WREN Symposium 2023

COLLABORATING FOR THE FUTURE
WORKING TOWARDS THE UN SUSTAINABLE DEVELOPMENT GOALS

BOOK OF ABSTRACTS

UNIVERSITY OF WOLLONGONG AUSTRALIA

UOW MALAYSIA
PART OF THE UNIVERSITY OF WOLLONGONG AUSTRALIA GLOBAL NETWORK

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PREFACE

Welcome to the conference proceedings of the Women's Research Engineering Network (WREN) Symposium 2023 – "Collaborating for the Future – Woking Towards the UN Sustainable Development Goals."

The journey towards sustainable development is one that requires collective effort, innovative solutions, and interdisciplinary collaboration. It is a journey that transcends borders, disciplines, and sectors, requiring us to come together to address the complex challenges facing our planet and its inhabitants.

In these proceedings, you will find a diverse collection of abstracts and posters, each offering valuable insights and innovative solutions aimed at advancing the Sustainable Development Goals (SDGs). From ending poverty and promoting health and wellbeing to ensuring inclusive education and fostering economic growth, the research presented here exemplifies the dedication and commitment of researchers towards building a more sustainable and equitable world.

As we navigate the challenges and opportunities on the path towards achieving the SDGs, it is essential to recognize the critical role that research plays in informing policy, inspiring action, and driving positive change. The contributions in these proceedings reflect the tireless efforts of researchers from around the world who are dedicated to making a difference in their communities and beyond.

We extend our sincere gratitude to all the authors, reviewers, and contributors who have made this publication possible. Their dedication, expertise, and passion for sustainability have enriched our collective understanding of the complex issues facing our world today.

As we embark on this journey together, let us continue to collaborate, innovate, and advocate for positive change. Together, we can make meaningful strides towards a more sustainable, inclusive, and prosperous future for all.

Thank you for joining us on this journey.

WREN Committee

2023

ABOUT THE WOMEN'S RESEARCH ENGINEER NETWORK (WREN)

At WREN, we are committed to achieving gender equity in engineering fields, striving to increase participation and retention among all genders, with a special focus on women. Our vision is a world where engineering is equally accessible and rewarding for everyone, and our purpose is rooted in creating a sustainable and equitable environment that values diversity and inclusivity. This commitment is reflected in our mission to serve as a dynamic platform for international collaboration among women research engineers, enhancing their visibility and encouraging supportive policies. We connect women across various stages of their careers — early, mid, and senior — through international collaborations, including grant proposals, joint publications, and co-teaching partnerships. Additionally, we maintain and deepen relationships with international partners, equip our members with career-advancing tools, amplify research led by women and underrepresented groups, and tackle systemic barriers through grassroots advocacy. Through these efforts, WREN not only supports individual career growth but also contributes to reshaping the engineering landscape into a more inclusive and equitable field. To learn more about our work or to join our network, please visit our website (https://thewren.global/) and get in touch.

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Abstract

Despite the wide-ranging impact of technology on the lives of young children, our understanding of its underlying design processes remains incomplete.This research examines the literature on the use of children as partners in the design process for technologies. The historical influence of cooperative design from Scandinavia (Bjerknes et al., 1987) and participatory design from the United States and the United Kingdom (Muller et al., 1991) is discussed, with a focus on the concept of having participants in the design process as full partners rather than token participants (Greenbaum & Kyng, 1992). Druin et al. (1998), Farber et al. (2002) and Guha et al. (2005) have lead the research that has been conducted on young children (4-6 year olds) as co-designers, with studies demonstrating their ability to self-report on their perceptions of technology use. However, the methods used to obtain valid results from partnerships with young children need to be specially developed. Through the use of parent and educator mediated engagement sessions, this project provides an insight into the co-design process, where children are engaged as collaborators. The data provided by the children is given in verbal response, through researcher observation reports, and child drawings. This research seeks to provide an account of a co-design process involving children aged between 4-6 years old, which contributes to the literature on children's participation in the design process for technologies.

Keywords: co-design; early childhood; technology; design process.

The role of UN SDGs in the ocean plastic pollution policy arena

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Abstract

Plastic production and waste generation has increased exponentially in the last 65 years, with the vast majority of plastic ending up in landfills or in the environment, and ultimately in the ocean. The amount of plastic waste entering the ocean is up to 14 million tonnes every year, and there are more than 1000 studies reporting the harmful impacts of plastics on the marine environment. These studies and several other discussion forums have been advocating against plastic in different arenas in the past decades, changing the perceptions regarding the material that was once synonymous with modernity. As a result of that, many policies have emerged to address the ocean plastic pollution problem. A recent one is the 2030 Agenda and the 17 Sustainable Development Goals of the United Nations (UN SDGs Agenda 2030). However, recent studies point out the fragmented approach of the current policies in trying to address the issue. Hence, the aim of this study was to understand the role of the UN SDG Agenda 2030 in the ocean plastic pollution policy arena. To do that, an exploratory literature review of relevant reports about policies on ocean plastic pollution published in the last 5 years was conducted. Three reports were selected for assessment. The literature assessed shows that the UN SDG Agenda 2030 is a relevant and significant policy that brings measurable targets to address ocean plastic pollution directly (SDG 14) and indirectly (SDG 3; SDG 6; SDG 11; SDG 12; SDG 13; and SDG 15). Despite being a non-legally binding agreement, these targets can help countries to effectively develop legislation to implement measures locally and achieve the SDGs cited above. Yet, plastic pollution presents challenges to all SDGs, and the lack of specific targets in the other SDGs can undermine the fulfillment of the 2030 Agenda.

Keywords: Plastic; Policy; SDGs; Measurable targets; Ocean plastic pollution.

The invisibility of urban informal settlements in city logistics policies

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Abstract

In Brazil, there are 13.6 million people living in favelas and generating around BRL120 billion a year. Even with this economic power, most favela residents are unable to shop online, mainly due to logistical barriers arising from three factors: (1) topography and road infrastructure, (2) lack of official addresses, and (3) insecurity. E-commerce delivery costs in favelas are about 20% to 50% higher than those of non-disadvantage neighborhoods in the same city. Therefore, the last mile delivery problems –the final step in the delivery process– in favelas promote transport-related social exclusion and residents are the most affected by inequalities. This study aims to list last mile delivery solutions in favelas. A literature review, and a visit to Carteiro Amigo Express –a specialized startup in delivering letters and packages in favelas of Rio de Janeiro– was carried out. Based on the information collected, city logistics measures can play an important role in this context. For instance, well-located collection-and-delivery points (CDP) on main roads in favelas can be a potential solution for all stakeholders. In this case, carriers would be able to access CDPs at a lower logistical cost, and favela residents would not need to travel long distances to pick up their orders. Other potential solutions would be the use of (1) cargo bikes as a mode of transport for carriers to access narrower roads and (2) digital postal code generators to solve the lack of formal addresses and, consequently, assist in scheduling and routing deliveries. Additionally, any delivery solution should be designed with favela residents since their useful, extensive local knowledge. Finally, while most research on urban freight planning is focused on non-disadvantaged areas, we hope this study will deepen the debate on promoting equitable access for all basic services and products, as well as urbanizing urban informal settlements.

Keywords: transport-related social exclusion; urban freight; e-commerce; informal settlements; favelas

How circular economy initiatives in urban areas can help achieve the Sustainable Development Goals (SDGs)

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Abstract

Urban areas, such as cities and urban settlements, are responsible for consuming large amounts of natural resources and energy to supply the needs of the growing population and ensure the functioning of their systems. Historically built under a linear development perspective, these areas generate large amounts of waste and greenhouse gases. In this way, linear urban areas can be unsustainable systems, and their adverse effects can negatively affect the environment and society. A circular economy (CE) is an economic system that seeks to end the idea of "take-make-dispose". CE is based on ending waste and pollution, extending the life cycle of products and materials, and regenerating nature. Urban environments can adopt the principles of CE in different ways to achieve Sustainable Development Goals (SDGs). This work analyzes how CE initiatives in urban areas can help attain different SDGs. To this end, we conducted a Literature Review about urban circularity. Additionally, we selected a group of cities considered reference in the CE development, and then analyzed their CE plans and strategies. The circularity initiatives in these cities were classified into activity sectors, and we related these actions to different SDGs. Finally, we examined how these actions could contribute, positively or negatively, to achieving SDGs. The results showed that all the cities studied believe their circularity strategies help to achieve urban sustainability. However, it is unclear how these initiatives will be monitored to ensure their benefits. Therefore, studies about urban circularity progress, which consider the environmental, economic, and mainly social consequences – as an often neglected dimension – are necessary to ensure that urban circularity help attains the SDGs.

