
    private int pointsToDeduct = 10;

    private const string plasticText = "Plastic";

    4 references
    public override void AddPoints(string tag)
    {
        if (tag == plasticText)
            pointsController.addPoints(pointsToAdd);
        else
            pointsController.addPoints(-1 * pointsToDeduct);
        Destroy(this.gameObject);
    }
}
```

```
public class Paper : InteractableObject
{
    private int pointsToAdd = 5;
    private int pointsToDeduct = 10;

    private const string paperText = "Paper";

    4 references
    public override void AddPoints(string tag)
    {
        if (tag == paperText)
            pointsController.addPoints(pointsToAdd);
        else
            pointsController.addPoints(-1 * pointsToDeduct);
        Destroy(this.gameObject);
    }
}
```

- Here, we create Plastic and Paper classes which extend from the abstract class InteractableObject
- In the OnTriggerEnter() method inside RecycleBinController class, we are able to replace the derived classes mentioned above with the base class it extends from
- The InteractableObject class is closed for modification but open for extension

Leaderboard

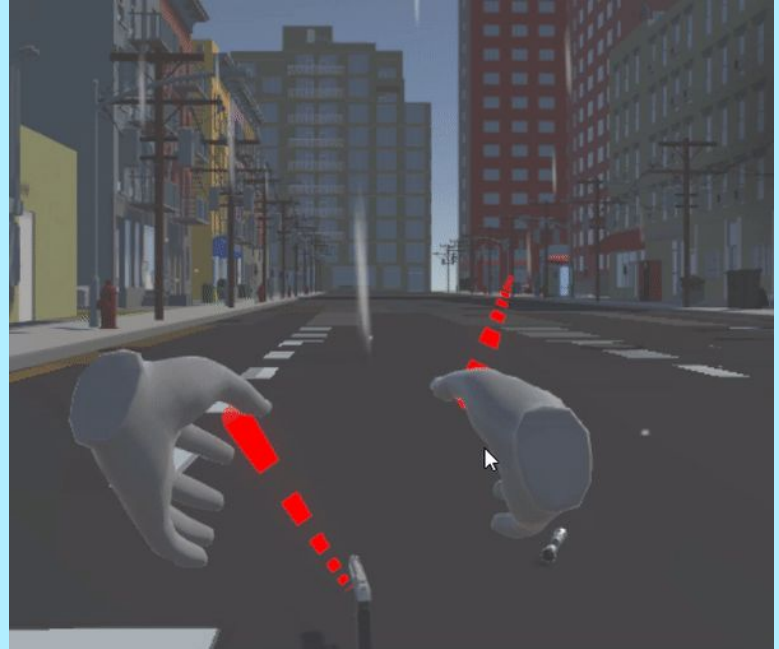
- **Encourages social aspect of the game**
 - Encourages collaborative learning, thus increasing levels of motivation
- **Competitive Spirit**
 - Make learning a fun experience
 - Compete against friends



	Ranking	Name	Score
	#1	Fadzli	300
	#2	Ben	289
	#3	Ernest	254

Easter Eggs

- Many interesting characters visited Gotham before, will you discover the clues left behind by them?



Contribution (Fazli, Ernest, Luo Hao)

- Front-end Development
 - Environment (Ernest)
 - UI Design & Implementation (Luo Hao)
 - VR Setup & Gameplay Mechanics (Fazli)
- Back-end Development
 - Firebase Database for Leaderboard (Ernest)
- Debug
 - QA Testing (Luo Hao)

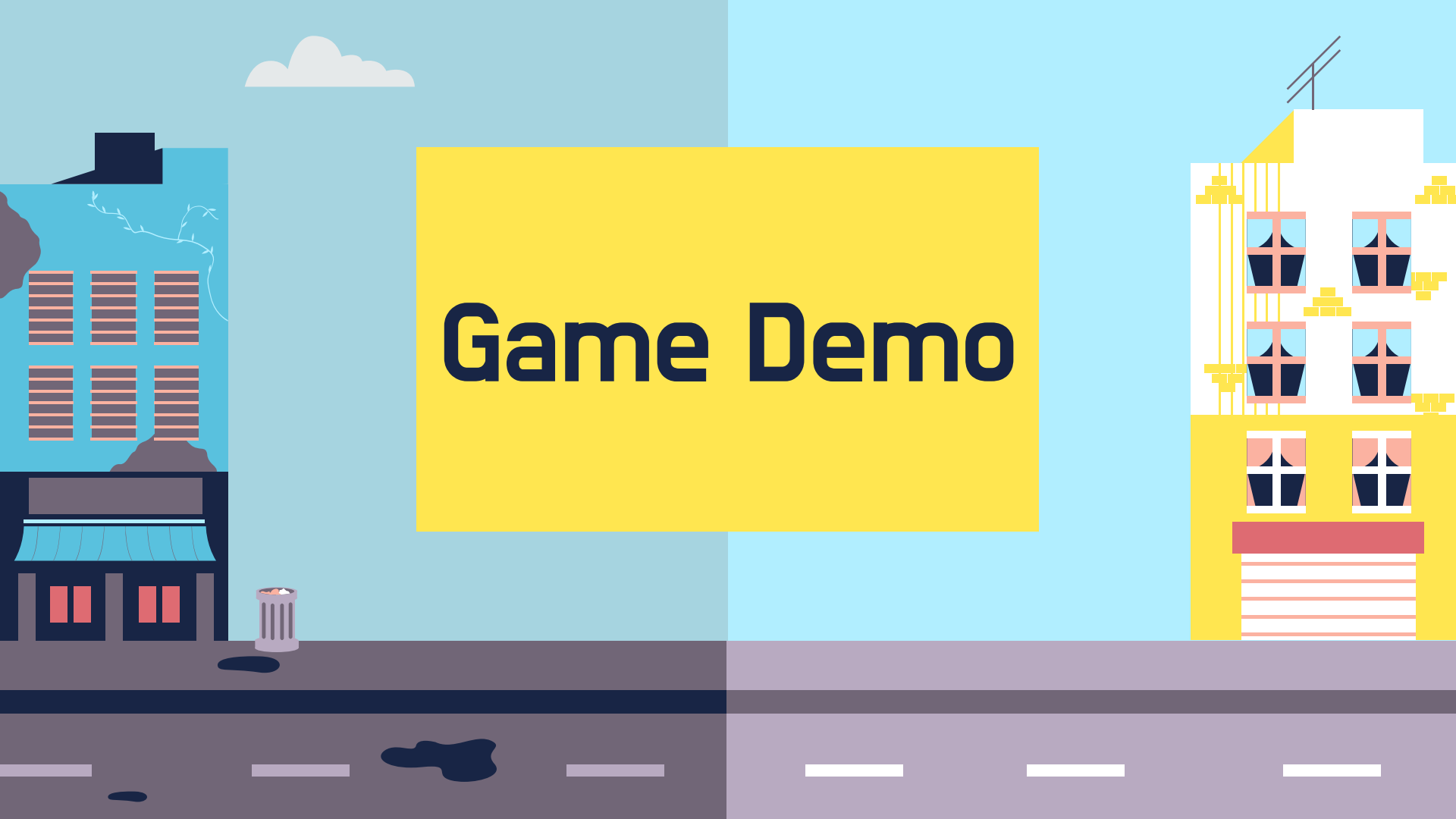
Contribution (Wanru, Rachel)

