Scientific Innovations & Technologies in Green Cities

Learning Goals

1. Learn about various implementations in environmentally conscious cities and what environmental issues they address.

1. Discuss limitations of implementations in specific areas and consider how efficiency will vary across regions.

Wind Turbines

Benefits of wind power:

- No carbon emissions
- Renewable
- Can boost job growth in rural areas
- Wind farms produce a lot of energy

Where are they effective?

- Require a lot of space
  - Tops of hills, open plains, coastal areas
  - Rural and remote

New Technology

Flower Turbines in New York City.

Ridge Blade in Kingston.

Benefits:

- Can be installed on existing roofs/flat ground, don't require large open spaces
- Bird friendly

Limitations:

- Don't produce as much energy as wind farms
- Physical obstacles in cities

Solar Panels

Benefits of solar power:

- No carbon emissions
- Renewable
- Solar farms are very effective, can provide for hundreds to thousands of people

Where are they effective?

- Areas with an abundance of sunlight
- Moderate temperatures, low humidity, and light winds
- Abundance of farm land

Rooftop Solar Power

Benefits:

- Can be installed on existing roofs/flat ground, don't require large open spaces
- Increases property value
- Energy independence

Limitations:

- Only power individual buildings
- More expensive than solar farms
- Rooftop must receive a lot of sunlight

Floating Solar Farms

Largest floating solar farm in North America, located in New Jersey

Benefits:

- Can float on water instead of being mounted to ground → doesn't require open spaces
- Water's cooling effect can increase power produced relative to land farms

Limitations:

- Require large unused bodies of water
- Could be harmful to aquatic ecosystems, require regular water monitoring

Hydropower

Benefits of hydropower:

- Renewable/no carbon emissions
- Low cost
- Promote economic growth in developing countries

Cons:

- Disrupt aquatic ecosystems and natural flow of water

Where are they most effective?

- Places with steep rivers, high rainfall, hilly or mountainous sites
- Coastal cities

Pumped Storage Hydropower

Benefits:

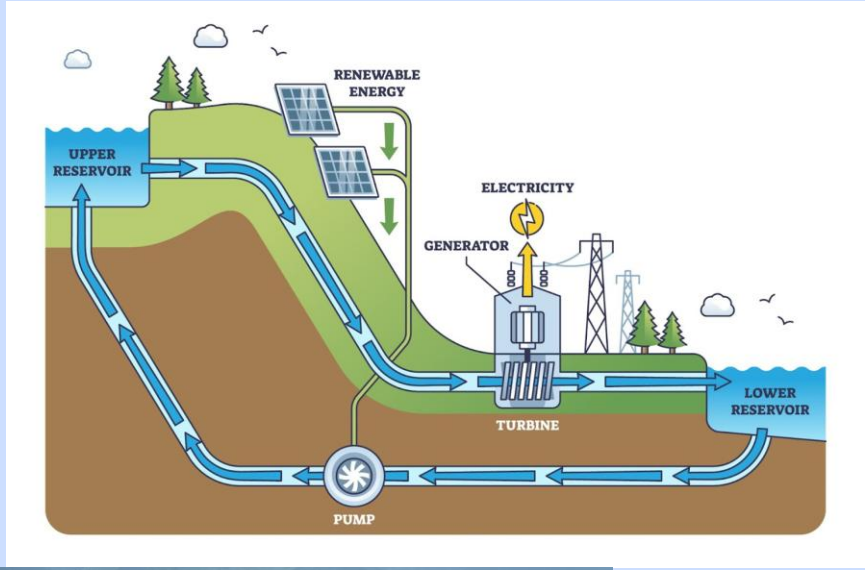
- Reuses water and can respond to changes in demand

Limitations:

- Can be hard to find the right area, needs a low and high reservoir

Where are they effective?

- Areas with lots of streams or bodies of water, in mountainous areas, such as British Columbia.

