

TRANSFORMING ORGANIC WASTE INTO CLEAN POWER

ENHANCED EFFICIENCY OF BIODIGESTERS FOR URBAN SUSTAINABILITY

“Let's transform what no one wants, into something that everyone needs”



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EXECUTIVE SUMMARY

PROBLEM

Unchecked Energy Waste &
Rising Methane Emissions

Each year, over 1.3 billion tons of organic waste decompose without being utilized, releasing vast amounts of methane (CH₄) into the atmosphere—a GHG 80 times more potent than CO₂ over **20 years**. As the global population grows, so do waste generation and energy demand, yet we continue to miss out on millions of megawatt-hours of potential energy.

This not only exacerbates the climate crisis but also poses serious public health risks, as untreated waste pollutes the air, water, and urban environments.

OPPORTUNITY

Transforming Waste into Clean,
Intelligent Energy

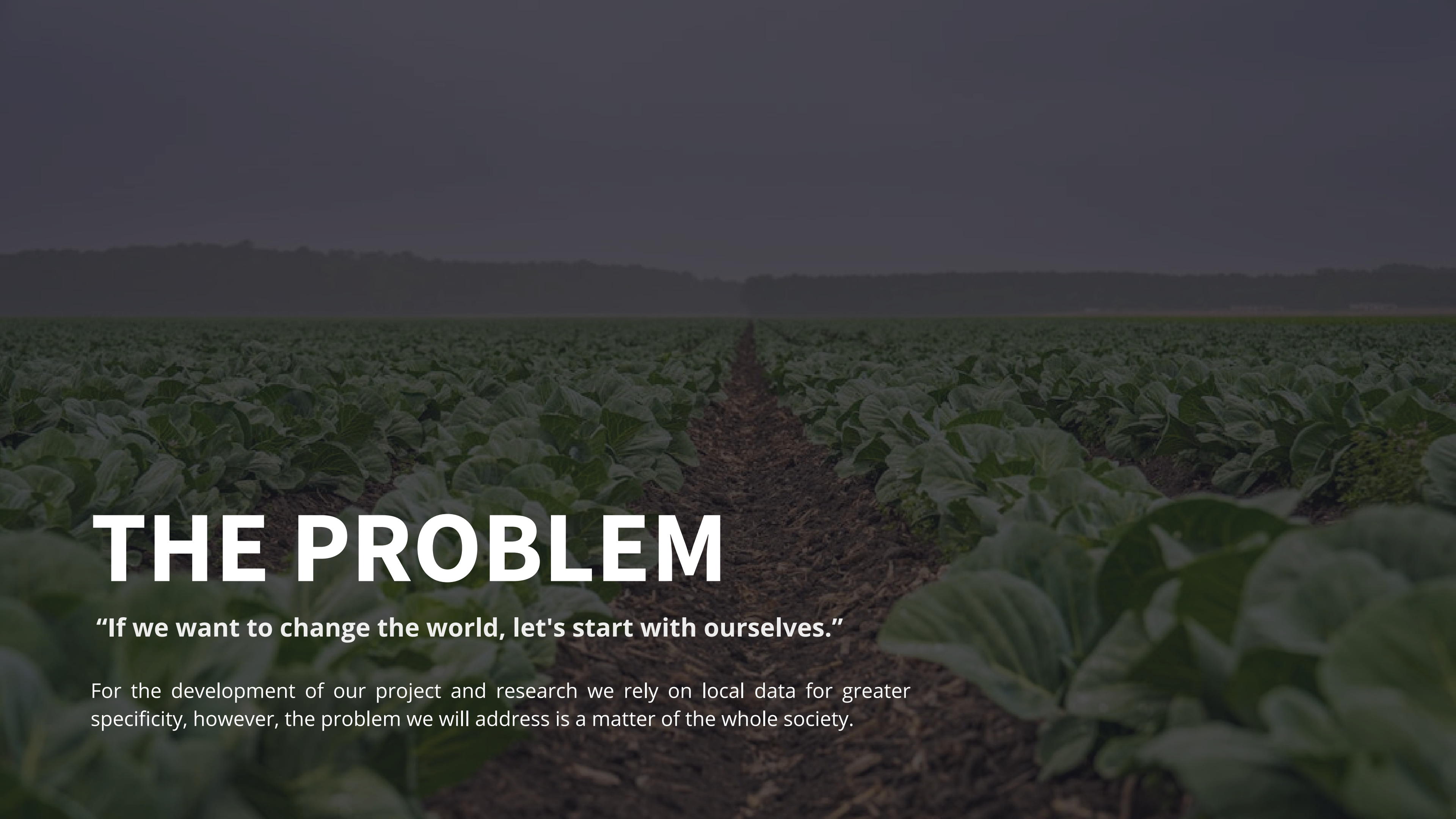
The global demand for sustainable and decentralized energy solutions is rising, yet billions of tons of organic waste remain untapped. ENOVA sees this as an opportunity to convert waste into wealth through smart biodigesters equipped with sensor-driven optimization.

By integrating real-time monitoring and AI analytics, we ensure maximum biogas yield, efficiency, and reliability for both domestic and industrial use. This not only reduces energy waste but also lowers costs, mitigates emissions, and enhances energy security in a rapidly **growing world**.