Keywords: Urban Circularity; Circular City; Circular Urban Areas; Sustainable Cities; SDGs.

Development of a Sustainable and Eco-Friendly Smart House

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Abstract

Sustainability is one of the global goals which is being applied everywhere including Malaysia where it is a normative notion that refers to development for future generations. Hence, implementing sustainable materials to construct buildings has been established as one of the solutions. In this project, the requirement to build a cheap smart house with 90% composite and 10% non-composite materials. The prerequisites for building the house include creating a smart, sustainable, and green concept home within the budget of RM 40000. A prototype scaled model was fabricated to meet the requirement from the industry. Material used in this project is made of rice husk, recycled rubber and recycled plastic. The structural prototype construction was covered the flooring, external walls, interior walls and supporting columns. The design of the prototype house was covered total of 9 square feet with certain conditions which are three rooms and common space for general use , electricity connection through solar generation, water supply piping and basic eco-friendly fittings. There are many features added to our house such as a robust design, double ceiling, solar-powered house, natural lighting, green roofing, open concept living room and automatic rainwater harvesting system to address the smart city concept. With the inclusion of solar panels leading total usage of 60% solar energy, the price of our smart house would be RM 42000 and RM 27000 for the base model. Hence, much more sustainable and affordable housing can be implemented. The finished prototype house did meet the element of the smart, sustainable and green concept.

Keywords: sustainable, smart, solar, housing

THE CIRCULAR ECONOMY IN THE FASHION INDUSTRY: A CIRCULAR FASHION INDEX FOR THE SUPPLY CHAIN

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Introduction

- The fashion industry suffers from sustainability criticism;
- Sustainability has become a hotly debated topic in fashion, especially the transition to a circular production model;
- Several CE initiatives became part of some fashion companies;
- There are several barriers that can hinder circular fashion and among them is consumer distrust towards sustainable organizations.

Purpose

- The purpose of this study is to develop the Circular Fashion Index (CFI), which will be generated from the construction of a tool to assess the circularity of the green fashion supply chain.

Materials and Methods

- Specific CE indicators for the fashion industry were identified and developed;
- These indicators were ranked and divided into the dimensions of the TBL and prioritized using the method AHP;
- The evaluation is being conducted through the survey methodology, where a questionnaire is sent to pre-selected fashion companies.

Results

- Six Brazilian companies have already been evaluated, but we still don't have the results of the indexes, as we are in the stage of defining the weights of the indicators.

Conclusions

- The main contributions of this research are summarized in the creation of the CFI, which, in addition to showing if the fashion supply chain can currently be considered green and circular, will also present an unprecedented selection of CE indicators specific to this sector.

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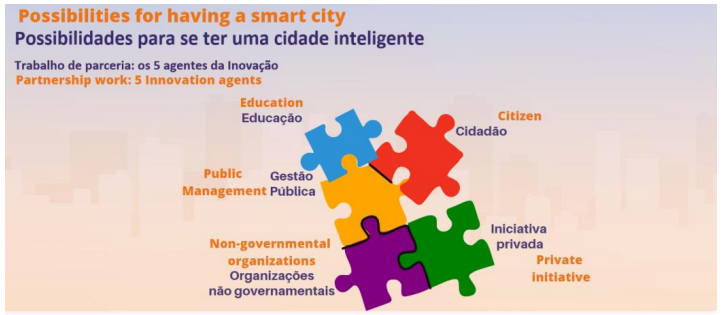
#Make@difference – Urbanism for Happiness

Rita de Cassia Girardi - USP
Adriana Coelho Vieira – INMETRO

Do you know how to transform citizens connected with Smart Cities to reach a score of 10 in the FIB?

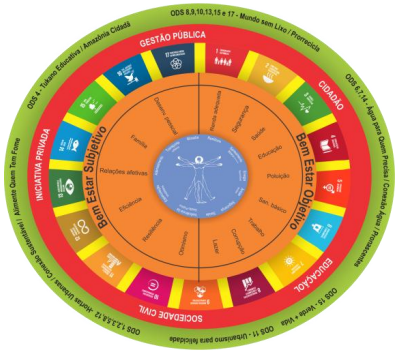
Smart cities are a utopia sought by people, since technology began to be part of their daily lives.

Urban transformation permeates the question “which city do we want and what city do we have?”

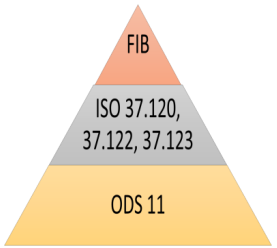


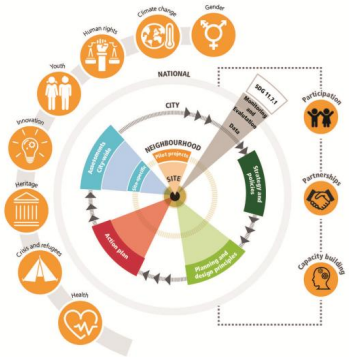
After all, all partners only justify their existence due to citizens.

How to make a difference?



Questionary - Guidelines





Conclusion

We note that the guidelines adopted to turn cities into **Smart Cities** focused on objective aspects tend to take into account the **Gross Domestic Product (GDH)**, neglecting the aspects of **Gross National Happiness (GNH)** indicators, which does not transform the urban space for **welfare**.

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MACHINE LEARNING FOR BIODIVERSITY: HABITAT SUITABILITY IN CONSERVATION UNITS IN SÃO PAULO STATE, BRAZIL

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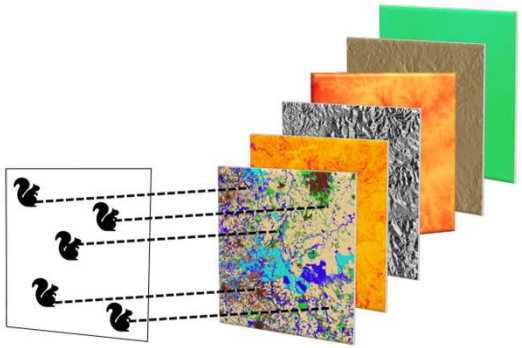
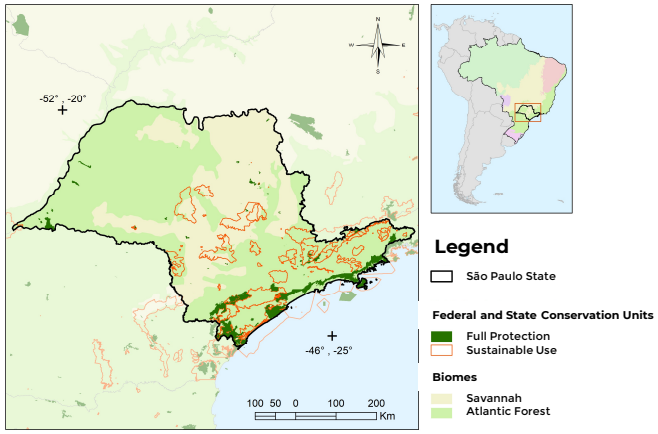
Introduction

Species Distribution Models, also called **Habitat Suitability Models** (HSMs) use computational algorithms to predict the distribution of a species in geographic space and time based on environmental variables.



The **aim** of this research is to evaluate Habitat Suitability in state and federal Conservation Units in the state of São Paulo, Brazil, based on Habitat Suitability Models, as a way of measuring the potential of these protected areas for the maintenance of mammalian species.

