

Environmental Challenge International (ECi) Student Competition

The Environmental Challenge International (ECi) gives student teams the opportunity to develop solutions to an environmental problem and present their solution to a panel of environmental professionals. We are very interested in hearing about how you interpreted the challenge, the issues you identified, your approach, how you arrived at the conclusions, and how well you can communicate and defend your thoughts and position. We want you to learn and have fun during the entire process!

The ECi is designed to promote the formation of student teams with the broadest feasible range of environmental disciplines including engineering, planning, policy, economics, and various other sciences. Teams must research the problem background, as well as the technical, social, economic, and political aspects of the situation. Teams must stay apprised of ongoing events related to the problem adjusting their solutions appropriately leading up to and during the conference.

Although winning solutions to the proposed problem must have sound engineering and technical bases, the solution does not require a full engineering design presentation. Solutions are expected to provide reasonable resolutions applying basic engineering and scientific knowledge to research scenarios and critical questions. Student teams should start to form following the posting of the problem. Just as corporations and other organizations pull together teams from their staff to address any given project most effectively, so too should each student team begin by identifying and recruiting representatives from appropriate disciplines as needed to address the problem holistically.

Environmental Challenge: Waste Management Solutions in Florida

As Florida continues to experience rapid population growth and urban development, the management of municipal solid waste (MSW) is becoming an increasingly critical issue. Landfills are approaching capacity in many areas, while the generation of waste per capita continues to rise. At the same time, there is an increasing focus on the potential for converting waste into energy and renewable natural gas (RNG) through technologies such as waste-to-energy (WTE) plants and landfill gas (LFG) capture systems. However, significant regulatory hurdles and technological limitations exist, making it necessary for innovative solutions to be explored.

Challenge:

University students will explore the challenges and opportunities related to waste management in Florida, focusing on:

- 1. Regulatory Challenges in Constructing New Landfills:**

Florida's regulations around landfill construction and operation are strict due to concerns over environmental impact, land use, and public health. Students must examine the

challenges posed by these regulations, such as the requirements for environmental impact assessments, community opposition, and the potential for prolonged approval processes. The challenge lies in balancing the need for new landfills with the state's goals for sustainable waste management practices and reduced environmental footprint.

2. **Opportunities for Waste-to-Energy (WTE):**

As traditional landfill options become more constrained, WTE technologies present an opportunity to convert non-recyclable waste into electricity or heat. Students should analyze the potential for expanding WTE facilities in Florida, addressing key considerations such as economic feasibility, the environmental benefits (e.g., reduced landfill use, reduced greenhouse gas emissions), and the social acceptance of such technologies.

3. **Opportunities for Renewable Natural Gas (RNG) from Landfill Gas (LFG):**

Landfill gas is primarily composed of methane, a potent greenhouse gas. However, if captured and processed, this gas can be converted into renewable natural gas (RNG), which can be used for energy production or as a substitute for fossil fuels in various applications. Students must explore the technological, financial, and regulatory barriers to expanding landfill gas capture and RNG production in Florida. Additionally, they should examine how such projects could contribute to the state's renewable energy goals and the reduction of carbon emissions.

Specific Tasks:

The City of Bayside is evaluating alternatives to accommodate the future demand for waste management in the city. Bayside's projected growth and economic development is expected to increase 20% in the next 5 years (2030). The city has a couple of municipal landfills to manage waste disposal; however, these are almost at capacity and cannot accommodate the expected growth. The city is looking at alternatives to expand waste management capacity to be able to accommodate expected growth.

The ECi teams have been hired by the City of Bayside to help them evaluate the available options to provide economic and environmentally feasible waste management options for the city. As consultants, the team should provide the following analyses to the City of Bayside to help them make the best decision:

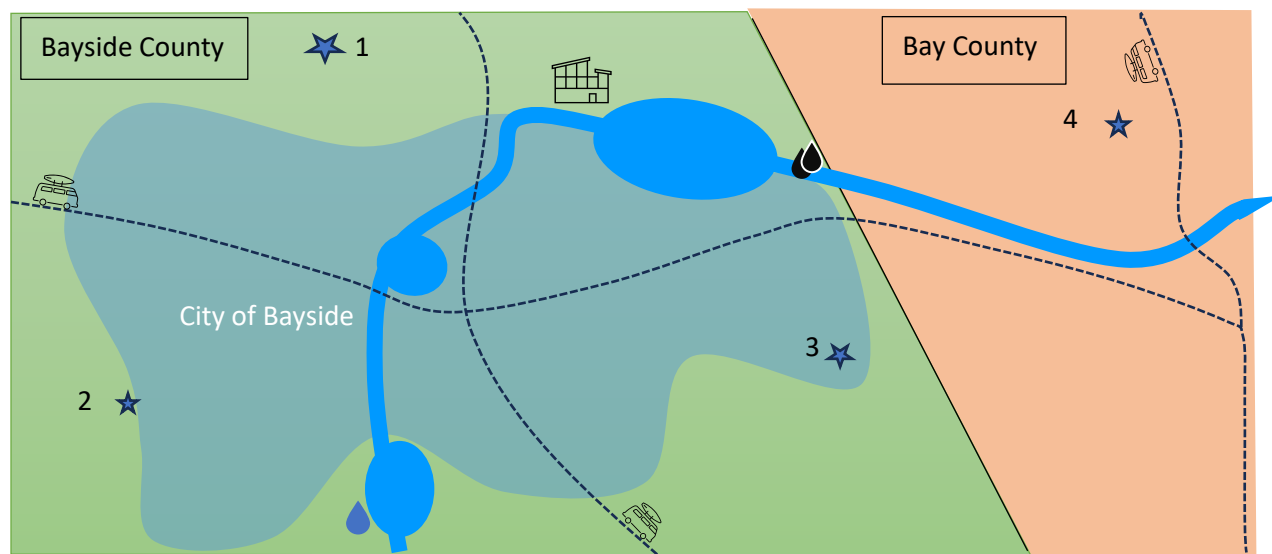
1. **Policy Analysis and Recommendations:**

- Research Florida's current landfill regulations and assess how they impact new landfill developments.
- Propose potential changes or alternative strategies that could facilitate the development of new landfills while mitigating environmental justice laws and their perceived concerns.

2. **Feasibility Study on Waste-to-Energy:**


- Evaluate the current state of WTE technology in Florida and the feasibility of expanding WTE infrastructure.
- Consider the financial, technological, and social factors that influence the adoption of WTE solutions in the state.

- Provide a cost-benefit analysis comparing WTE to traditional landfill methods.
- 3. **Renewable Natural Gas (RNG) from Landfill Gas:**
 - Investigate current landfill gas collection systems in Florida and explore how additional infrastructure could enhance RNG production.
 1. This can include a literature review of the pros/cons of various LFG purification treatment technologies.
 - Analyze the environmental benefits of capturing methane and producing RNG and explore the regulatory framework surrounding such projects in Florida.
 - Provide analysis of federal regulations that incentivize the adoption of RNG production from landfill gas.



★ Municipal Landfills

Population – 210,000

 Unincorporated Bayside County

 Bay County

 Bayside City Limits

 Bay River and lakes and waterways.

 Current Interstates and main roads

 Proposed Construction Site

Highest Elevation – 10 feet above sea level

 Potable Water Treatment Plant

 Wastewater Treatment Plant

Municipal Solid Waste Generation Bayside County

Metric	Landfill 1	Landfill 2	Landfill 3	Landfill 4 (Bay County)
Population Served	111,000	74,600	24,400	55,600
Median Household Income	\$64,800	\$56,784	\$30,234	\$72,325
Projected Median Household Income by 2030	\$80,000	\$120,000	\$50,000	\$72,000
Waste Disposed (tons per Week)	2,500	1,300	120	8,450
Waste Disposed (Tons per Year)	114,000	76,000	6,240	49,400
Per capita waste disposal	5.0	5.3	5.0	4.3
% Residential	48.7%	37.7%	37.7%	66.3%
% Industrial	51.3%	62.3%	62.3%	33.7%
Projected growth by 2030	20%	20%	20%	15.2%
Recycling Contamination Rate	20.4%	35.2%	35.2%	8.9%
Recycling Participation Rate	42.0%	48.9%	48.9%	24.0%
Landfill Capacity	75%	68%	85%	82%

Role-Players That You May Encounter During this Project:

- **Role-Player 1: State Level Politician**
- **Role-Player 2: State/Federal Environmental Agency Representative**
- **Role-Player 3: Environmental Advocacy Group**
- **Role-Player 4: Industry Representative**