OUTCOMES

Our waste can also be a
resource

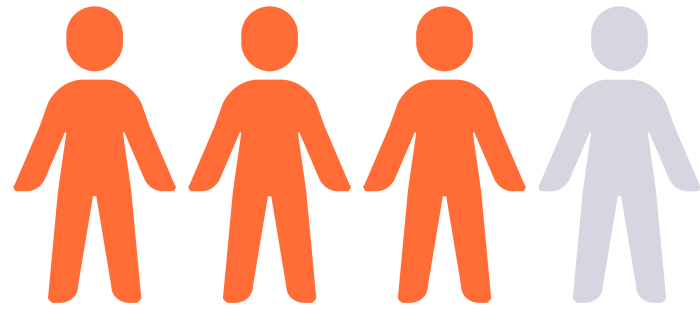
- Implement smart biodigesters could reduce methane emissions by **50-70%**, reducing **CH₄ impact**.
- Generate millions of MWh of renewable energy annually, reducing dependence on fossil fuels.
- Reduction of energy costs in industries and homes, encouraging circular economy models.
- Less air and water pollution, reducing respiratory diseases and infections related to untreated waste.

The background image is a photograph of a vast agricultural field, likely a tobacco plantation, with rows of green plants stretching towards a distant horizon. A narrow, dark path or furrow runs down the center of the field, creating a strong sense of perspective. The sky above is a deep, dark grey, suggesting dusk or dawn. The overall mood is contemplative and somber.

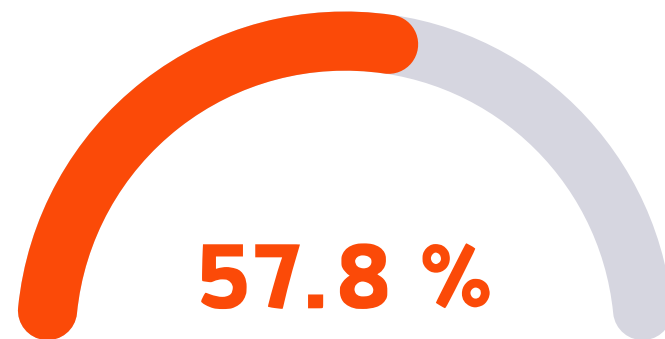
THE PROBLEM

“If we want to change the world, let's start with ourselves.”

For the development of our project and research we rely on local data for greater specificity, however, the problem we will address is a matter of the whole society.

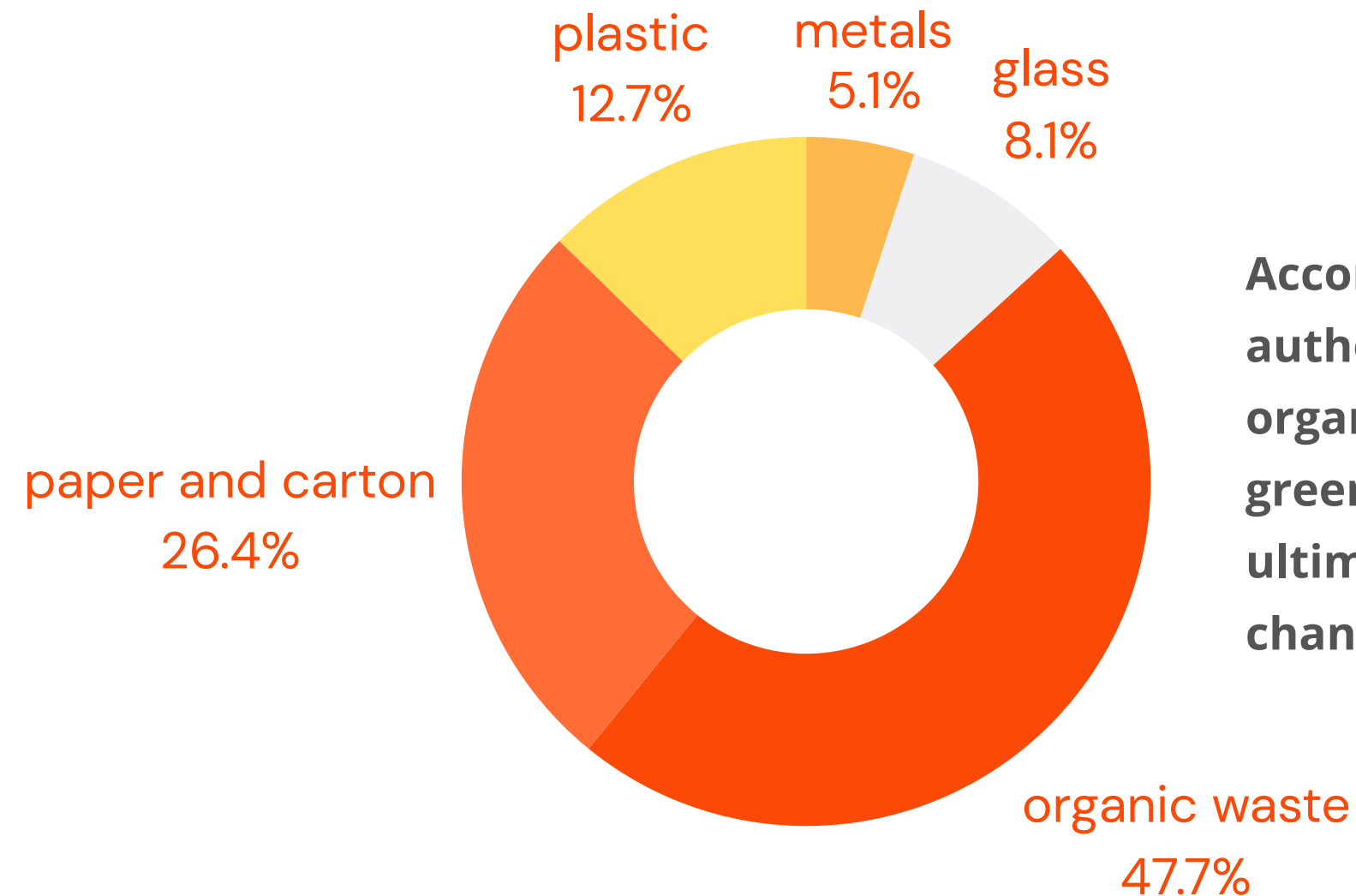


3/4 of the population in **Panama** has access to waste collection services, but there is still part of the population that lacks it.



