

The Team

Introduce your team members:

- Country
- University
- Name of each team member, what you're studying & role in the project
- Any other information you would like to share!

BIOCHARCONS



BARTOLO, CRISTINE
ALRIE D.

TECHNICALS



SACDALAN, JOHN
LESTER D.

PROJECT LEADER



BAUTISTA, COLEEN
ANN D.

LOGISTICS



BATAAN PENINSULA STATE UNIVERSITY

Balanga City, Bataan, Philippines
Civil Engineering Department

PROBLEM



Circular Innovation Overview

Insert an overview of your circular economy project/startup, for example:

- What is the waste problem you've identified?
- What is your solution?
- Where are you based and what community are you serving?
- What is the current progress that you have made?



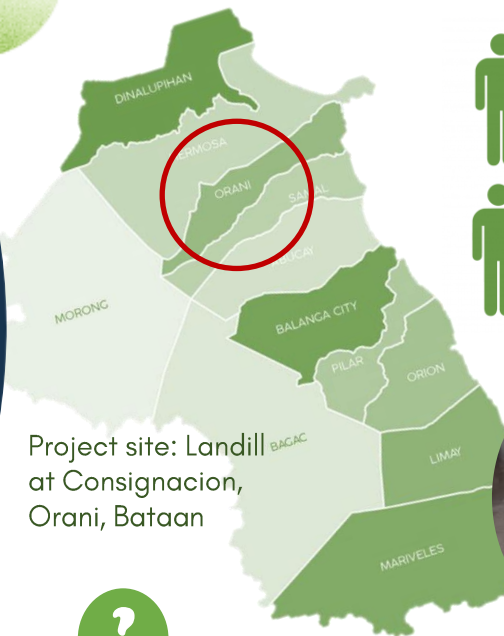
Visit at the Landfill of Bamboo Waste in Consignacion, Orani, Bataan, Philippines

PROBLEM VALIDATION

Circular Innovation Overview

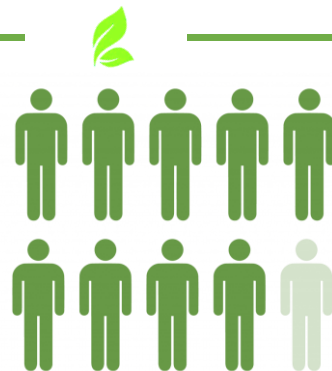
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HOW MIGHT WE

UTILIZE AGRICULTURAL WASTE SUCH AS BAMBOO STEM TO MINIMIZE THE ATMOSPHERIC CARBON DIOXIDE CONCENTRATION?



9 out of 10 workers stated that disposing bamboo waste is **challenging** due to legal restrictions on burning.



Only 75% of bamboo stick is used in industrial purposes while **25% is being wasted**



15 sq. meter of bamboo waste is produced on weekly basis

Circular Innovation Overview



OUR CIRCULAR SOLUTION BIOCHAR CONCRETE



COLLECTING BAMBOO BIOMASS FROM SECTORS PRODUCING AGRICULTURAL WASTE.

SHREDDING THE COLLECTED BAMBOO BIOMASS INTO FIBER STRIPS.

PROCESSED BIOMASS WILL UNDERGO HEATING AT 300 DEGREE CELCIUS IN A SMALL SCALE PYROLYZER TO PRODUCE THE BIOCHAR.

ACTIVATING THE BIOCHAR BY NaOH TO ENHANCE ITS MICROPOROSITY.

PARTIAL CEMENT REPLACEMENT BY NAOH-ACTIVATED BIOCHAR FOR CARBON CAPTURING AND SEQUESTRATION.