Study area



Processing environment

Google Colaboratory · python · R

Input data

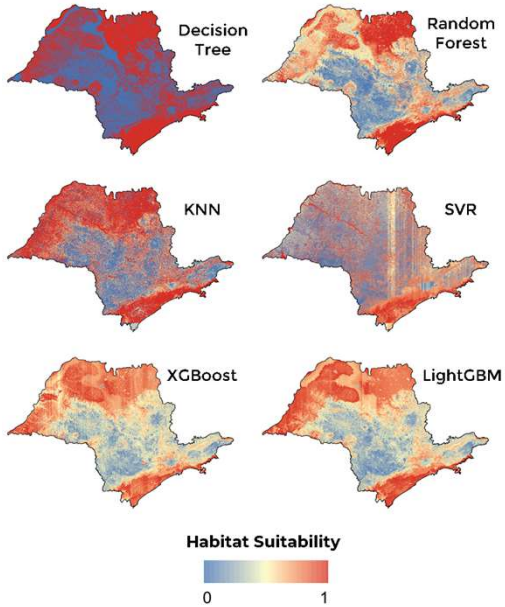
- Altitude
- Slope
- Precipitation
- Temperature
- Artificial Nightlights
- Land Cover

Occurrence data GBIF Global Biodiversity Information Facility

Regression Machine Learning Models

- Decision Tree
- Random Forest
- KNN
- SVR
- XGBoost
- LightGBM

Results



Conclusions

- Tree-based models performed better than distance-based and margin-maximizing methods.
- The Habitat Suitability in a protected areas must be consistent with its category and with the objectives of its creation.
- The occurrence of the species indicates but does not define the suitability of the habitat.

Embedding Sustainable Development Goals in Engineering Curriculum

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Abstract

Engineers have a critical impact on the world and society, regardless of their discipline or chosen career path. Engaging with and embedding the United Nations Sustainable Development Goals (SDGs) within engineering curriculum is vital to develop graduates with a real-world focus, who will be able to tackle the problems of the future sustainably. A framework is presented, starting with engaging with the goals as educators and understanding how different disciplines could relate to each of the SDGs. Following engagement with the goals, groups identify how SDGs could be addressed across the learning outcomes, assessments, technical and non-technical content within a subject. This poster highlights the process and some of the outcomes of the first workshop where this framework was presented.

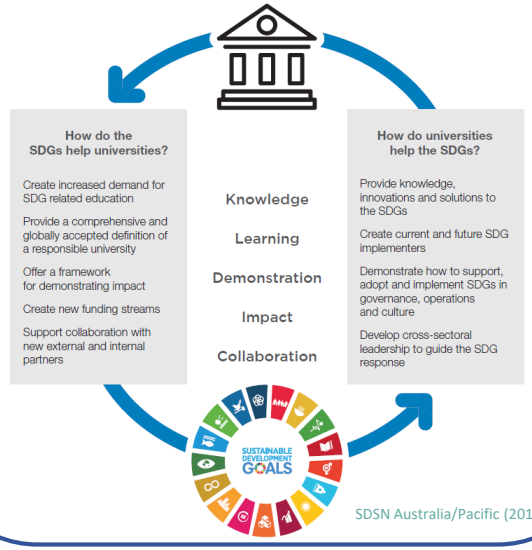
The Workshop

A workshop on how to embed SDGs within engineering curriculum was developed and was presented at a national engineering education conference in 2022. It consisted of interactive activities and two sessions of engagement, and was attended by

What impacts do engineers have on the world and society?

Word cloud of responses from the AAEE 2022 Workshop

Universities and the SDGs



SDSN Australia/Pacific (2017)

How do engineering disciplines engage with the SDGs?

- Participants were asked to choose their top 3 goals – whilst there were 5 goals clearly favoured (6,12 7, 9, 11), there were 5 that were not chosen at all (5, 8, 15, 16, 17)
- Groups were then asked to think about some of these less commonly chosen goals to think about how the indicators and targets could relate to different disciplines of engineering
- Results were surprising! From human trafficking to weapons, to how plastic generation impacts life below water. Thinking outside the box broadens the educators involvement and there were always things to relate to.

How to embed SDGs in subjects?

After engaging with the goals, participants are challenged to think about particular subjects they are involved within and identify:

- What are the relevant SDGs and targets for this subject?
- How are SDGs referenced in the subject description?
- Do the subject learning outcomes mention the SDGs?
- Does the technical content covered address the SDG targets?
- How can assessments be adapted to assure learning towards the goals?
- Does the subject help prepare students for delivering the goals by developing transferable skills?

Feedback from workshop

- Loved hearing about the need to track human trafficking. Also the need for better weapons to avoid collateral damage in warfare
- Great workshop. I realize I need to make more explicit connections to the SDGs in my courses
- Loved the suggestions for how to explicitly embed across the curriculum - will be using your suggestions, very useful!! Great to also have the time to reflect.
- A framework / exercises for getting the students familar with the SDGs
- The goals are vauge, you've shown where the real substance in the UNSDGs are
- the struggles are common. Great discussion on how to embed these goals.
- LOVED the first activity. I've realised we need to look way more at the indicators.
- Loved learning from other people!

Outcomes

This workshop demonstrated the untapped potential of engineering educating engaging with the SDGs, indicators and targets. Through a structure approach, educators were challenged to investigate the SDGs in depth and identify how they could integrate with teaching practices. Embedding the UN SDGS within engineering practice will enable the engineers of the future to support the transition to a sustainable economy.

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Challenges Facing the Digital Transformation of Higher Education in Vietnam and Its Impact on the Quality of Education

Key Concept

The 4th Industrial Revolution (IR 4.0) is the application of the latest advances of automation and data sharing in manufacturing technologies, such as cyber-physical networks, Internet of Things, Cloud, and Artificial Intelligence to establish a deeply integrated production model of customised products and services, transforming traditional industries into smart industries (Zhou et al., 2015).

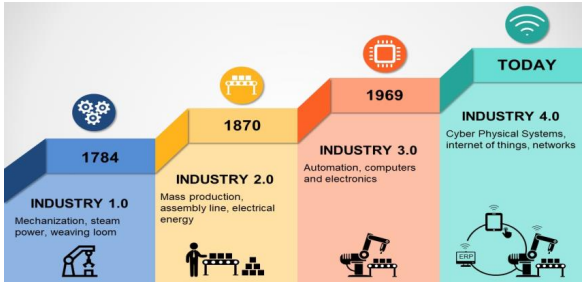

Figure 1. The four stages of the industrial revolution.
Source: https://www.conceptncontent.com/industrial-revolution-4-0/

Digital Transformation (DX) can be defined as "the modification of processes, procedures, capabilities and policies to take advantage of the changes and opportunities posed by new digital technologies". Vision, strategy, people, processes, and technology are essential for digital Transformation (Sandhu, 2018).

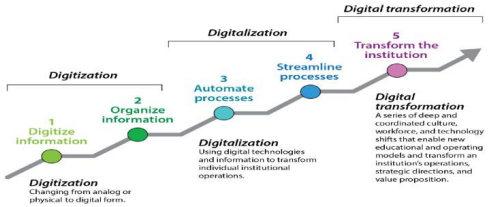

Figure 2. Digital transformation in context (Brooks & McCormack, 2020).

DX in Higher Education is the transformation of all educational activities from real or physical to cyber-physical environments enabled by Artificial Intelligence (AI), Internet of Things (IoT), Cloud, Big Data and other digital technologies and other digital technologies (Ho & Nguyen, 2022).

Background

The emergence of digitalized education is a global phenomenon resulting from the rapid advancement of information technology in the context of the 4th Industrial Revolution. Artificial intelligence, big data, block chain, and other emerging technologies will transform the nature of teaching and learning, leading to a restructuring of education's culture and ecology (Xiao, 2019). DX in higher education is regarded as essential not only to compete, but also to sustain core operation (Marks, 2020). DX in HE can enhance access to education, scale up training capacity, increase the quality of teaching and learning, and provide new opportunities for lifelong learning, ultimately contributing to the achievement of SDG 4 Quality Education. In that context, Vietnam higher education needs to be revamped to cope with changes in the work nature, the industries and requirements of labor future skills in the IR 4.0 era. Notably, the "National Digital Transformation Program to 2025 with a vision to 2030" approved by Vietnam Prime Minister highlights that education is one of the top priorities in digital transformation (Prime Minister, 2020).