Almost half of the waste collected is properly processed. The rest ends up in bodies of water and clandestine dumps.

Quantifying the Problem



According to sanitation authorities, waste, especially organic waste, releases greenhouse gases (GHGs) that ultimately facilitate climate change.

The waste is conducive to the transmission of diseases by mosquitoes and other pests, putting the health of the population at risk, with the greatest impact on those living near landfills.

Impact as a society

43% solid wastes are produced by households and businesses

However, large industries, especially those in the food and agro-industrial sector, also contribute to the generation of organic waste.

Methane (CH_4)

Agricultural production generates a considerable amount of organic waste, such as crop residues and unused by-products. These can decompose, releasing methane (CH_4), a greenhouse gas with a global warming potential 25 times greater than that of carbon dioxide (CO_2).

Nitrous oxide (N_2O)

Livestock activity produces manure and other wastes that emit methane and nitrous oxide, having a global warming potential approximately 298 times greater than CO_2 . These emissions are immeasurable considering that livestock is an important economic activity not only in Panama.





THE SOLUTION

"Where others see garbage, we see opportunities."

OUR SOLUTION: ENOVA

● **Smart biodigesters**

Our project is based on the development of an advanced anaerobic biodigestion system capable of transforming organic waste, such as food waste, biomass and industrial and agricultural surpluses, into clean and sustainable energy.

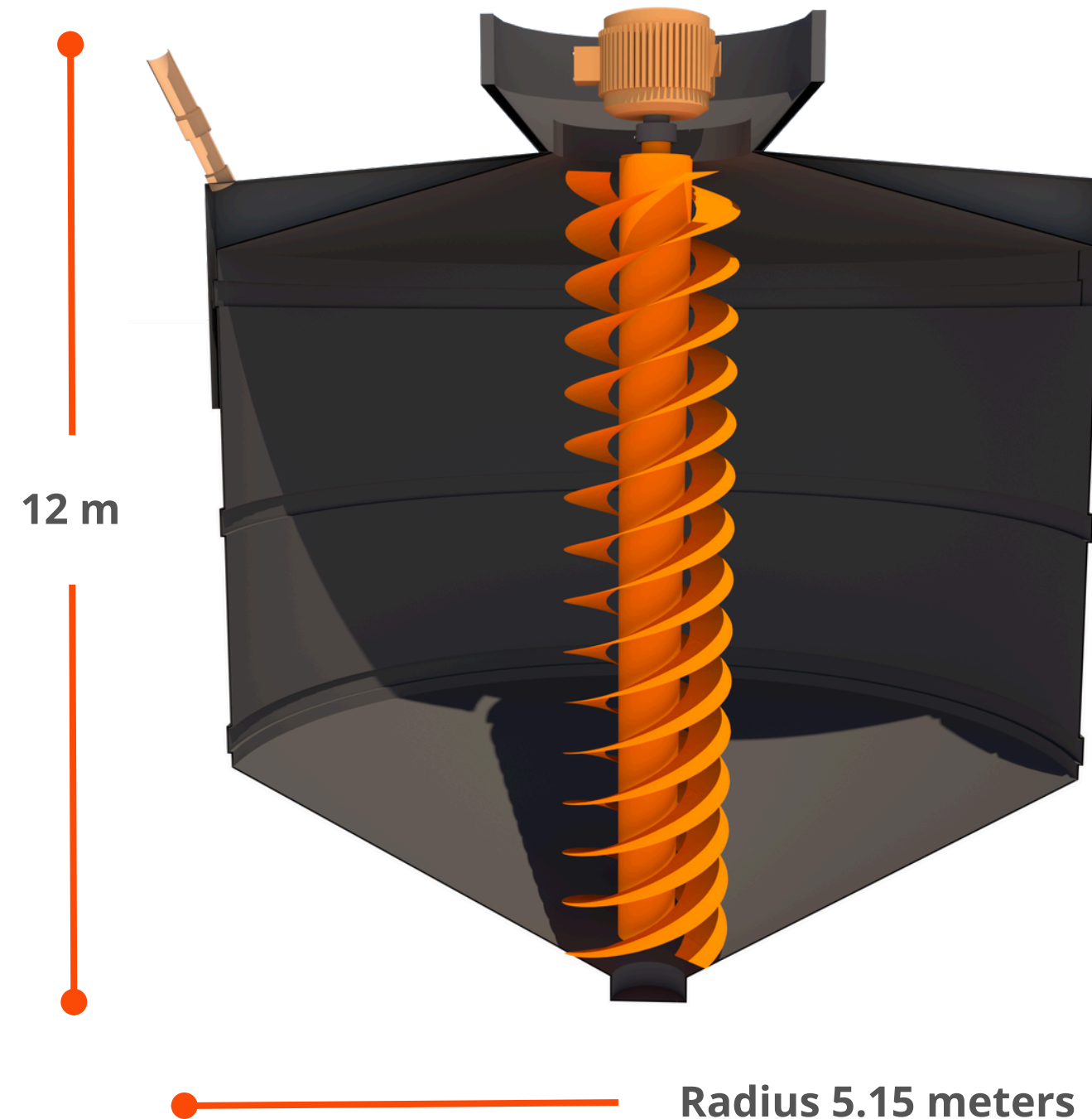
Unlike conventional biodigesters, which tend to be slow and low capacity, our solution optimizes the process through artificial intelligence and real-time sensors, maximizing biogas production and reducing conversion times.

- Thanks to an intelligent monitoring network connected to an app or mobile controller, our system automatically monitors and adjusts biodigester conditions, ensuring superior efficiency. In this way, we not only reduce our carbon footprint by mitigating greenhouse gas emissions, but also drive a sustainable economic development model, aligned with environmental preservation.