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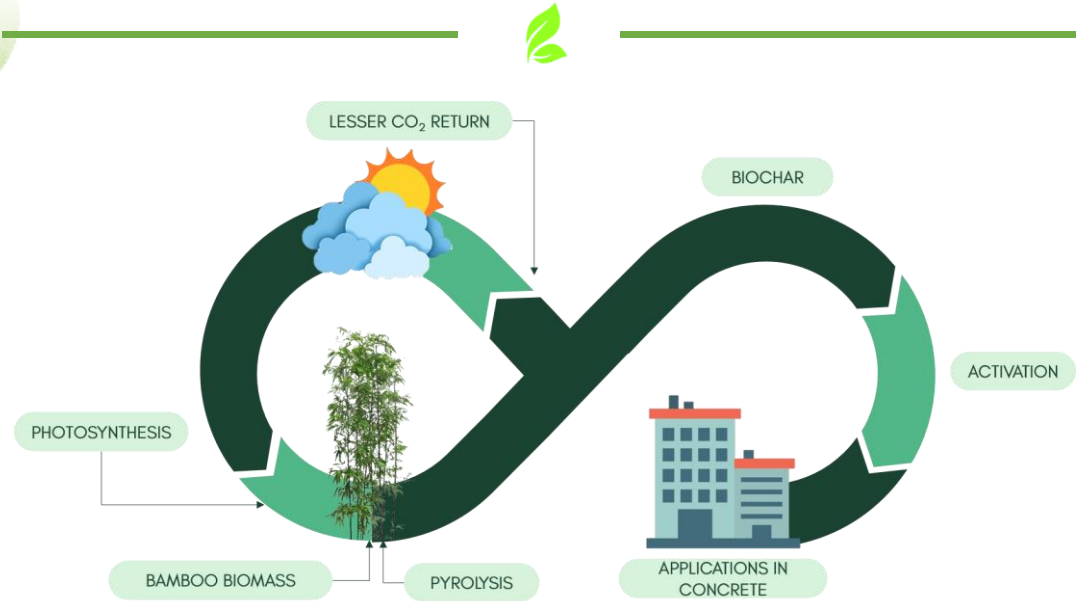
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CIRCULAR ECONOMY CONCEPT OF BIOCHAR IN THE CONSTRUCTION INDUSTRY



BIOCHAR CARBON CYCLE

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COLLECTING
BAMBOO WASTE AS
PRIMARY RAW
MATERIAL



SHREDDING
BIOMASS INTO FIBER
STRIPS



PYROLYSIS
UNDERGO SLOW
PYROLYSIS TO
PRODUCE BIOCHAR



ACTIVATING
SOAKED IN NAOH
SOLUTION FOR
ACTIVATION



**CONCRETE
MIXING**
PROTOTYPE
PRODUCTION

TESTINGS



**MQ135 CARBON
DIOXIDE SENSOR TEST**



**ASTM COMPRESSIVE
STRENGTH TEST**



**PHENOLPHTHALEIN
SOLUTION TEST**

P
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Project Goals

Provide an overview of:

- Short and long term goals that you have set for the project
- Any milestones or deliverables that your team has set for the project

OUR GOALS



TO DEVELOP AND INVESTIGATE A CONCRETE MIXTURE DESIGN WITH SODIUM HYDROXIDE (NAOH) - ACTIVATED BAMBOO BIOCHAR AS PARTIAL CEMENT REPLACEMENT TO UTILIZE GENERATED BAMBOO WASTES AND PARTLY REMOVE SIGNIFICANT QUANTITIES OF CO₂ FROM THE ATMOSPHERE AND COMBAT GLOBAL WARMING.

MINIMIZE

BAMBOO WASTE



Large quantities of bamboo waste in Consignacion Orani, Bataan can potentially be utilized once this study has been widely implemented.

BIOCHAR'S CO₂

ADSORPTION POTENTIAL



To investigate the efficiency of introducing biochar to the concrete mixtures in terms of quantification of the CO₂ adsorption potential and capacity.

CONCRETE CO₂

SEQUESTRATION



To investigate the CO₂ sequestration potential of concrete by evaluating the presence of carbonation in the external surface and cross-sectional area of the concrete.

COMPRESSIVE STRENGTH

INVESTIGATION



To investigate the mechanical properties of concrete in terms of its compressive strength.

Impact & Results

Give an overview of the achievements and impact so far. For example:

- Any initial goals you have achieved
- Partnerships you have developed
- Product development achievements
- Any milestones you have achieved on the road to implementation of your project
- Any impact your project may have already had
- The environmental or social impact measures that you hope to report on once you have implemented your project

