
Everything Old Can Be Made New Again
Circular Economy - Rails to Trails - Fashion Sharing - Circular Food Systems

Problem: What are we trying to solve?

A linear economy is where people "make, take, use, dispose" which hurts the environment a lot. Clothes and textiles are thrown out and waste fields make micro fibers that go in air, soil, plants and water. Plastic products get old and break down into tiny pieces that get into air and water, making it a plastic soup.

- Over 300 million tons of plastic are released into the open and produced worldwide each year.
- 5 million tons of it ends up in oceans, the rest is dumped on land, sea, or in sewer lines.
- Plastic causes damage to ecosystems.
- Lack of recycling and reusing items isn't sustainable, such as fashion and food.
- Of all plastic used, 40% is used once. Every year several billion items such as bags, bottles, trays, and food packaging are used. Some people are careless with packaging and leave it as litter.
- 30% of food is wasted or thrown out, 40 million metric tons of food every year. When this food is thrown away we get rid of things we could reuse.

This project gives a sustainable city design where everything old can be made new again.

Bioremediation Research

Rails for Trails. Abandoned railroads turned into walking and biking trails for the community brings many people together. Over 19,000 miles of abandoned rail lines transformed into 1,600 walking and bicycling trails through innovative Rails to Trails programs. Some of the old materials are recycled to build the trails to bring others around for a safe chill area. Other metals are used in projects in the city, so you don't have to mine more materials from nature for construction.

Highways Underpasses become Parks. Isolated underpasses, which are often places for crime, are found directly below highways. Hiro knows that underpasses are “diamonds in the rough, ready to be polished”. The city of Hiro reuses highway underpasses to create community parks. Hiro is connecting neighborhoods and creating valuable green spaces.

Toxic Brownfields into New Developments. Hiro is redesigning other forms of infrastructure too. Designing around their transportation systems. Transforming old water infrastructure, turning polluted waterways and toxic brownfields into new developments that create new business. These approaches are environmentally sustainable and use existing infrastructure rather than simply pulling down and disposing of old infrastructure.

Circular Food Research

Everyone needs to start making smart food choices, conserve energy, try to use eco-friendly products, recycle to lower waste, start composting, environmentally friendly packaging, and conservation practices.

Composting Fields

Separate sections of landfills are for breaking down and throwing away food for compost. Compost is used many times to grow plants. Compost is a material that can be added to soil to help plants grow. Food scraps and yard waste, together currently make up more than 30% of what we throw away, and could be added into compost instead. Making compost keeps these materials out of landfills where they take up space and release a greenhouse gas.

Rather than bending nature to produce food, food can be designed for nature to thrive.

- Businesses can use a bigger range of ingredients in products.
- For example, sweetness comes from sugar cane, sugar beet, or corn, but it can also come from date palms, carob, and coconut.
- Planting a variety of crops can make food supplies more resistant to disease or shocks.

Spirulina is an algae and one of the richest protein sources available.

- Spirulina produces 20X more protein per acre than other crops like corn or soybeans while using 10X less water to produce it.
- Compact bioreactors are used to grow fresh spirulina more efficiently and sustainably.

Fashion Share & Reconstruction

Circular Fashion Share and Swap

The sharing economy is a part of the fashion industry that includes rental services, swapping, and subscription models. Polyester is one of the most commonly used plastics in textiles/clothes. Hiro reuses old clothes to reduce the chances of a dirty environment.

- Clothing Donations: Sell their clothes to people in need or families.
- Fashion Swap: an app and service that keeps clothes in use and doesn't just add them to the landfill.

Sustainable Reconstruction - Everything Old Can Be Made New Again

The City of Hiro uses pieces of building waste to make or build new parks and buildings. For new parks, we can use steel and wood to build what is needed in that park such as swings and playgrounds. This is a way to bring the community and everyone all together, parks and buildings for people to go to and have fun.

1) Use building demolition materials to create new cities and parks.
2) New Structures; Recycling Centers, Housing, Chuck E Cheese, dog parks.
3) Create new jobs for many ages by taking old buildings or materials, and making new ones.

Technology & Energy in a Circular Economy

Design and Plan for a Circular Economy

- Cradle 2 Cradle is the design and production of materials and products that can truly be recycled, that breakdown and go back to nature, or the landfill at the end of their life.
    - Example: Building a park from building demolition waste.

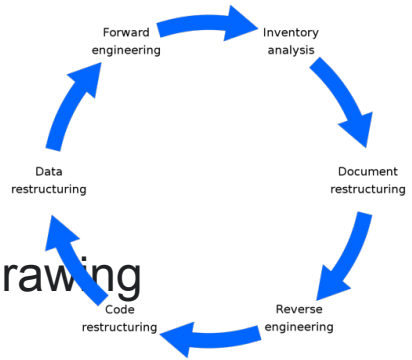
- Digital Technology, Waste + Information = Resource
    - Digital watermark, QR code, or DNA Markers help track movement of materials and products so they can match buyers.
    - Information from materials and products that is tracked.