Problem Statement

The current state of information technology application and digital transformation in Vietnam's education falls behind expectations, being in its early development and experiencing numerous obstacles (Nguyen, 2020). These challenges have a significant impact on achieving SDG 4 Quality Education of the country. According to Pham et al. (2021), higher education in Vietnam needs to identify and overcome all current challenges facing the digital transformation in order to prepare high-quality human resources to satisfy IR 4.0 requirements. This investigation is going to address this issue.

Investigation Question

What are the challenges of digital transformation in higher education in Vietnam and its impact on the quality of education ?

Significance

The investigation may contribute to knowledge enrichment and practice advancement of DX in Vietnam's higher education. The approach in this investigation is essential to achieve a holistic DX and contributes to a more inclusive and equitable quality education, which is crucial for achieving SDG 4.

Challenges & Impact on Quality of Education

1. Lack of holistic strategies

- ✓ DX in higher education in Vietnam has not yet developed holistic strategies (Pitt et al., 2022). Only a minority of educational institutions have already formed a DX taskforce team and begin establishing their own DX strategies (Ho & Nguyen, 2021).
- ✓ Even having strategies, the incorporation of strategies into the actual plan has been implemented slowly and the DX of the universities in Vietnam is just at the beginning (Nguyen, 2020; Tri et al., 2021).
- ✓ DX strategies in Vietnam have been lagging behind other countries in the area and globally regarding the development history, the cohesion and comprehension of strategies.

=> A lack of strategies can lead to a fragmented programme and an infrastructure that is challenging to manage and slow to react to the rapidly evolving market requirements (PWC, 2018).

2. Insufficient regulatory framework

- ✓ Vietnam government has not yet established a clear implementation guideline for applying and adopting these policies to encourage the development of DX (Do, 2020).
- ✓ There is a lack of adequate regulations that encourage and facilitate the use of current educational technologies in regular courses (Pham & Ho, 2020).

=> the government's unclear policies regarding incorporating e-learning into regular courses constitute a significant factor preventing institutions from integrating online education into their regular curriculum (Pham & Ho, 2020).

3. Conventional learning - teaching pedagogies and inappropriate education content

- ✓ Teaching and learning pedagogies at Vietnam's educational institutions are predominantly conventional (Ho & Nguyen, 2021)
- ✓ Vietnamese educators are not well-equipped to deploy technology-based tools in the classroom, resulting in their lack of confidence and skepticism in online and blended learning methods (Nguyen et al., 2022).
- ✓ Learning in digital environment with self-directed approach is also challenging for the majority of university students (Alebaikan & Troudi, 2010).
- ✓ Vietnam's education content is outdated and inappropriate, making them incompatible with the expectations of IR 4.0 (Tran et al., 2022)
- ✓ The content are not yet aligned with current industry standards, the teaching pedagogies and assessments are incorrect and unrealistic, and the curriculum is inflexible, with only a few elective subjects that meet students' competencies and needs (Tran et al., 2022).

=> Face-to-face education is still the predominant method of instruction in the country, while online learning accounts for just a tiny percentage and the implementation of the blended model remains limited (Tran et al., 2022).

=> Low human capability: the current labour force of Vietnam is deficient in professional expertise, leadership, and communication, resulting in low labor productivity, at about 4.4% of Singapore; 17.4% of Malaysia; 35.2% of Thailand; 48.5% of the Philippines; and 48.5% of Indonesia (Tri et al., 2021).

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Challenges Facing the Digital Transformation of Higher Education in Vietnam and Its Impact on the Quality of Education

4. Insufficient and inconsistent awareness and lack of digital competence of human resource

- ✓ The insufficient awareness of its key stakeholders about DX, particularly among leaders who are enabling factors of this process The most significant barriers that hinder digital transformation and the policies that support DX is the mindset and perceptions of leaders that are not open (Hai et al., 2021).
- ✓ Perceptions about who should be involved in and support DX vary widely by campus roles (Brooks & McCormack, 2020). Many individuals might misunderstand digital transformation with digitisation (of digital information) and digitalisation (of processes).
- ✓ Vietnam's school administrators, lecturers, and non-teaching employees have limited and inconsistent digital abilities (Nguyen, 2020): teachers lack training in e-pedagogies, students' self-directed learning in the digital environment is spontaneous,

=> They are not willing and ready for the DX which is the most hinder element for the transformation.

Implication

Research Implication

- ✓ Further research on other constrains of DX in higher education based on proposed DX ecosystem in education by Ho and Nguyen (2022) is recommended.
- ✓ It might include further review on barriers regarding digital infrastructure, platforms, digital administration and management, data and connectivity, safety and security, especially with attention to equity and inclusion elements
- ✓ A focus on studies of e-pedagogies including online learning and blended learning is strongly suggested since this is the critical hindrance in DX in higher education in Vietnam.

Policy Implication

- ✓ Vietnam government, MOET and authorities should further develop the regulatory framework within education including legal documents with clear implementation guidelines on curriculum, management, and assessment in the context of IR 4.0.
- ✓ Vietnam should promote better curriculum practises by implementing regulations that encourage higher education institutions to adopt innovative methods to course design, mainly through embracing new technology and pedagogies.
- ✓ A common development DX strategy and implementation roadmaps for higher education institutions in Vietnam is recommended. These initiatives should be connected to ministry-level metrics for digital transformation and offer higher education the required assistance to address how to implement digital transformation in their institutions.
- ✓ Universities must establish a devoted core DX task force to design and implement the DX strategies, action plan, and feedback on practises for government and policymakers.

Practice Implication

- ✓ Capacity development for higher education personnel regarding awareness, digital skills, and e-pedagogies are strongly recommended.
- ✓ Digital literacy training, mentorship, and guidance should be provided at the national and organisational levels.
- ✓ The renovation of education content, curriculum teaching-learning pedagogies should be promoted to improve the quality of Vietnamese university graduates.
- ✓ It is essential to promote knowledge sharing and prototype DX training programmes to leverage the expertise of key stakeholders in higher education in Vietnam.
- ✓ Integrating blended learning for most higher education programs is critical for digital transformation. This would enable the whole higher education key stakeholders to prepare for the digital age.

Overall, academics, producers, and decision-makers should strengthen their communication and collaboration to recognize and investigate challenges and recommendations for the DX in Vietnamese higher education.

References

Alebaikan, R., & Troudi, S. (2010). Blended learning in Saudi universities: Challenges and perspectives. *ALT-J*, *18*(1), 49–59. https://doi.org/10.1080/09687761003657614

Do, K. L. (2020). Legal framework for the digital economy in Vietnam. *PS-Engage*. https://ps-engage.com/legal-framework-for-the-digital-economy-in-vietnam/

Hai, T. N., Van, Q. N., & Thi Tuyet, M. N. (2021). Digital Transformation: Opportunities and Challenges for Leaders in the Emerging Countries in Response to Covid-19 Pandemic. *Emerging Science Journal*, *5*, 21–36. https://doi.org/10.28991/esj-2021-SPER-03

Ho, T. B., & Nguyen, N. Q. (2021). *Activity report on the fact finding on digital transformation at 11 partner TVET institutes*. GIZ Vietnam. https://drive.google.com/file/d/16mn

Ho, T. B., & Nguyen, N. Q. (2022). *Chuyển đổi số thế nào?* Information and Communications Publishing House.

