

The Future is She: Girls Go Robotics

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Environmental sustainability is at the forefront of young people's global consciousness. Three students have proven that new technologies can be designed to address significant ecological issues, winning an international robotics competition and creating an innovative robot prototype, Rocky CO₂, that can change the way we address carbon emissions.

The need to forge a green, eco-friendly future is rapidly increasing. New advances in science and technology make it an exciting time for young people who want to solve ecological issues through digital means. In Malta, a team of young innovators are leading the way in the discussion. Sofiya Chuzhda (from Ġ.F. Abela Junior College), Antonia Ciappara (from St Nicholas College, Dingli Secondary School), and Elizabeth Kovrigina (from IES El Getares, Algeciras, Cádiz, Spain), teamed up to win an international robotics competition facilitated by Girls Go Circular, an online project that aims to enhance female representation in the digital realm. The team's revolutionary prototype, Rocky CO₂, tackles CO₂ emissions through a process called 'enhanced rock weathering', and their work has paid off.

GIRLS GO CIRCULAR AND THE COMPETITION

Girls Go Circular is a free initiative that aims to bridge the digital gender gap and motivate 40,000 schoolgirls interested in STEM (science, technology, engineering, and mathematics) by 2027, equipping

them with digital and entrepreneurial skills to succeed in the circular economy. Sofiya first heard about Girls Go Circular and the robotics competition in complete Gen Z fashion: through Instagram. 'I was just scrolling through my feed, and I saw this ad pop up advertising the competition. I thought, "Wow, what an amazing opportunity." I've always been interested in the environment and how we can improve it. I said to myself, "We have to do this."' Sofiya immediately messaged her friend and fellow STEM student, Elizabeth, who was just as excited about the opportunity. 'I've always been interested in STEM, so when I heard about this, it seemed right up my alley and struck me as a very unique experience,' Elizabeth says. The duo quickly signed up for the programme and a place in the Robot Design Challenge, a competition that invited teams of three students to design a robotic prototype to address a significant ecological problem. Teams had to specify the target user and the environmental impact, as well as create an actual prototype. One team from each participating country would be invited to the Women and Girls in STEM Forum held in Brussels, and the top three would present their prototypes to their peers. ➔



The trio from left to right: Elizabeth Kovrigina, Antonia Ciappara, and Sofiya Chuzhda

Photo courtesy of Sofiya Chuzhda

Through JA Malta, an NGO promoting Entrepreneurship, Employability, and Financial Literacy, and their mentor, Marco Calleja, Sofiya and Elizabeth were grouped with Antonia, who was already involved in Girls Go Circular, to complete their trio. 'I have always been interested in environmental issues,' Antonia explains, 'and this was a perfect opportunity to help me further both my knowledge and skills.' Together, the three students set out to identify a prevalent ecological issue and create their robot.

FIGURING OUT THE PROBLEM AND OVERCOMING CHALLENGES

One of the greatest challenges the trio faced was that they could not meet in person, as Elizabeth was based in Spain. 'We were the only team whose members were located in different countries, but I think working online only boosted our knowledge and experience and allowed us to put the skills we learned into practice,' Elizabeth explains. Despite the difficulty, the trio delegated their research and expanded the search for their ecological challenge, finding a plethora of possible topics they could cover.