TESTING PHASE



MQ135 CARBON DIOXIDE SENSOR TEST

INVESTIGATE THE CO₂ ADSORPTION CAPACITY OF CONCRETE



ASTM COMPRESSIVE STRENGTH TEST

INVESTIGATE THE MECHANICAL PROPERTIES OF CONCRETE



PHENOLPHTHALEIN SOLUTION TEST

INVESTIGATE THE CO₂ SEQUESTRATION OF CONCRETE BY MEASURING CARBONATION DEPTH

RESULTS

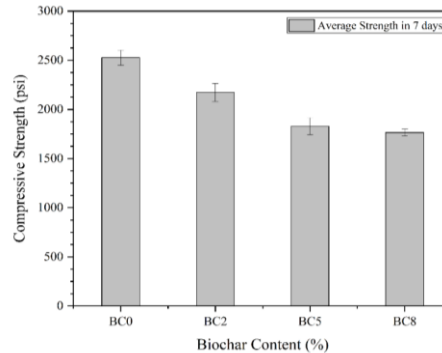


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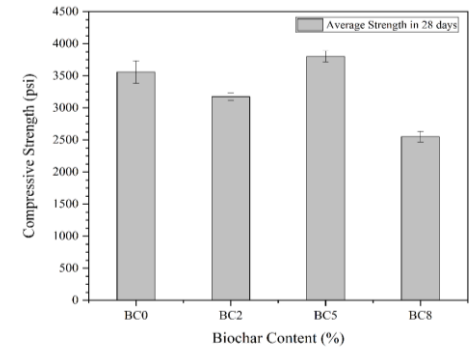
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RELATIONSHIP BETWEEN PARTIALLY REPLACING CEMENT WITH 2%, 5%, AND 8% OF BIOCHAR AND THE COMPRESSIVE STRENGTH OF CONCRETE



COMPRESSIVE STRENGTH CONCRETE AT 7 DAYS

The figure clearly exhibits a discernible downward trend, indicating that as the biochar content in the concrete mixture increases, the compressive strength of the concrete is increasingly compromised.



COMPRESSIVE STRENGTH CONCRETE AT 28 DAYS

The figure clearly shows an upward and downward trend of the compressive strength of the concrete samples. Replacing **5% biochar** to cement displayed a **higher compressive strength** value of **3801.33 psi** compared to the controlled concrete's 3558.50 psi.

RESULTS

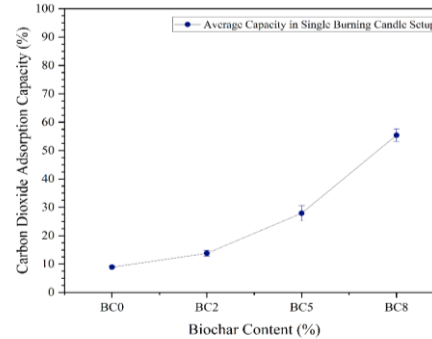


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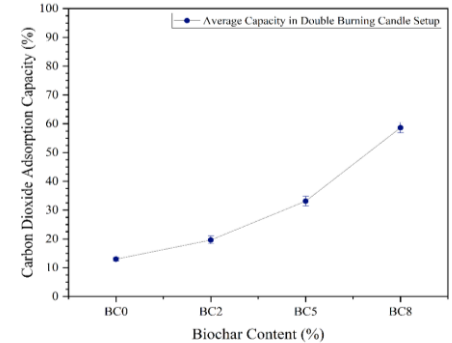
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RELATIONSHIP BETWEEN PARTIALLY REPLACING CEMENT WITH 2%, 5%, AND 8% OF BIOCHAR AND THE CO₂ ADSORPTION CAPACITY OF CONCRETE



CO₂ ADSORPTION CAPACITY SINGLE BURNING SET UP



CO₂ ADSORPTION CAPACITY DOUBLE BURNING SET UP

The graphs clearly demonstrate a positive relationship, indicating that as the percentage of bamboo biochar increases, the CO₂ adsorption capacity also increases.

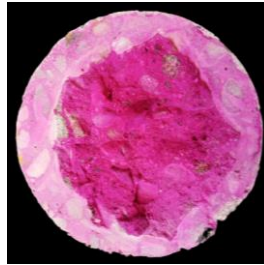
RESULTS

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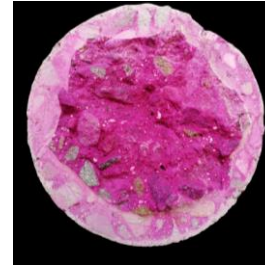
RELATIONSHIP BETWEEN PARTIALLY REPLACING CEMENT WITH 2%, 5%, AND 8% OF BIOCHAR AND THE CO₂ SEQUESTRATION POTENTIAL OF CONCRETE



**BCO
CONTROLLED**



BC2



BC5



BC8

The figures clearly demonstrate a positive relationship, indicating that as the percentage of bamboo biochar increases, the carbonation depth increases with that there was a CO₂ sequestration happened in the concrete.



The results mainly shows that this project is successful which we can proudly say that the prototype that we made is effective in mitigating carbon dioxide in the atmosphere and can contribute to the reduction of agricultural waste.

SIGNIFICANCE

Impact & Results

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CIRCULAR ECONOMY OF **BAMBOO WASTES**



ELIMINATION OF **AGRICULTURAL WASTE.**



RECOMMENDATIONS ON **URBAN PLANNING AND DESIGN INNOVATION**



GLOBAL WARMING MITIGATION AND ADAPTATION.