Marks, A., & AL-Ali, M. (2020). Digital Transformation in Higher Education: A Framework for Maturity Assessment. *International Journal of Advanced Computer Science and Applications*, *11*(12). https://doi.org/10.14569/IJACSA.2020.0111261

Nguyen-Anh, T., Nguyen, A. T., Tran-Phuong, C., & Nguyen-Thi-Phuong, A. (2022). Digital transformation in higher education from online learning perspective: A comparative study of Singapore and Vietnam. *Policy Futures in Education*, 147821032211241. https://doi.org/10.1177/14782103221124181

Nguyen, S. D. (2020). Digital transformation in art pedagogical training in Vietnam today. *Vietnam Journal of Education*, *4*(4), 69–75. https://doi.org/10.52296/vje.2020.82

Pham, H. Q. (2013). *Teacher education curriculum development: Theory and practice*. Thai Nguyen University Publishing House.

Pham, H., Tran, Q.-N., La, G.-L., Doan, H.-M., & Vu, T.-D. (2021). Readiness for digital transformation of higher education in the Covid-19 context: The dataset of Vietnam's students. *Data in Brief*, *39*, 107482. https://doi.org/10.1016/j.dib.2021.107482

Pham, H.-H., & Ho, T.-T.-H. (2020). Toward a 'new normal' with e-learning in Vietnamese higher education during the post COVID-19 pandemic. *Higher Education Research & Development*, *39*(7), 1327–1331. https://doi.org/10.1080/07294360.2020.1823945

Pitt, B., Huynh, T. Q., Gregson, J., Seal, T., Tran, H. H., Nguyen, H. T., Bui, T. N. T., & Nguyen, H. M. (2022). *Readiness of Digital Transformation in Vietnamese Universities*. British Council. https://www.britishcouncil.vn/sites/default/files/report_readiness_of_digital_transformation_in_vietnamese_universities.pdf

Prime Minister. (2020). *Decision No. 749/QD-TTg on National Digital Transformation Program through 2025, with a view towards 2030.* https://english.luatvietnam.vn/decision-no-749-qd-ttg-on-approving-the-national-digital-transformation-program-until-2025-with-a-vision-184241-doc1.html

PWC. (2018). *The 2018 digital university: Staying relevant in the digital age.* Pwc. https://www.pwc.co.uk/publicsector

Sandhu, G. (2018). The role of academic libraries in the digital transformation of the universities. *5th International Symposium on Emerging Trends and Technologies in Libraries and Information Services (ETTLIS)* (292-296). IEEE.

Prime Minister. (2020). *Decision No. 749/QD-TTg on National Digital Transformation Program through 2025, with a view towards 2030.* https://english.luatvietnam.vn/decision-no-749-qd-ttg-on-approving-the-national-digital-transformation-program-until-2025-with-a-vision-184241-doc1.html

Xiao, J. (2019). Digital transformation in higher education: Critiquing the five-year development plans (2016-2020) of 75 Chinese universities. *Distance Education*, *40*(4), 515–533. https://doi.org/10.1080/01587919.2019.1680272

Zhou, K., Liu, T., & Zhou, L. (2015). *Industry 4.0: Towards future industrial opportunities and challenges*. 2147–2152.

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WREN 2023
The First WREN Symposium

Development of eco-efficient geopolymeric mortars using chamotte and waste glass-based alkaline solutions

Beatryz Cardoso Mendes/Federal University of Viçosa

Leonardo Gonçalves Pedroti/ Federal University of Viçosa

Introduction

Geopolymers are binder materials that can be an alternative to replace Portland cement. They are considered less aggressive to the environment because of the lower emission of CO_2 and use of energy in their production chain. In addition, these materials can be produced using alternative raw-materials such as solid wastes, making them more sustainable. This work aimed to manufacture a more eco-efficient geopolymeric mortar and to recycle industrial wastes, chamotte and waste glass (WG).

Methodology

Four selected pastes from a previous study [1] were submitted to mechanical strength tests, microstructural evaluation and isothermal calorimetry tests. Two mixtures of mortar were produced for each paste, the first being defined based on preliminary studies, and the second based on the modified Andreasen packing method. Physical and mechanical tests were performed, and the environmental impacts of replacing the traditional activator by the WG-based one were also assessed.

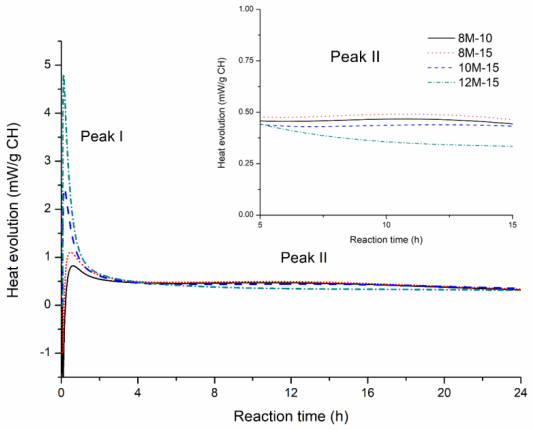

Figure 1. Isothermal calorimetry of 8M-10, 8M-15, 10M-15 and 12M-15 pastes.

Results and Discussion

The microstructural analyses revealed that pastes with molar concentration of 8 mol/L and waste glass content of 10g and 15g demonstrated higher formation of zeolite structures and development of polycondensation reactions (Fig. 1). Regarding to the characterization of mortars, it can be concluded that addition of sand and particle packing are key factors to determine the final properties in low-strength composites (Fig. 2). The use of alternative activator can reduce 69.8 % of the embodied energy and 78.0 % of CO_2 footprint compared to the traditional waterglass activators (Table 1).

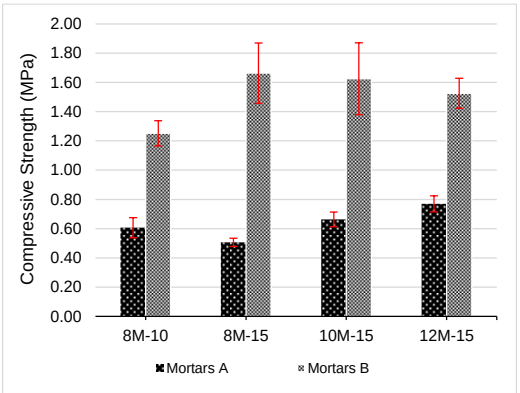

Figure 2. Compressive strength of mortars A and B at 7 days.

Conclusion

This study proved the sustainability potential and technical viability of using WG as an activator in chamotte-based geopolymeric mortars.

Constituent	Embodied energy (MJ/kg)	CO_2 footprint (kg/kg)
Commercial sodium silicate	5.40	1.50
WG-based solution	1.63	0.33
Waste glass	0.11	0.01
NaOH	0.78	0.14
Heating contribution	0.74	0.18
	SUB-RAW Index	**0.589**

Table 1. Embodied energy and CO2 footprint values of commercial waterglass and waste glass-based solution.

References

[1] Mendes BC, Pedroti LG, Vieira CMF, Carvalho JMF, Ribeiro JCL, Albuini-Oliveira NM, et al. Evaluation of eco-efficient geopolymer using chamotte and waste glass-based alkaline solutions. Case Stud Constr Mater 2022;16:e00847. https://doi.org/10.1016/j.cscm.2021.e00847.

Acknowledgements/Contact

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UFV Universidade Federal de Viçosa

Machine learning models for predicting compressive strength of concrete: potential and challenges

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Concrete composition

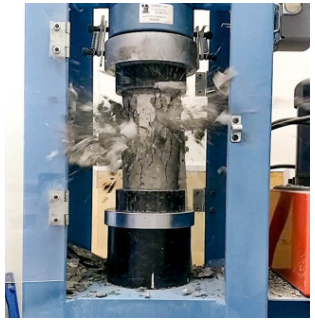
Concrete composition: Portland cement, fine aggregates, coarse aggregates, water, blast furnace slag, fly ash, superplasticizer (in order)

Rc

Compressive strength of concrete

However, experimental tests of Rc demand high expenditure of:

- Human labor.
- Natural resource.
- Time.



Rupture of cylindrical specimen in a hydraulic press

Typically,

Traditional concrete mix design methods:

- American Concrete Institute (ACI).
- Brazilian Association of Portland Cement (ABCP).
- Brazilian Technological Research Institute.