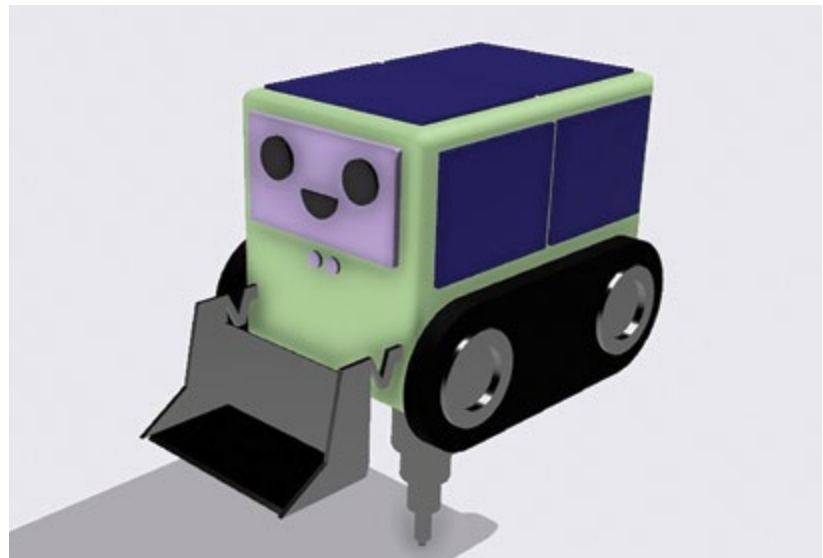
Through their research, the trio stumbled upon a Vox video about carbon capture and the process of

removing CO₂ from the atmosphere. They were eager to learn more. While there are numerous ways to remove CO₂ from the atmosphere, the girls were most interested in the process of rock weathering, a naturally sustainable geoengineering technique where CO₂ is permanently stored in carbonate minerals. The team also learned that this technique could be accelerated through a process called enhanced rock weathering, which opened the doors to their ecological problem and solution: creating a robot that could remove CO₂ from the air through enhanced rock weathering. But what

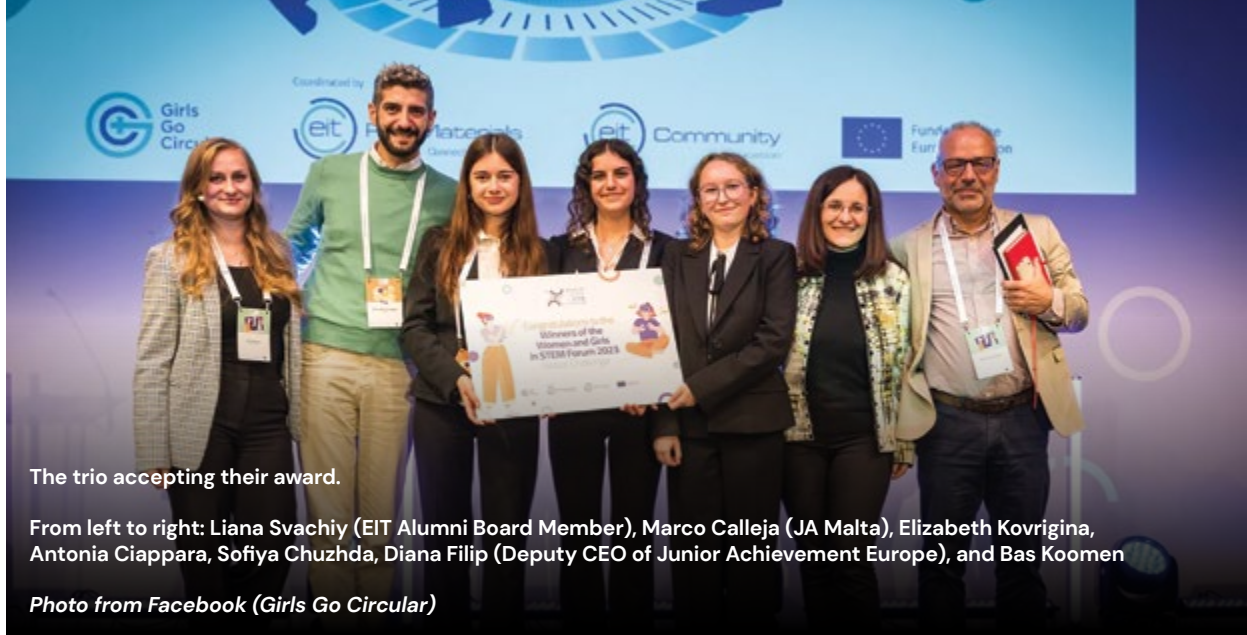
exactly is this technique and how can it help sustain our environment?

