



# Turning Waste into Fuel

Azza Faiad  
Egypt

## ☀ Call to Action

**Ride a bike, or walk to school or work; encourage your community to adapt to solar power. If you have to drive, use electric or hybrid cars. Follow Azza on Twitter: @AzzaFaiad**

## ☀ Values

- Innovative
- Determined
- Persistent
- Diligent
- Imaginative
- Environmentalist

## ☀ Lessons Learned

**Look for innovative solutions to the world's pressing problems, like creating fuel from waste!**

**Exploring a passion in one discipline can lend itself to many others.**

**Having one setback doesn't make you a failure.**

**Azza Faiad is an up-and-coming leader in Egypt's renewable energy space.**

In high school she discovered a way to convert plastics into biofuel, while significantly reducing the cost of the manufacturing process with a cheap, abundant catalyst not used before. Her work was supported by the Egyptian Petroleum Research Institute in Cairo, who saw her incredible potential as a scientist and creative thinker. She was awarded the EIRO Forum prize for her work, and was invited to participate in the EU Contest for Young Scientists (EUCYS). She studied engineering at Alexandria University, and is currently a researcher in the Electrical and Control Engineering Department with the Arab Academy for Science, Technology and Maritime Transport.

## ☀ Language Arts

**Design a social media campaign of at least five posts,** using images and words designed to make people more aware of the need to substitute more sustainable sources of fuel than fossil fuels.

What other options would you promote? Why?

**Write a cause-and-effect essay explaining why an increase in the price of oil** causes an increase in everything we consume.

**Write a research essay focusing on which cultural changes need to happen in our society** in order to embrace the changes we need to make in order to build a more sustainable world.

**Azza Faiad is a woman in the engineering field.** Research the situation of women in STEM in the Middle East. Based on this research, what challenges do you think Azza had to overcome in order to become successful in her field? Based on what you know about the U.S., what challenges do you think a woman trying to achieve success would face in the U.S.? What challenges would they

share? Which would be different?

## STEM Activities

**Biofuel feedstocks that contain a lot of water, for example, food waste, cannot be burned; but they can be reused to produce biogas.** Biogas can be burned to produce heat for cooking, warming homes, and producing electricity. Have students evaluate the pros and cons of biogas feedstocks, research the features of a biogas generator, and design a biogas generator using common household materials. If materials are provided for the students to build the generator, this activity can be done in an hour-long session; or it could be a long-term project that students can come back to, to collect the biogas produced. Students can compare the amount of biogas produced by different biofuel feedstocks, or the same feedstock can be used and the effect of different climates can be simulated by placing the generator in different locations (for example, near a window, outside, or in a dark closet).

**Our society's dependence on oil has caused a plethora of problems, including but not limited to the long petrol lines Azza was experiencing when she was inspired to research and develop an innovative alternative source of fuel.** The best way to reduce pollution from oil is to simply stop using it in the first place. Research alternative energy sources at Project Drawdown (<https://www.drawdown.org/sectors/electricity><sup>4</sup>) and list three that you think could directly replace oil in specific contexts.

**Azza talks about minimizing the “carbon footprint” of many industries, but corporations aren't the only ones with carbon footprints (though theirs is the largest and most harmful).** Find out what the carbon footprint for your household is, using the U.S. Environmental Protection Agency's Carbon Footprint Calculator: <https://www3.epa.gov/carbon-footprint-calculator/><sup>2</sup>. What is the main activity through which you are adding to your house's carbon footprint? How do you think you could help to reduce this number?

## Sustainability Innovations

**Throughout Azza's life, she has targeted many different problems of sustainability.** Here is a list of organizations and entities that have made it their mission to find biofuel alternatives, and reduce their carbon footprint.

- **Brightmark** - This company focuses on converting not easily recyclable plastic waste into wax and eco-friendly fuels. <https://www.brightmark.com><sup>3</sup>

**Countries across the world are making efforts to reduce emissions and find alternatives to our current emission issues.**

- Paris, Mexico City, Madrid, and Athens have implemented a ban of diesel vehicles by 2025.
- The City of Portland, Oregon is proposing a healthy climate fee and a clean air protection fee to apply to the city's largest polluters. Fees would range from \$15,000-\$2.6 million.
- The Portland Bureau of Transportation has closed off more than 100 miles of streets to through traffic to promote safety, the use of bicycles, and walking during the pandemic.

**The growing need for sustainability has never been more imperative that it is today.** Identify one sustainable policy, organization, or initiative in your community, and one worldwide that has a positive impact on reducing our carbon footprint on the Earth.

## Sustainability Career Pathways

**Chemical Engineer.** Azza worked to help develop a new catalyst to break down plastic waste and turn it into a new source of fuel. Chemistry is at the heart of modern economies: from fuels and fungicides, to flavorings and fertilizers (and that's just one letter of the alphabet!). [Explore this field](#)<sup>4</sup> and learn about ways you could make a [career in chemistry](#)<sup>5</sup> to help build a greener economy.

**Renewable Energy Scientist.** Great leaps are being made in renewable energy every year: from higher-efficiency wind turbines to transparent solar energy-generating glass. Do you want to help advance the field? Learn more about being a [renewable energy scientist here](#)<sup>6</sup>.

**Renewable Energy Technician.** Are you interested in expanding our use of renewable energy, rather than developing the science and technology behind it? Would you like to be involved in installing solar panels and wind turbines? Explore the career of [Renewable Energy Technician](#)<sup>7</sup>.

**Welder.** Building wind turbines and other advanced technology requires the skill of welding. This is not often considered as a green job, but when using it to build green technologies, it certainly is. [Learn more here](#)<sup>8</sup>.

**Waste Manager.** Waste, unfortunately, is a major side effect of the industrial economy--a reality Azza saw to her dismay as she drove past the seemingly endless landfill between Alexandria and Cairo. Determining strategies to reduce waste, and manage the waste produced in safe and sustainable ways is an [essential green career](#).<sup>9</sup>

**Bicycle Mechanic.** Ultimately, in order to reduce our dependence on fossil fuels, it'll take more than electrifying cars or moving to mass transit. We'll need to also live more local lives, where walking and cycling are primary ways of moving ourselves around. This will mean a boon in the bicycle industry: manufacturing, marketing, sales, and keeping bicycles up and running. Are you good with your hands? Consider learning the trade of bicycle mechanics. [Here's a great introduction](#)<sup>10</sup>.

1 <https://www.drawdown.org/sectors/electricity>

2 <https://www3.epa.gov/carbon-footprint-calculator/>

3 <https://www.brightmark.com/>

4 <https://www.livescience.com/48134-what-is-chemical-engineering.html>

5 <https://destinationsscanner.com/is-chemical-engineering-a-good-career-in-year/>

6 <https://climatekids.nasa.gov/career-wind-energy/>

7 <https://work.chron.com/job-description-renewable-energy-technician-17008.html>

8 <https://www.yourfreecareertest.com/welder/>

9 <https://www.onlinecollege.org/jobs/energy-environment/waste-manager/>

10 <https://www.bikerandbicycle.com/how-to-become-a-bicycle-mechanic-a-guide/>