They are based in empirical tables and formulas

Innovatively,

Machine learning (ML) techniques:

- Extreme Gradient Boosting (XGBoost).
- Support Vector Regression (SVR).
- Artificial Neural Networks (ANN).
- Gaussian Process Regression (GPR).

They identify patterns in a given dataset with a bunch of concrete mixes and predict the Rc of a new mix with little human intervention.

We built ML models with:

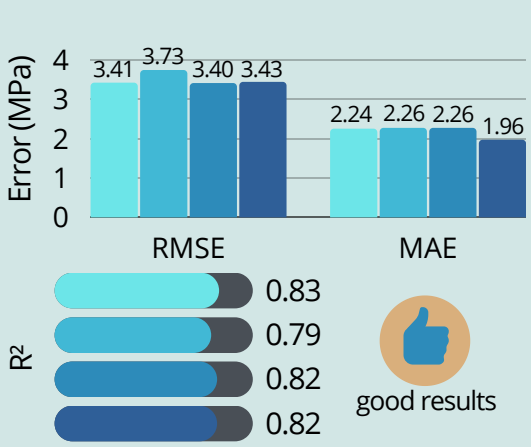
Yeh's dataset

- Most studied worldwide
- Data from Taiwan
- Data from 1987-1997
- 329 instances

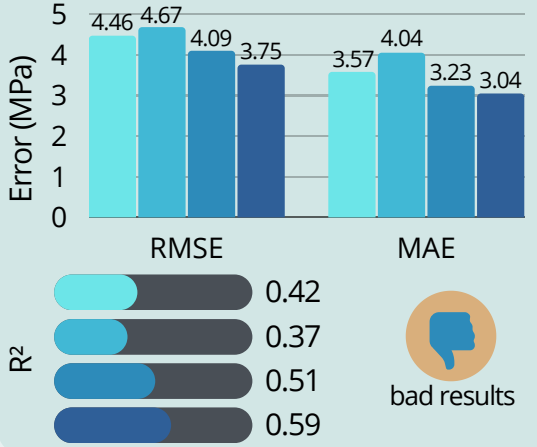
New diverse dataset

- Data from studies worldwide
- Data from 2009-2019
- 22 instances

Accuracy of the models trained and tested with Yeh's dataset



Accuracy of the models trained with Yeh's dataset and tested with the diverse dataset



RMSE: Root Mean Square Error
MAE: Mean Absolute Error
R²: Coefficient of Determination

XGBoost SVR ANN GPR

To solve this issue, we need a training dataset avoiding:

- Old data;
- Specific regions.
- Specific materials.
- Specific concrete types.

Sustainble development goals covered

References
R. C. F. D. Paixão, R. E. K. Penido, A. A. Cury, and J. C. Mendes, "Comparison of machine learning techniques to predict the compressive strength of concrete and considerations on model generalization". IBRACON Structures and Materials Journal, vol. 15, n. 5, 2022.
I. C. Yeh, "Modeling of strength of high-performance concrete using artificial neural networks". Cement and Concrete research, pp. 1797-1808, 1998.
D. V. Dao, H. Adeli, H. B. Ly, L. M. Le, V. M. Le, T. T. Le, and B. T. Pham, "A sensitivity and robustness analysis of GPR and ANN for high-performance concrete compressive strength prediction using a Monte Carlo simulation". Sustainability, p. 830, 2020.

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WREN 2023
The First WREN Symposium

FEMALE PARTICIPATION IN BRAZILIAN ENGINEERING GRADUATE PROGRAMS: AN ANALYSIS OF CIVIL, ENVIRONMENTAL, AND TRANSPORT ENGINEERING

AUTHORS AND AFFILIATIONS

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WREN 2023 The 1st WREN Symposium

01. INTRODUCTION

- Currently, women are most graduate students in Brazil.
- Female participation in STEM careers remains incipient, especially as professors.
- The percentage of women (in all fields) decreases as they advance in academic careers – the Scissor Effect.
- Lack of women's representativeness puts them at disadvantage: female professors could act as role models to be followed by female students.

02. OBJECTIVE

This study analyzes the female participation in Brazilian Civil, Environmental and Transport engineering graduate programs between 2013 and 2020, and investigate the advisor-advisee relationships by gender.

This work focuses on the gendered aspects of the advisor-advisee relationship as a potential explanation for women's struggles in academia.

03. METHODOLOGY

- Data from all master's thesis and PhD dissertations from Brazilian Engineering graduate programs (Civil, Transport and Enviromental) between 2013 and 2020.
- Identify the sex the 16,131 master's and Ph.D. advisor-advisee pairs.
- Development of a library of first names, to establish the sex of students and professors.

04. RESULTS/FINDINGS

47%

47% of master's degree receivers between 2013 and 2020 were women

42%

42% of PhDs receivers between 2013 and 2020 were women

28%

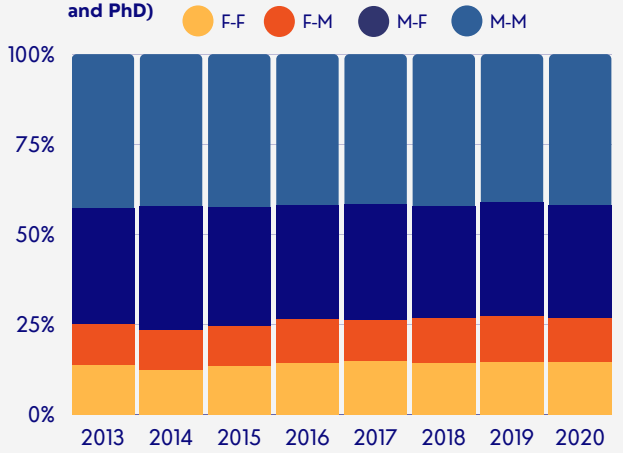
Women represent only 28% of advisors

Ratio of advisees to advisors according to the advisor's sex

Male professors advise 13% more students

Proportionally, female advisors tend to work with female students, and male advisors tend to work with male students.

Pairs of advisor-advisee related by their sex (master's and PhD)



05. CONCLUSIONS

- The increase in female participation in engineering graduate programs has not yet been reflected in their greater participation in higher academic positions - confirmation of the Scissor Effect in the analyzed fields.
- There is an urgent need for the implementation of public policies to reduce gender differences in academia since gender equity is fundamental for a more egalitarian and sustainable society.

Main References: Bolzani, V. d. (2017). Mulheres na ciência: por que ainda somos tão poucas? Ciência e cultura, 69(4), 56-59. doi:10.21800/2317-66602017000400017; Gaule, P., & Piacentini, M. (2018). An advisor like me? Advisor gender and post-graduate careers in science. Research Policy, 47(4), 805-813. doi:10.1016/j.respol.2018.02.011; Schienbinger, L. (2001). O Feminismo Mudou a Ciência? Bauru, SP: EDUSC.

Acknowledgements: CAPES, FAPEMIG.

Career Progression of Women Academics in STEM: a New Conceptual Approach

The under-representation of women academics in STEM (science, technology, engineering, and mathematics) persists in Australia, despite female participation rates being at an all-time high. Within higher education, less than one-third (29%) of women work in STEM disciplines, compared to half (49%) in non-STEM disciplines (Department of Industry Science Resources, 2022).

What do we really know about the reasons and causes for this?

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Introduction

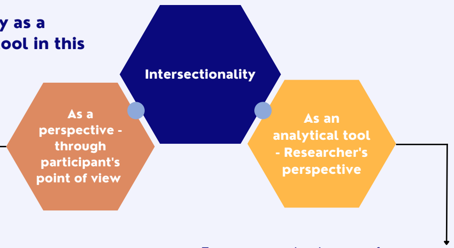
Women's underrepresentation in stem academia is more prominent in senior roles. Most current research address this at a macro level. A new research approach is required to better understand the causes/issues, and consequently redress this gender imbalance in STEM higher education.

Aims

- Provide a micro-level of analysis by exploring how various identities of women academics in STEM influence career progression
- Aims to understand how the interactions of meso-level organisational stakeholders play a crucial role in the career progression of women academics in STEM

New Conceptual Approach

The use of Intersectionality as a perspective and an analytical tool in this study.