Wave Energy on Lake Ontario

Hiro uses wave energy, which is energy that is produced by water and by buoys. It is produced by wave energy because Hiro is located along Lake Ontario. The wave energy is healthy for the community because it is green energy.

Investigation Procedure - Engineering Design Process

- Define the problem: waste free city with a circular economy. Keep materials in use and keep a green environment
- Conduct research as a team of 3.
- Brainstorm and conceptualize solutions to the problem.
- Write a research essay.
- Use the essay to create prototypes: a virtual city, a city drawing and 3d city model.
- Write a final project reflection in our team project plan.
- Present our project to be evaluated.
- Think about how we could improve our design for the future.



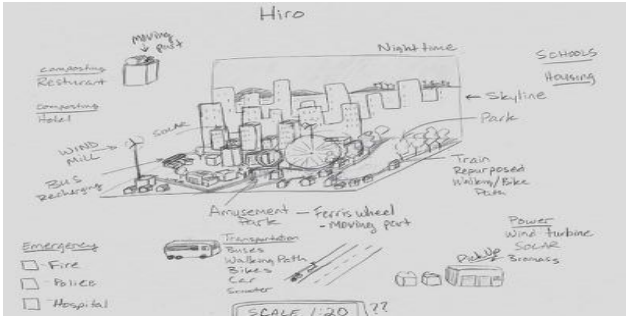
Prototypes

Prototype 1: Virtual City

We started off with a virtual city using a computer and thinking about the problems in a city. Our goal was helping the city with their problems and solutions and creating a well done city.

Prototype 2: 2D city drawing

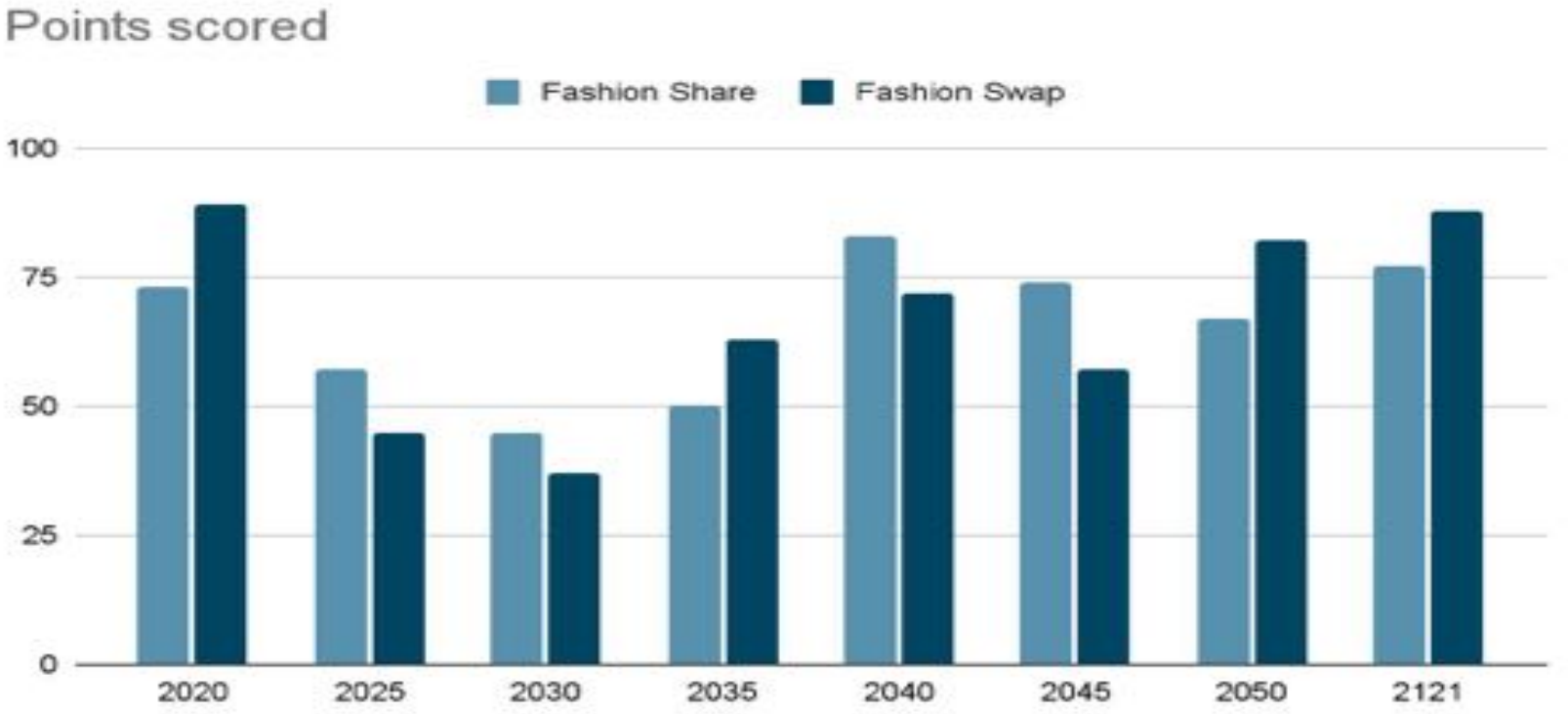
We created a drawing of our city and thinking about how we could create a green city and thinking about problems we may have in the future, present and problem solving and,making a healthy green city.