WE ARE ENOVA: ENERGIA NOVA

- Enova convert methane into electrical energy, thus reducing the emission of this gas and, in the process, generating self-sustainable, efficient and clean energy.
- What differentiates us is the implementation of cutting-edge technologies, a network of sensors and AI that will provide the customer with full control of their product along with great operating capacity.



- With an integrated rotor capable of boosting efficiency and speed for increased biodigester productivity.

95% Automated

- Its availability of sensors and the conditions of the biodigester, which seeks, with AI, to automate its operations, giving it a greater speed of reaction to different situations, providing great balance and security to the customer.

WASTE CONVERSION

HOW IT WORKS?



Depositing waste

In the biodigester, the shredded organic material is mixed with water and fed into the inlet chamber. This combination creates the ideal environment for decomposition.



Fertilizer and biogas

The biogas from the biodigester is directed to a generator where it is incinerated to produce electricity. This can be used on-site or connected to the grid, converting the biogas into clean, useful energy.



Clean energy

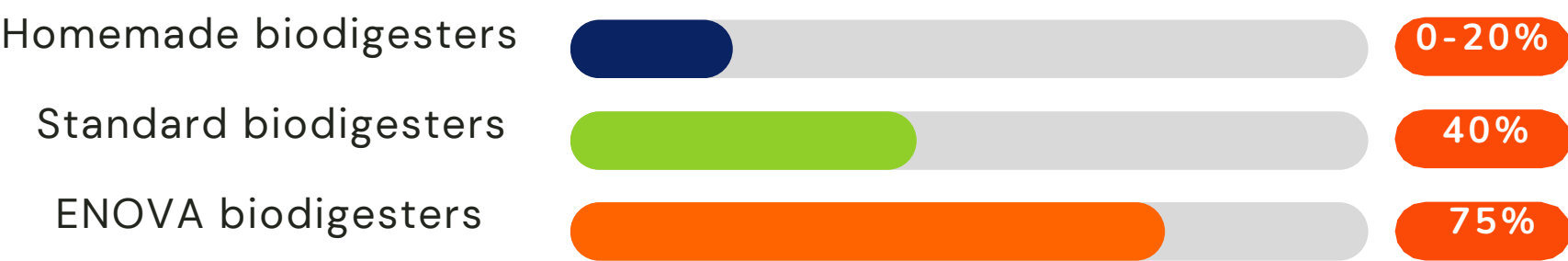
Inside the biodigester, organic material is decomposed without oxygen by bacteria, generating biogas for energy and a stabilized by-product that functions as organic fertilizer.

Efficiency and sustainability

- Thanks to the integration of artificial intelligence and an advanced rotor that accelerates decomposition, our biodigesters represent an innovative solution for transforming organic waste into valuable resources. They not only boost the circular economy, but also promote sustainable practices with a positive impact on the environment.

ENOVA VS COMPETITION

Total efficiency percentage approx. of electrical energy



ENOVA				
Biomass capacity 50%		3,000 kg (density 400kg/m³)		
	Biogas (0.5 m³/kg) 90% methane (CH4)	And 5 PSI	Energy (50% efficiency) Performance of 2.5 kWh/m³	CUSTOMER SAVINGS
GRANDCHILD	1,350 m³		3,375 kWh	
DAY	270 m³/day	54 m³	675 kWh/day	Per day B/. 108.00
WE	8,100 m³/mes	1,620 m³	20,250 kWh/mes	Per month B/. 3,240.00
YEAR	97,200 m³/year	19,440 m³	243,000 kWh/year	Per year B/. 38,880.00

TRADITIONAL BIODIGESTER			
Biomass capacity 50%		3,000 kg (density 400kg/m³)	
	Biogas (0.3 m³/kg) 90% methane (CH4)	Energy (50% efficiency) Performance of 2.5 kWh/m³	CUSTOMER SAVINGS
GRANDCHILD	810 m³	2,025 kWh	
DAY	162 m³/day	405 kWh/day	Per day B/. 64.80
WE	4,860 m³/mes	12,150 kWh/mes	Per month B/. 1,944.00
YEAR	58,320 m³/year	145,800 kWh/year	Per year B/. 23,328.00

BENEFITS OF ENOVA

- Reduction of greenhouse gas emissions

- Operation in the absence of sunlight

- Electric power generation

- Use of organic waste

- Production of organic fertilizers

- Adaptability to areas with low solar radiation

- Reduction of methane emissions

- Automation and monitoring with AI

Target audience and market



Customer segment

Food industry: Companies focused on the manufacture of organic products or using this type of materials or resources in their processes. The energy and industrial sectors are the first and third largest polluters, with a carbon footprint that exceeds 23% of the country's total greenhouse gas emissions. This covers a segment of customers directly related to climate change.

Value proposal



The generation of sustainable energy seeks to reduce the expenditure of electricity for the operation of equipment in food industries that operate 24/7 from their organic waste by providing the necessary resource for industrial manufacturing processes, such as the production or cooking of food, manufacturing procedures and organization of by-products, refrigeration and storage for food preservation, which require lighting and air conditioning of the ambient environment, prepared for subsequent packaging and labeling.

However, we propose a brilliant solution, our biodigesters have great scalability, what do we mean? Although the main focus is on large industries such as factories, agriculture and supermarkets, it can be easily adapted to small spaces, such as domestic places, which means that a technology as efficient as an industry can be in our homes.

Target audience



HOW IT WORKS?