WHAT IS ENHANCED ROCK WEATHERING?

The process is quite straightforward: CO₂ in the air dissolves in rainwater, becoming carbonic acid, and when it falls on rocks that have magnesium or calcium ions, it reacts, forming carbonates that store CO₂ in these minerals. The team discovered that this could be enhanced by accelerating the natural weathering process and breaking down ion-rich minerals to absorb greater quantities of CO₂.



Prototype of Rocky CO₂
Image courtesy of Sofiya Chuzhda



The trio accepting their award.

From left to right: Liana Svachiy (EIT Alumni Board Member), Marco Calleja (JA Malta), Elizabeth Kovrigina, Antonia Ciappara, Sofiya Chuzhda, Diana Filip (Deputy CEO of Junior Achievement Europe), and Bas Koomen

Photo from Facebook (Girls Go Circular)

While there is great global emphasis on reducing CO₂ emissions, the idea of removing CO₂ from the air is less well-known. 'It's not stopping CO₂ production; rather, it is removing that CO₂ from the air, which was mind-blowing to me,' says Sofiya. The team decided that a robot that could speed up this natural process by crushing rocks to increase surface area and create a widespread reaction could be designed, mitigating the greenhouse effect and effectively dispersing CO₂ that is already present in our atmosphere.

ROCKY CO.2: HOW DOES IT WORK?

Now that they had their revolutionary solution, the team set out to create their robot – a difficult feat given that none of the team members had a background in robotics. However, with the drive to create new ecologically sustainable technology, the girls designed an autonomous robot prototype to locate magnesium and calcium-rich rocks like limestone and basalt, crush them into a fine powder, and disperse them. What emerged was their innovative prototype, Rocky CO.2. Made from cellulose nanofibers and recycled aluminium and equipped with solar panels to reduce carbon emissions, Rocky CO.2 essentially functions as a drill that crushes rocks

and spreads them to absorb CO₂. The rocks themselves don't absorb CO₂ rather, a reaction occurs within the ions in the rock, forming carbonates, which store CO₂ quickly and more effectively. Rocky CO.2 dramatically speeds up the weathering process, and the robot also reduces soil acidity while increasing its fertility by dispersing magnesium and calcium, making the soil more suitable for plant growth. While Rocky CO.2 may be a simple concept, Sofiya, Antonia, and Elizabeth brought innovative technology and scientific solutions to the forefront, highlighting their passion for sustainability and drive to impact our environment to forge a carbon-free future positively.

WINNING BIG AND THE FUTURE OF ROCKY CO.2

Girls Go Circular challenged their participants to think sustainably and imagine how technology can counteract ecological issues, and team Rocky CO.2 delivered. The team and their robot prototype were invited to Brussels to present at the Women and Girls STEM Forum, which was also the first time the entire team met in person, mere hours before their presentation! After a dynamic explanation of their prototype and highlighting the far-reaching environmental impact of Rocky CO.2, Sofiya, Antonia, and Elizabeth were

awarded top prize by a panel of esteemed judges. Recalling the moment of victory, Sofiya remembers: 'We were all nervous but extremely excited too. I had my doubts about winning, Antonia was also not expecting it, but I remember Elizabeth gripping my hand very tightly with a confident smile and whispering that we were going to win, and as it turned out, she was right.'

ADVICE FOR GIRLS IN STEM

'Pursuing a career in STEM is already challenging enough and having to do it in a male-dominated environment only makes it harder,' Antonia says. 'However, don't let this stop you from following your dreams. Never give up because in the end you will succeed and it will all have been worth it.' Sofiya also stresses for young women to engage in initiatives like Girls Go Circular. 'Don't be afraid or let people tell you it's too hard to jump on these opportunities,' Sofiya comments. 'And always be on social media, because that is where the opportunities are advertised the most. Make your social media algorithm work for you.' Ultimately, Sofiya, Antonia, and Elizabeth have proved that young people can instigate substantial change in our world. The possibilities of what they can achieve through initiatives like Girls Go Circular are endless. **T**