- Storyboarding
 - Game-flow
 - Storyline
- Presentation slides
 - Features of game
- Report
 - Documentation of methodologies used
- Video editing and flow
 - Trailer

Upcoming Plans

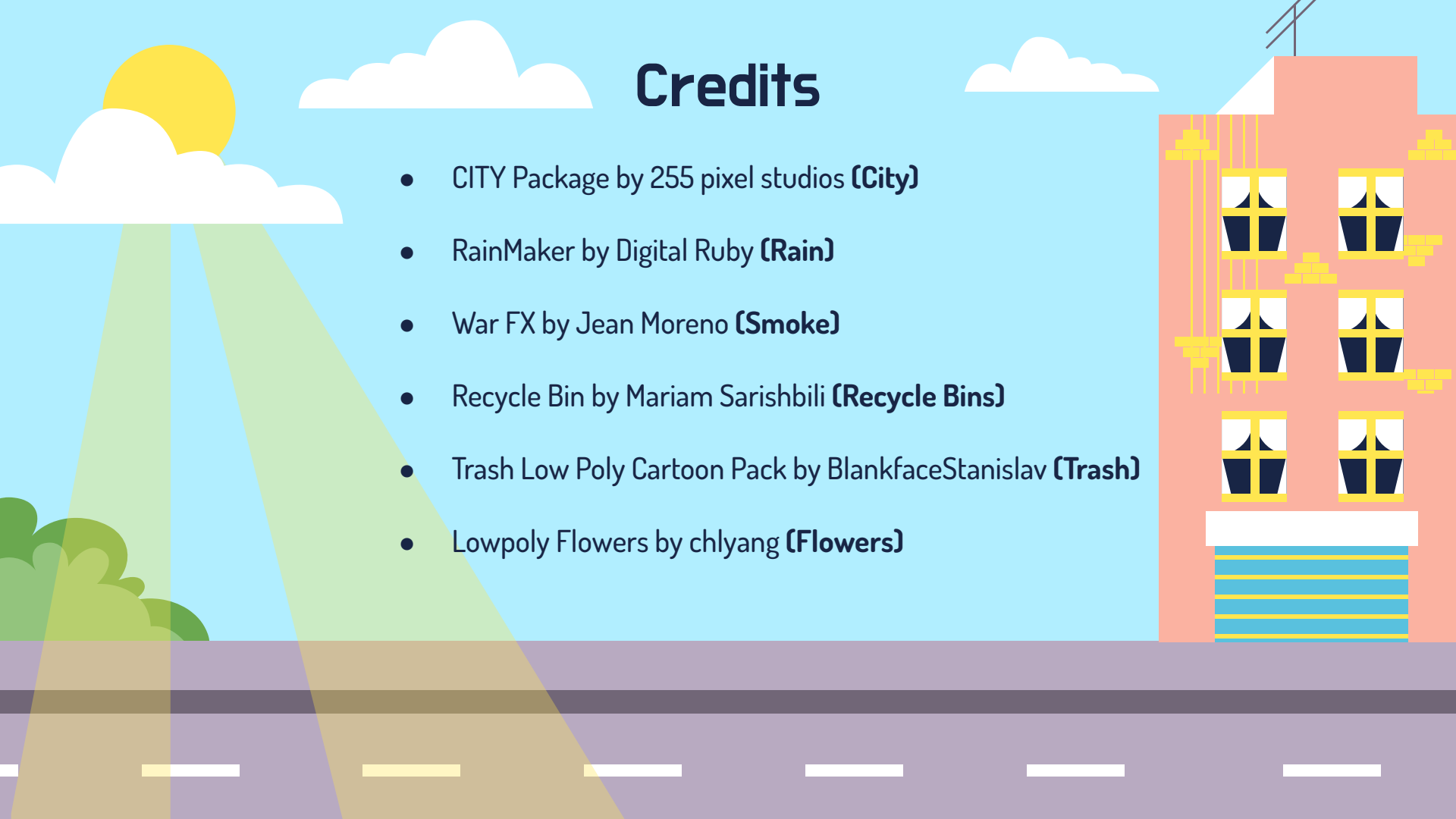
- Expandable
 - Large map
 - Metaverse is the future
- Multiplayer/Coop
- Public transport
 - Transition between different maps as we expand the game

Game Demo



Credits

- CITY Package by 255 pixel studios **(City)**
- RainMaker by Digital Ruby **(Rain)**
- War FX by Jean Moreno **(Smoke)**
- Recycle Bin by Mariam Sarishbili **(Recycle Bins)**
- Trash Low Poly Cartoon Pack by BlankfaceStanislav **(Trash)**
- Lowpoly Flowers by chlyang **(Flowers)**





References

- Andres, G. (2021, April 23). Less waste generated in Singapore in 2020, recycling rates drop due to impact of covid-19. CNA. Retrieved February 22, 2022, from <https://www.channelnewsasia.com/singapore/less-waste-generated-singapore-recycling-rates-drop-239601>



Thank you!