All parts shown here are easily scalable, both mechanically and electrically

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PHASE 2 - The eyes

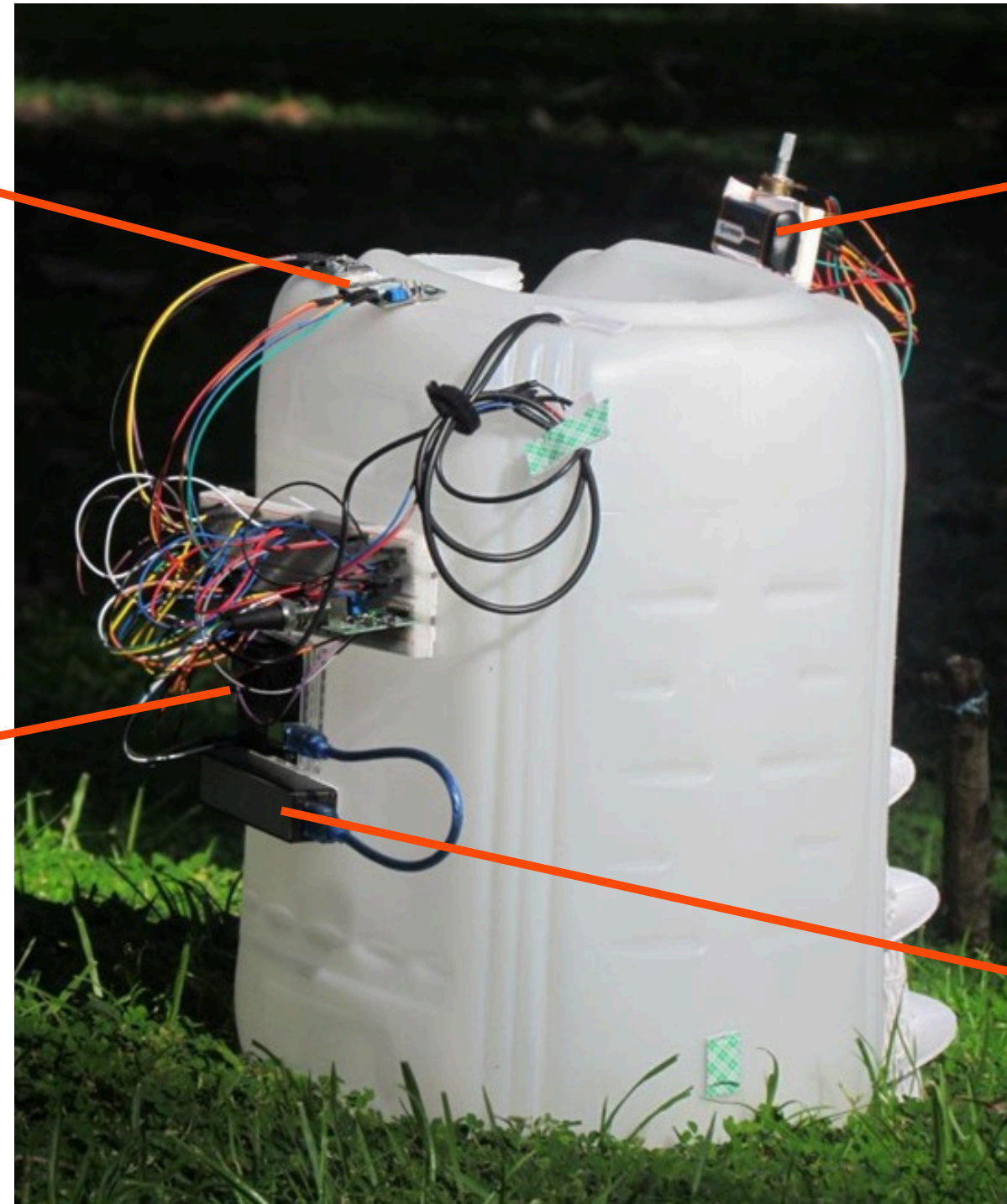
In this second phase is the sensor network, in this case we use humidity, temperature, ultrasonic and pH sensors, in the case of a large-scale model the use of a fluid pressure sensor is recommended.

These sensors are the ones that measure and tell the processor what measures to take and what state it is in.

PHASE 1 - Biodigester Control

For this first phase, an information processing unit is required. In this prototype we use an Arduino Uno WiFi. This board will be responsible for obtaining data from the sensors and transmitting it to the Internet. It will store the AI model and in general will be the brain. In case of a project that demands more resources, you could opt for a Raspberry Pi 4/5.

01



03

PHASE 3 - The hands

Here the way the computer interacts with the biodigester comes into play, with the use of relays and controllers the operation of an electric motor can be automated, the load capacity varies depending on the size of the biodigester, in this prototype we use a small potentiometer together with the helicoid, our star idea to maintain a computer-biodigester interaction

04

PHASE 4 - The energy out

Neither sensors nor anything can function without energy, in this phase the energy rectification process occurs, this is where the amount of energy required by the user is regulated, with the help of AI production is optimized to the maximum, here a small part of the energy produced will be diverted to a system of batteries that are responsible for storing the circuit in general 24/7.

7 AFFORDABLE AND
CLEAN ENERGY



8 DECENT WORK AND
ECONOMIC GROWTH



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



11 SUSTAINABLE CITIES
AND COMMUNITIES



IMPACT AND SUSTAINABILITY

We have a broad vision of the possible impact we can generate, so we decided not only to make a product, but also a pact with nature, human and natural welfare, being more than a product, ENOVA meets 8 SDGs. We eliminate organic health problems, we offer as included a by-product of organic matter, compost and also energy and space savings. This provides benefits for everyone, customers, third parties and ENOVA.

Their ability to operate without relying on sunlight makes them viable in diverse regions, ensuring a constant and sustainable energy supply. This is crucial for rural communities, agricultural industries and decentralized energy systems.