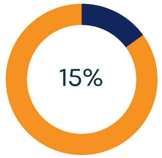


- To focus on the individual (micro level)
- To focus on organisational stakeholder's influence on the individual (micro and meso levels)

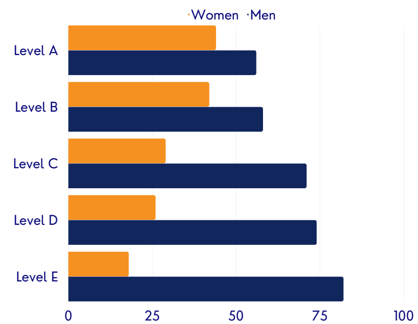
- To investigate the diversity of experiences in women academics in STEM (Atewologun & Mahalingam, 2018)
- Through lived experiences of micro and meso levels, explore power dynamics related to career progression that make various identities invisible (Acker, 2006; Atewologun & Mahalingam, 2018)
- To focus on the intersectional location of the researcher using intersectional reflexivity (Atewologun & Mahalingam, 2018; Kassam et al., 2020)

	Identity	Intersectionality	Meso-level Organisational Stakeholders	Type of Research
Key Themes	Sense of self, power relationships, and sensemaking (Alvesson et al. 2008; Ashforth & Schinoff 2016; Brown 2021)	Relationship between various identities, power in conceptualising, theorising and analysing identities and identifications, subjective importance and the situational relevance of various identities (Atewologun et al. 2020; McCall 2005)	Individuals who are involved in the career progression of women academics, such as promotion committee members, heads of schools and discipline leaders (Allen et al. 2021; González Ramos et al. 2015; Halili & Martin 2020; Huang et al. 2020; Maxwell et al. 2019)	Qualitative research to capture the complexities that are presented in this research topic.

Background



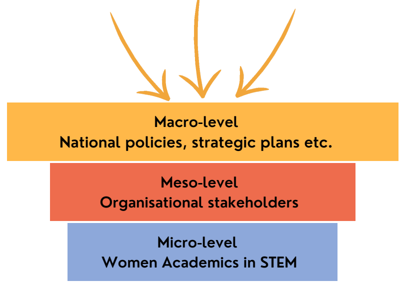
Women Working in STEM Occupations – Australia 2021
(Department of Industry Science Resources, 2021)



Research and Teaching Workforce 2021
(Department of Industry Science Resources 2022)

Macro level

- National strategic plans
- **Gender Equality and Women's Empowerment Strategy 2016** (Australian Academy of Science 2019; Norma Jarboe 2017; Universities Australia 2020)
- **The Decadal Plan** (Australian Academy of Science 2019; McKinnon 2022)
- **Launch of the STEM Equity Evaluation Portal** (Women in STEM Ambassador 2022)
- Institutional frameworks - **SAGE Athena Swan Charter** (SAGE 2021)
- Regulatory frameworks - **The Role and Future of TEQSA** (Universities Australia 2010, 2016)
- Legislation - **Workplace Gender Equality Act 2012** (Australian Government 2012)



This research proposes using a **different conceptual approach, which gives primacy to the individual and meso-level areas** to better understand why women don't progress in their careers in the same way as men.

Research questions

We propose future research shifts towards the individual level, multi-level analysis, and using different theoretical lenses. To address this, we are using Intersectionality and Constructivist Grounded Theory to explore the following research questions.

- How do various identity intersections of women academics in STEM influence their career progression?
- How do the interactions of organisational stakeholders play a role in career progression?

Related literature

Ashforth, BE & Johnson, SA 2002, 'Which Hat to Wear? The Relative Salience of Multiple Identities in Organizational Contexts', in MA Hogg & DJ Terry (eds), Social Identity Processes in Organizational Contexts, Psychology Press.
Ashforth, BE & Schinoff, BS 2016, 'Identity Under Construction: How Individuals Come to Define Themselves in Organizations', Annual Review of Organizational Psychology and Organizational Behavior, vol. 3, no. 1, pp. 111-37.
AlAlvesson, M, Lee Ashcraft, K & Thomas, R 2008, 'Identity Matters: Reflections on the Construction of Identity Scholarship in Organization Studies', Organization, vol. 15, no. 1, pp. 5-28.
Alyessonmukhambetova, A, Torrano, DH & Nam, A 2021, 'Fixing the Leaky Pipeline for Talented Women in STEM', International Journal of Science and Mathematics Education.
, M & Willmott, H 2002, 'Identity Regulation as Organizational Control: Producing the Appropriate Individual', Journal of Management Studies, vol. 39, no. 5, pp. 619-44.
Atewologun, D 2011, 'ADVANCING RACIO-ETHNIC AND DIVERSITY THEORISING THROUGH 'INTERSECTIONAL IDENTITY WORK'', Academy of Management Annual Meeting Proceedings, vol. 2011, no. 1, pp. 1-6.
Atewologun, D, Kutzer, R & Doldor, E 2020, 'Applying an Intersectional Perspective to Identity Foci at Work', in AD Brown (ed.), The Oxford Handbook of Identities in Organizations.
Atewologun, D & Mahalingam, R 2018, 'Intersectionality as a methodological tool in qualitative equality, diversity and inclusion research', in LAE Booysen, R Bendl & JK Pringle (eds), Handbook of Research Methods in Diversity Management, Equality and Inclusion at Work, pp. 149-70.
Atewologun, D & Sealy, R 2014, 'Experiencing privilege at ethnic, gender and senior intersections', Journal of Managerial Psychology, vol. 29, no. 4, pp. 423-39.
Atewologun, D, Sealy, R & Vinnicombe, S 2016, 'Revealing Intersectional Dynamics in Organizations: Introducing 'Intersectional Identity Work': GENDER, WORK AND ORGANIZATION', Gender, Work & Organization, vol. 23, no. 3, pp. 223-47.
Australian Academy of Science 2019, Women in STEM Decadal Plan, Australian Academy of Science.
Department of Industry Science Resources 2022, Teaching and research workforce in STEM and other fields | STEM Equity Monitor | Department of Industry, Science and Resources, 2022/09/20/T17:59:52+1000, https://www.industry.gov.au/publications/stem-equity-monitor/workforce-data/teaching-and-research-workforce-stem-and-other-fields.

Ethanol fermentation of tapioca wastewater in anaerobic baffled reactor

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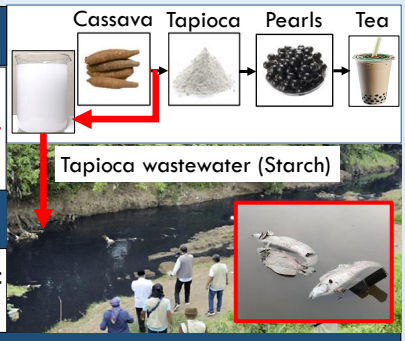
①Introduction

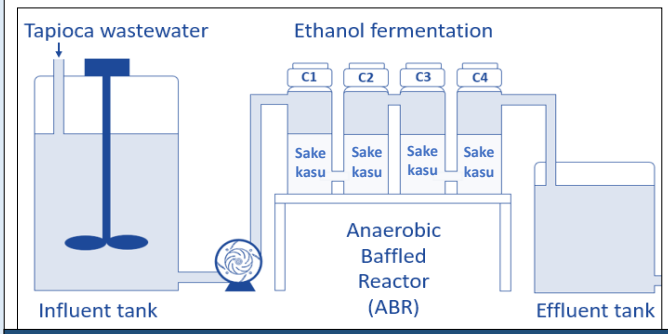
Tapioca wastewater has COD between 6,000-20,000 mg.L^{-1} (Zainuddin, 2021). It was reported polluting the water environment, resulting to fish death (Mufidah, 2020). Anaerobic treatment provides low cost to reduce the COD, yet the HRT was very long (24 h) (Jiraprasertwong, 2019).