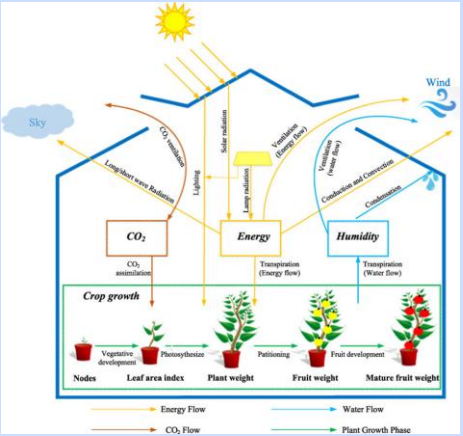


Green Spaces

- Pros: Improves air quality, reduces urban heat island effect, enhances biodiversity
- Cons: Maintenance costs, space constraints in dense cities
- Where are they effective? Urban areas with limited natural greenery, high pollution

Greenhouses

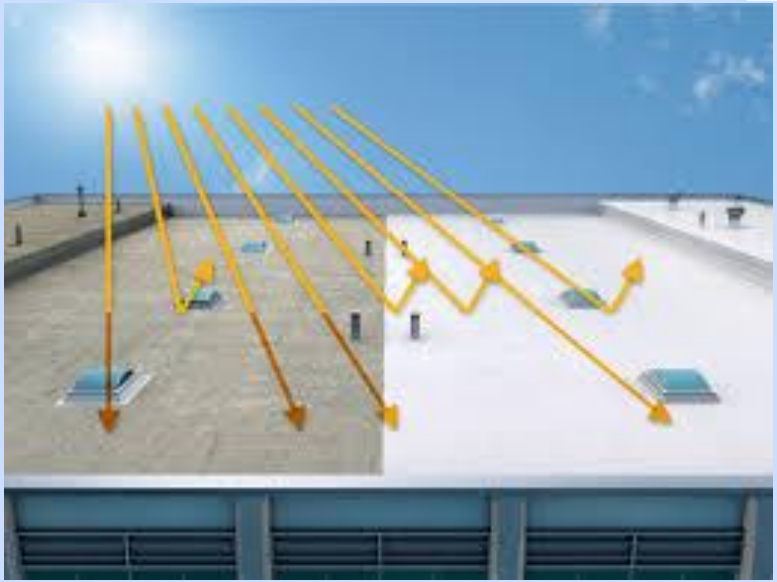
- Pros: Enables year-round farming, efficient in harsh climates, improved yield
- Cons: Energy-intensive (if not optimized), high maintenance
- Where are they effective?
  Cold or harsh climates, limited farmable land



Public Transportation

- Pros: Reduces emissions, traffic congestion, and reliance on fossil fuels
- Cons: High upfront costs, dependency on infrastructure
- Where are they effective?
  High population density, urban sprawl, existing transit networks

Green Architecture



Green Architecture

Benefits

- Reduced carbon footprint through re-using resources.
- Can refurbish older buildings that are not green architecture.
- Can weave plant life into buildings to create forms of insulation.

Negatives:

- Can be costly to refurbish buildings.
- Some areas cannot support plant life weaved into walls of buildings such as severe cold weather climates.

Where are they effective?

- Big cities that are under construction, for example Toronto.

Urban Farming

Urban Farming

Benefits

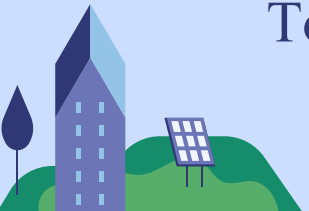
- Can be implemented in any spaces in cities. Such as roof tops, parks, and green centers.
- Can sequester carbon from urban environments lowering greenhouse gas emissions.

Negatives:

- Difficult to do in extreme climates.
- May need more infrastructure in place to complete.

Where are they effective?

- They can be effective in big urban sprawling cities, such as Toronto or London.



How to be Persuasive!

Save our Planet and Future

What Strategies were used?

What persuasive strategies does Quintin use in his speech?

How does he support his argument with facts or examples?

Which parts of his speech did you find most convincing? Why?

What could you learn from his speech to make your own arguments more persuasive?