12 RESPONSIBLE
CONSUMPTION
AND PRODUCTION



13 CLIMATE
ACTION



15 LIFE
ON LAND



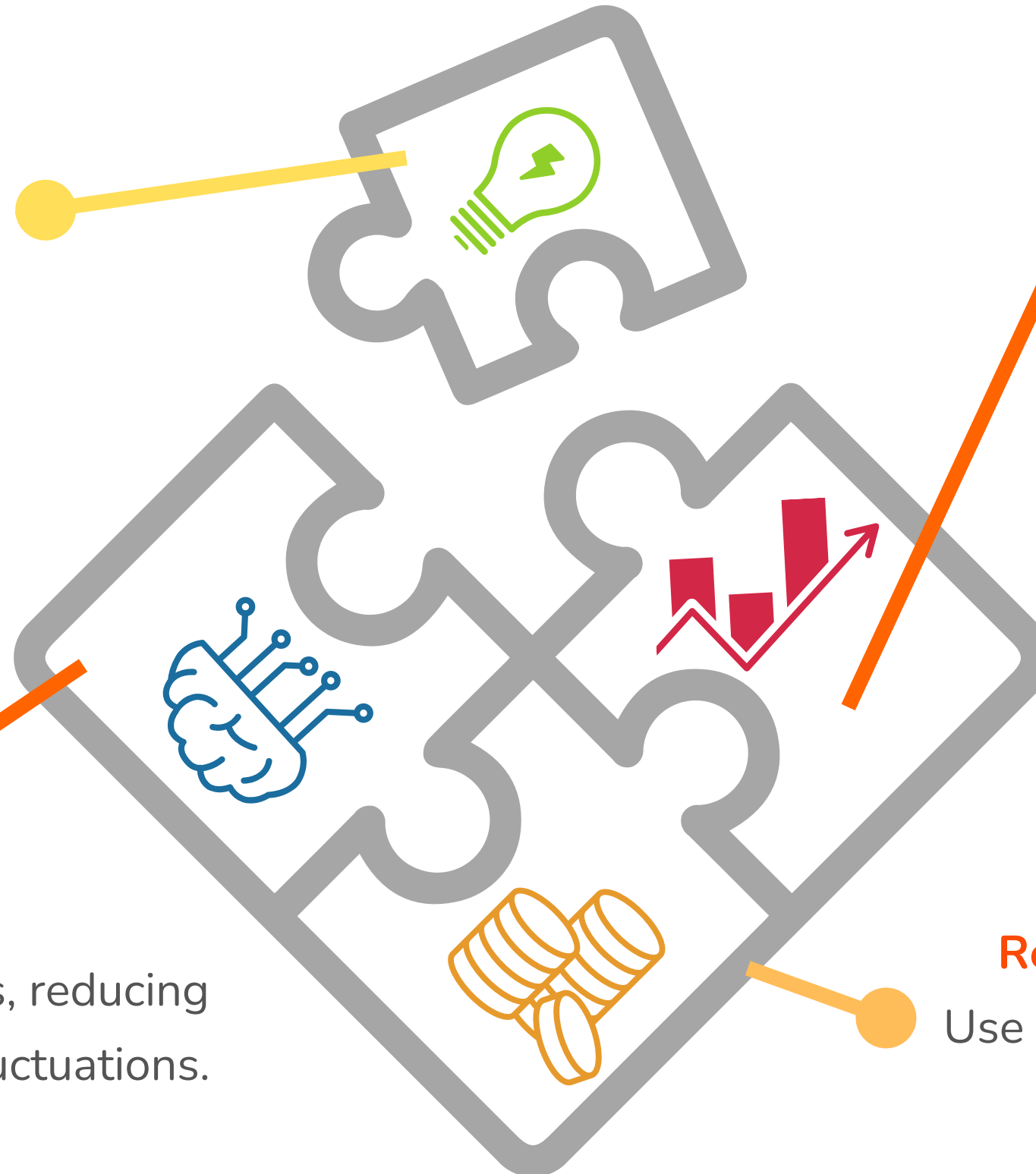
17 PARTNERSHIPS
FOR THE GOALS



IMPACT AND SUSTAINABILITY

Savings in energy costs:

Less reliance on fossil fuels and grid power.



New economic opportunities:

Development of sustainable business models based on energy generation and waste management.

Energy autonomy:

Especially in rural communities, reducing vulnerability to energy price fluctuations.

Reduction of agricultural costs:

Use of natural biofertilizers instead of synthetic chemicals.