Prototype 3: 3d model

We created a 3D design of our city using the engineering design process.

Results and Data



Results and Data

Discussion and Interpretation - Results

This project gives a sustainable city design where everything old can be made new again.

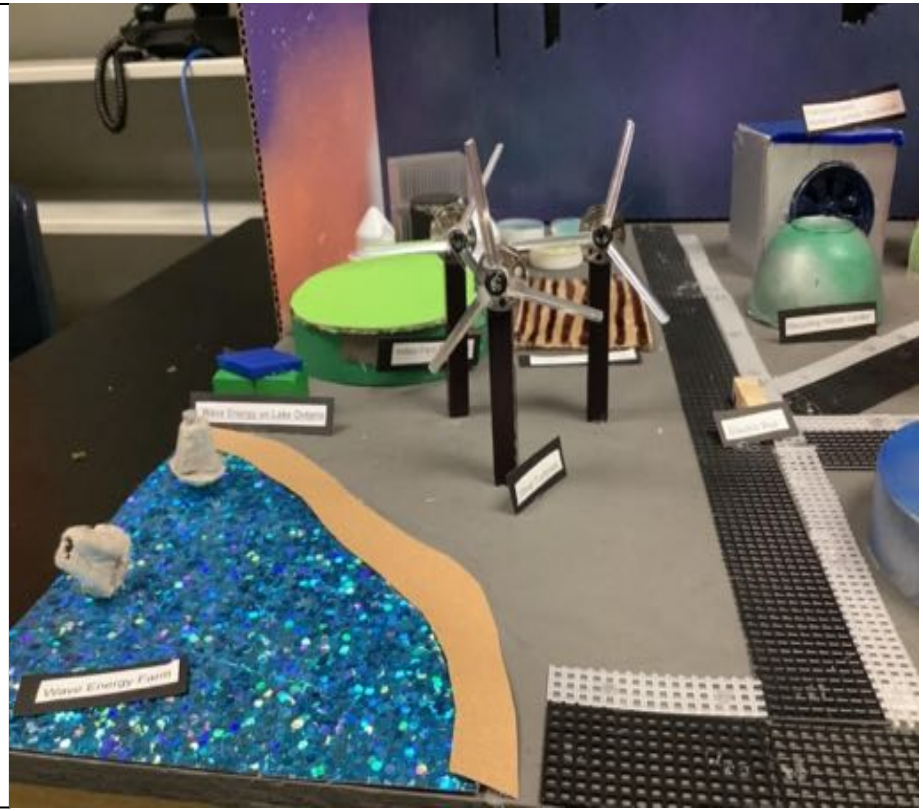
- With technology and the fashion swap app, more people can trade clothes and express themselves. People share clothes and find a new style.
- People come to Hiro to see the Rails to Trails park and see how we recycle, reuse, and repurpose all materials into a park. Rails for trails connects cities by trails. We designed a community park for people to hang, chill around in, and meet new people. This helps the city be more green and have cleaner air. Helping everyone get a chance to go outdoors, bike, and walk. Abandoned railroads for trains are turned into walking and biking trails for the community brings many people together across Hiro and Canada.
- Our circular food systems and composting fields show how our community is becoming a healthier community for residents to live in and regenerating nature.

Discussion and Interpretation - Results

Our algae and composting farm is what helps produce the most nutrition in the city.This farm gives us lots of protein because Spirulina is an algae and one of the richest protein sources available.

- Spirulina produces 20X more protein per acre than other crops like corn or soybeans while using 10X less water to produce it.
- Switching from high impact animal proteins to lower impact plant proteins is good for nature.

We use old food for composting and it creates new food creating a cycle!



Implications and ideas for Future Research

This project is important to the real world because this project gives everyone more ideas and gives us thoughts and models for the future. Our project creates a green environment for people to come and enjoy, and see as a model for other cities. With all of the trees in our city, it gives people more oxygen and cleaner environments for people to live in. Having a rails-to-trails park, and bioremediation projects in our city, helps to creates a green, circular economy. Our city design is helping people live a healthy life, bringing flocks of new residents and visitors in the city.

In the future, we can make an app and service that keeps all materials in use and doesn't just add them to the landfill. It’s better to keep reusing old clothes, and old buildings for creating new ones. This also keeps forests together so we don’t need to keep destroying them. Changing from a linear economy to a circular economy has changed people lives for the better, living in our well built and designed city.

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