UNITED NATIONS' **SDG 11.**



UNITED NATIONS' **SDG 13.**



ACTION TOWARDS **NET-ZERO GREENHOUSE GAS EMISSION BY 2050**



HNRDA 2022-2028 INDUSTRY, ENERGY AND EMERGING TECHNOLOGY

Micro Grant

Give us an overview of what you have achieved with the micro grant from Circular Cities Asia and The Regional Project Energy Security and Climate Change Asia-Pacific (RECAP) of the Konrad-Adenauer-Stiftung

OVERVIEW

EXPENSES

Php 8 000



ACQUISITION OF MATERIALS

Php 6 000



RESEARCH AND DEVELOPMENT

Php 7 000



PROTOTYPE PRODUCTION

Php 5 000



PROTOTYPE TESTING

Php 3 000



OPTIMIZED PROTOTYPE

Lessons Learnt

- Tell us more about what you have learnt from this project and any unforeseen circumstances or challenges you have faced
- What learning experiences helped you to improve your project?
- What is your team's biggest achievement so far?
- What skills have you learnt as a result of working on this project?

WHAT WE HAVE LEARN SO FAR

This project has been quite challenging, requiring our determination and focus to produce a satisfactory outcome. Despite the difficulties, we have made significant progress and consider it a success. Although we recognize that there is still a long way to go, we have learned valuable lessons along the journey.

One important lesson we have acquired is the **significance of planning**. Through this project, we have enhanced our ability to create a well-structured project plan. This has helped us organize our methodology, data collection methods, and analysis techniques more effectively. By having a clear plan in place, we were able to navigate the project process more efficiently.

Another lesson we have learned is the **importance of critical thinking**. Throughout the project, we have honed our skills in thinking critically and drawing accurate conclusions. This has allowed us to contribute to the advancement of knowledge in our field. By questioning assumptions, evaluating evidence objectively, and considering alternative explanations, we have been able to derive more insightful insights from our research.

Lessons Learnt

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WHAT WE HAVE LEARN SO FAR

Collaboration has also emerged as a crucial lesson for us. We have recognized the value of working together with others. Engaging in discussions, sharing ideas, and seeking feedback from our peers has enriched our project significantly. Collaborating with others has brought diverse perspectives to the table and has expanded our understanding of the subject matter.

Lastly, we have learned the importance of **embracing failures as learning opportunities**. This project has presented us with numerous challenges and setbacks. However, instead of being discouraged, we have learned to analyze the reasons behind these failures and setbacks. By understanding the causes, we have been able to make necessary adjustments to improve our project and learn from these experiences.

Stories

If there are any stories, testimonials, quotes or feedback that you would like to give us about your experience of any of the following, please share them here.

- Your experience of the Circular Campus Programme
- Your experience of working on a circular economy project or startup
- The impact the micro grant has had on your project
- Any other outcomes that you or your customers have experienced that you would like to share

We are grateful to Circular Cities Asia and The Regional Project Energy Security and Climate Change Asia-Pacific for their generous support through the micro grant. Without their financial assistance, our project would not have been possible. Their contribution has been instrumental in helping us implement our project plan.

The support we received from these organizations has had a significant impact on our project. It provided us with the necessary financial backing to carry out our project and take concrete actions to address environmental problems. Through their assistance, we were able to explore and formulate innovative solutions to these pressing issues.

Moreover, this support has had a profound effect on our personal growth. It has allowed us to immerse ourselves in the realm of environmental concerns and deepen our understanding of the challenges we face. By actively engaging with these problems, we have become more aware of the urgency to protect our environment and have developed a greater sense of responsibility towards sustainable practices.

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The experiences and lessons we have acquired throughout this project will be cherished. They have left a lasting impact on our hearts and minds. We will carry the knowledge gained and the skills developed with us as we continue on our individual and collective journeys.

We cannot express enough gratitude for the support extended to us by Circular Cities Asia and The Regional Project Energy Security and Climate Change Asia-Pacific. Their willingness to extend a helping hand has made this project possible and successful. We are sincerely thankful for their belief in our endeavor and their commitment to environmental sustainability.



Next Steps

Tell us what's next for your project and what your plans are for the future!

You can also write any questions you have for us, or tell us if you're seeking support or connections to help progress your project.

WAYS FORWARD



Further develop the prototype into a scalable system and conduct pilot studies to assess its feasibility and effectiveness on a larger scale.

**SCALE-UP AND
PILOT STUDIES**

Conduct a cost-benefit analysis to assess the economic viability of implementing the prototype on a commercial scale, taking into account installation, operation, and maintenance costs, as well as potential revenue streams.

**ECONOMIC
FEASIBILITY
ANALYSIS**

Conduct field trials to assess the prototype's performance in real-world scenarios and explore potential applications in different agricultural settings or industrial sectors.

**FIELD TRIALS
AND REAL-
WORLD
APPLICATIONS**