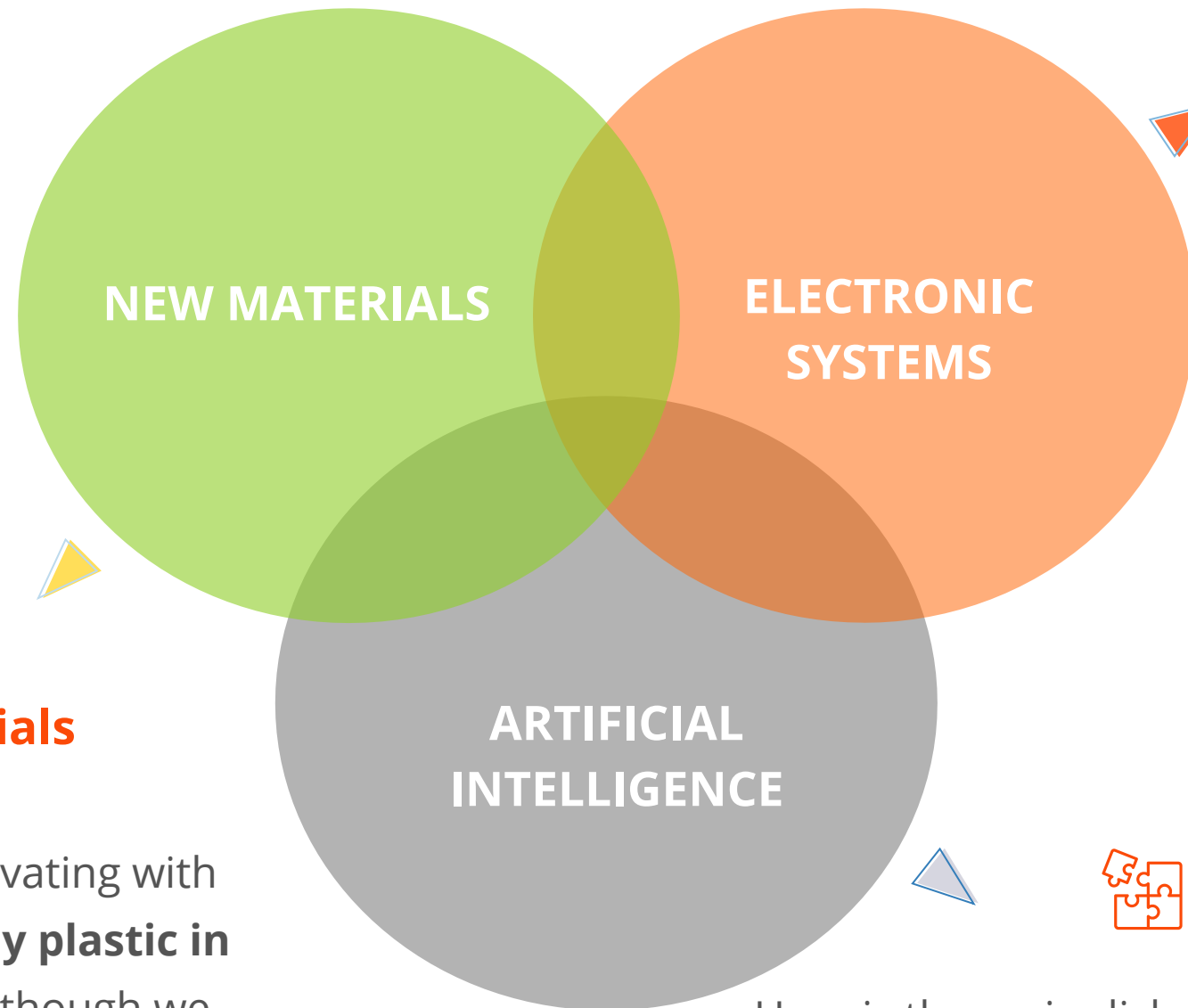
Technology & Innovation

We have three technological pillars on which we are based



Use of recycled materials

To begin with, our project begins by innovating with **the use of recycled materials, especially plastic in the construction of the biodigester**, although we are used to seeing small contributions of recycled materials such as bottles or souvenirs, **in this case the treated plastic will be the main center of the project.**



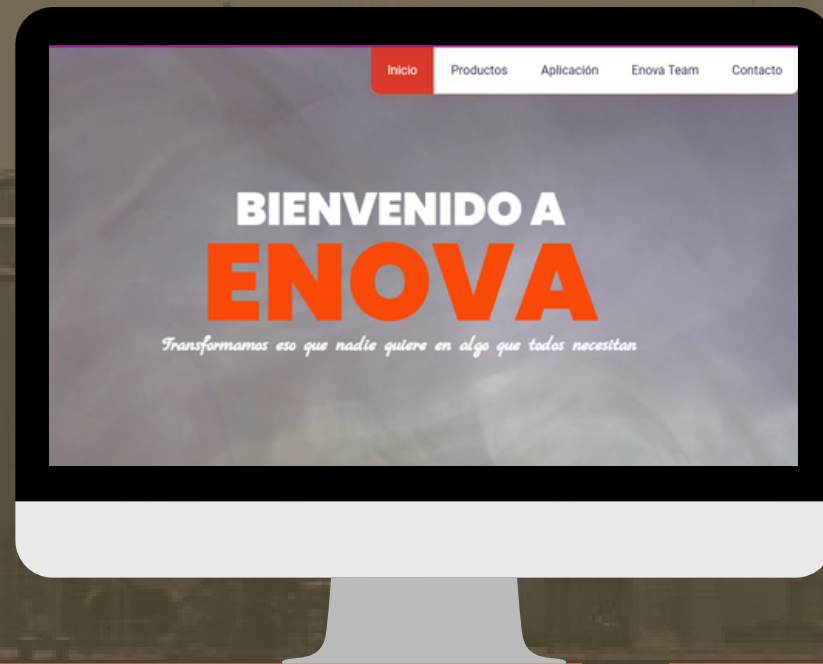
Computers implementation

We are used to a traditional biodigester system, where what is most often used is only biogas and fertilizer, which is a very rudimentary system, generating plastic bags and pits, in this case we take a technological leap, **we include sensors and microcomputers in charge of automating the system**, of course, maintaining the capacity for data analysis and decisions by the user.



ENOVA ecosystem

Here is the main dish, we are developing an **Artificial Intelligence** in charge of automating the system, which will be hosted on the system's local computer, **with Internet connection capacity and even creating an ecosystem of monitoring applications**, imagine waking up and knowing that you can reduce your energy expenses by up to 100%, **it is ideal, right?**



Business Model

Energy efficiency and savings

Each 15 m³ biodigester has an estimated manufacturing cost of \$10,000 and will be sold for \$35,000, **including three years of maintenance**. With a projected return on investment **(ROI) of one year**, we aim to sell 10 units in the first year, achieving an 80% profit margin, while 20% of the revenue will be allocated to partnerships

Our business model targets both B2B and B2C markets, generating revenue through direct sales and **pay-per-click** (PPC) advertising on our **website**. The project will be sustained through **biodigester sales and strategic partnerships**, while PPC ads will help cover operational costs.

Financial projections are estimates and subject to market conditions.

Maintenance costs are included for the first three years. Revenue allocation for partnerships may vary based **on strategic agreements**.

Challenges and next steps

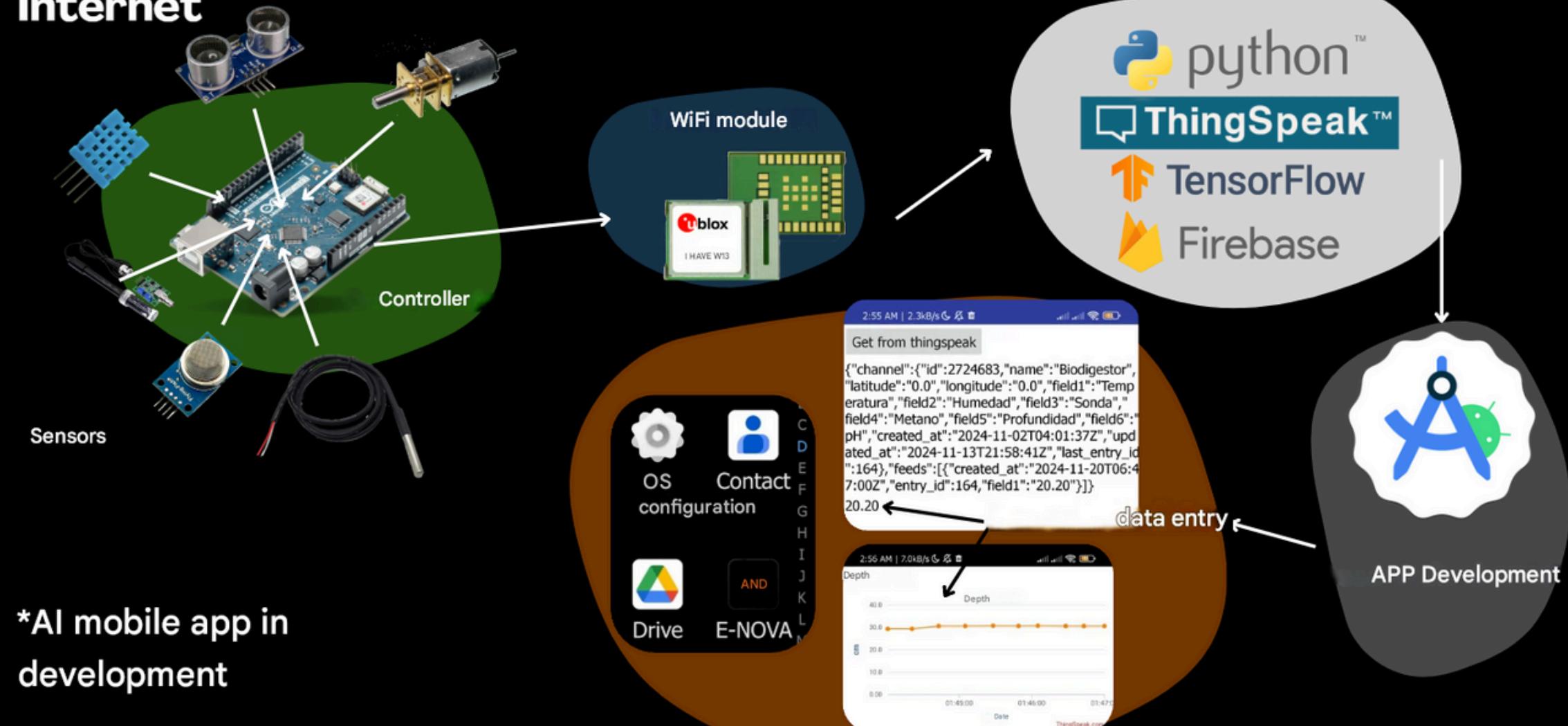
- **Main Obstacles:** One of the primary challenges is the initial high manufacturing cost, which may limit early adoption. Additionally, raising awareness and educating potential customers about the benefits of biodigesters remains a hurdle. Establishing reliable partnerships and securing long-term maintenance commitments are also key challenges.
- **Lessons Learned:** Market education is crucial for increasing adoption. We've identified the need for strategic alliances to optimize production costs and enhance customer trust. Additionally, incorporating flexible financing options could make our product more accessible.
- **Future Plans:** We aim to streamline manufacturing processes to reduce costs, expand our marketing efforts to reach a wider audience, and explore financing solutions such as leasing or installment payments. Strengthening partnerships will also be a priority to ensure sustainable growth and long-term impact.

Who knows? Maybe this technology will help us get to Mars one day. 🚀



INNOVATION IN TECHNOLOGIES

Biodigester Connection ->
Internet



SYSTEMS THINKING

THANK YOU, WEF!

For providing us with valuable experiences that have enriched our learning and growth. Your support has been key to keep moving forward, thank you for making this possible!



Keila M. Wong

CEO | CFO



Jahir Zurdo

CIO | CTO



Paula Mendoza

CMO | CDO

Our team is committed to taking this innovative technology to the next level. We work with passion and vision to create sustainable solutions that can have a real impact. The future is promising! 🚀

Call to action

We want everyone to join in to stop environmental pollution, as promoted by SDGs 13 and 17. With ENOVA, you can be part of the 10% that is making a difference in the fight against climate change.

What We Want From You:

We invite you to support and invest in our innovative project, provide feedback, or explore potential partnerships. Together, we can make a significant impact in sustainability and renewable energy.

CONTACT US:



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Key Learnings:

Innova Nation provided essential training in AI and business strategy, helping refine our project's technical and commercial aspects.

Mentorship & Resources:

Access to expert mentors guided our development and strategy, while valuable resources enhanced our industry understanding.

The Experience:

Workshops and feedback sessions challenged us to improve and adapt our solution, making it stronger and more viable.

Testimonial:

"Innova Nation empowered us with the knowledge, skills, and mentorship to turn our ideas into impactful solutions."