②Research objectives

(1) To evaluate the performance of tapioca wastewater ethanol fermentation in Anaerobic Baffled Reactor (ABR) with sake kasu as microbial source (2) To elucidate the microorganisms

③Materials and methods



ABR characteristics		
1	Column number	4
2	Total volume	10 L
3	Working volume	8 L

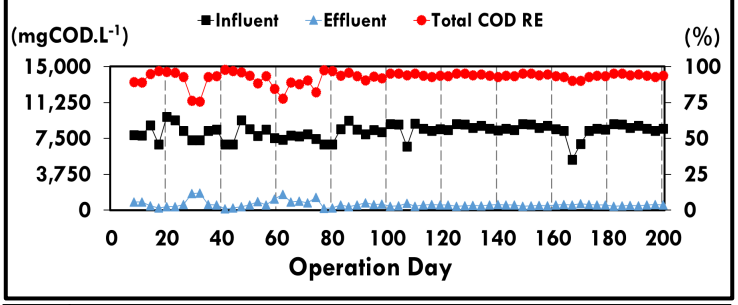
Operation condition		
1	Temperature	30°C
2	Flowrate	0.8 L/h (19.2 L/d)
3	HRT	10 h (8 L / 0.8 L/h)

Tapioca wastewater characteristics		
1	T-COD	6,900 mg.L^{-1}
2	S-COD	1,230 mg. L^{-1}
3	pH	6.71
4	ORP	-170.52 mV

In each column, 100 g of sake kasu was mixed with 160 g of tapioca, 40 g of peptone, 40 g of malt extract, 2 g of $MgCl_2$, 2 g of KH_2PO_4, and 4 L of ultrapure water to cultivate microorganisms

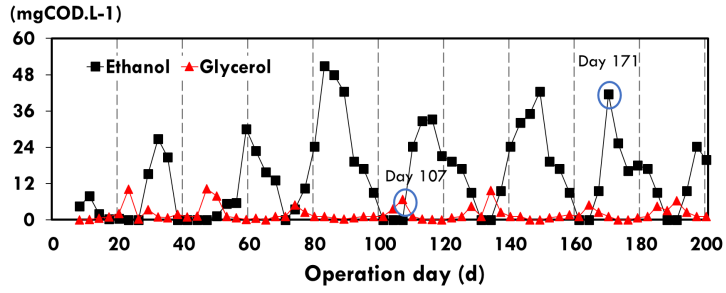
④Results and discussions

Total COD removal



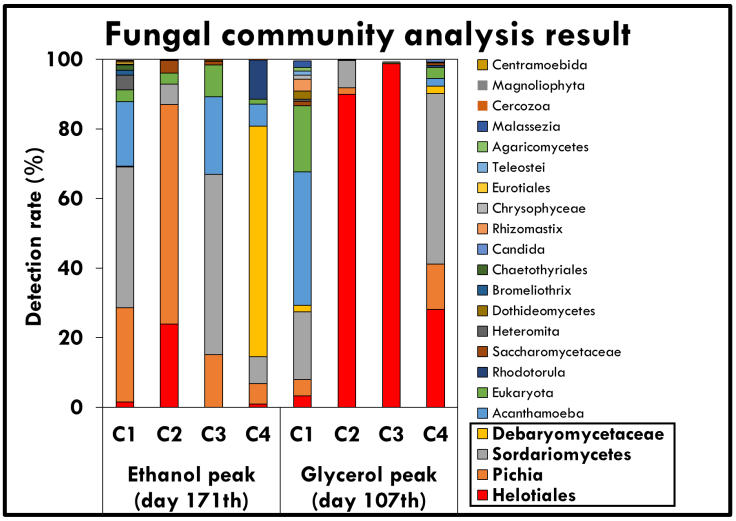
① After 80 days, COD RE reached 92.31%, higher than that in anaerobic treatment (40%) with same HRT.

Ethanol production performance

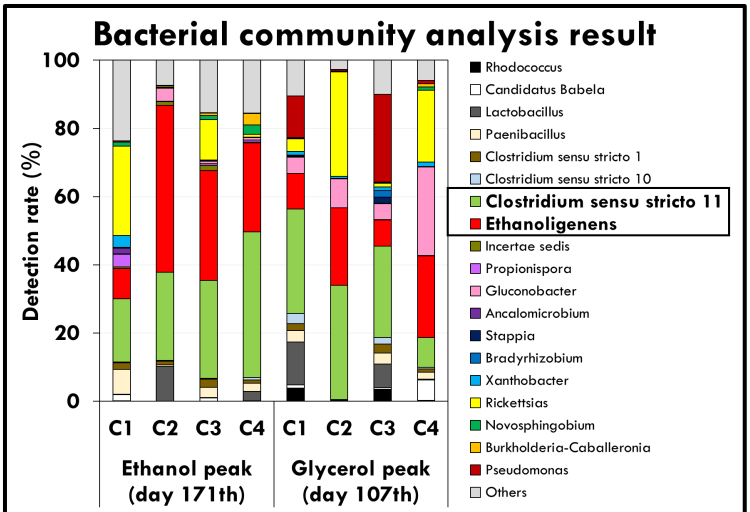


② Instead of continuous production, ethanol cycles took place between 10-15 days due to glycerol formation

Fungal community analysis result



Bacterial community analysis result



③ The interaction between bacteria (*C. sensu stricto 11*, *Ethanoligenens*), and fungi (*Debaryomycetaceae*, *Sordariomycetes*, *Pichia*) were observed in ethanol peak. Meanwhile, *Helotiales* increased significantly during glycerol peak.

⑤Conclusion

Ethanol fermentation of tapioca wastewater in ABR showed high efficiency for COD removal and ethanol production. Controlling fungal population could be considered a potential strategy to improve ethanol.

Road Accidentity: Data Analysis Using Multinomial Logistics Regression: Casa Study The State of Rio de Janeiro - Brazil

Rita de Cassia Girardi - USP

Adriana Coelho Vieira – INMETRO

What are the main causes of road accidents?

POLÍCIA RODOVIÁRIA FEDERAL

BOLETIM DE ACIDENTE DE TRÂNSITO

What is urban mobility?

- People and objects easy going to move from one place to another.
- The world's population becomes more urban each year.
- 54% of the population is currently urban; By 2050 (UN) 66%.

Influence of Highways/ Essential factors

The strong urban expansion caused the highways to be included in urban areas. The highways have a high flow of people and cargo.

75% of production in the country is transported by road network (ANTT)

2021 there were 64,452 accidents (BR) 4,562 in RJ (PRF)

2021 5,391 fatalities BR 308 in RJ (PRF)

National Land Transport Agency (ANTT) - Federal Highway Police (PRF)

Use safety devices; Respect the limits imposed by the road;

Do not combine vehicle and driving to alcoholic beverages or drugs;

Do not use electronic devices.

World Health Organization (WHO) - United Nations (UN)

Injury

Personal Injury by Land Motor Vehicles (DPVAT)
National School of Insurance (ENS)
National Transport Confederation (CNT)

BRL 292 Billion, or **4%** of the national GDP, is the total annual cost (2019) of road accidents in Brazil.

BRL 800 million per day (ENS).

BRL 6.74 billion (2020) is the total investment in highways (CNT).

In Brazil there were more than **40,000** indemnities for death

230 thousand for disability (DPVAT).

2021 – 2030

Decade of action for Road Safety

The WHO kicked off the Decade of Action for Road Safety 2021-2030, with the ambitious goal of preventing at least 50% of road traffic deaths and injuries by 2030.

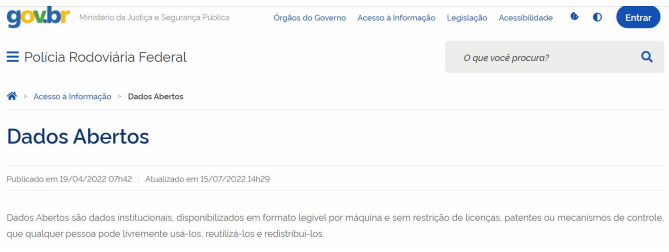
The program **Avançar Cidades** – Urban Mobility Program aims to improve the quality of population movements in urban environments through the financing of urban mobility actions.

3 GOOD HEALTH AND WELL-BEING

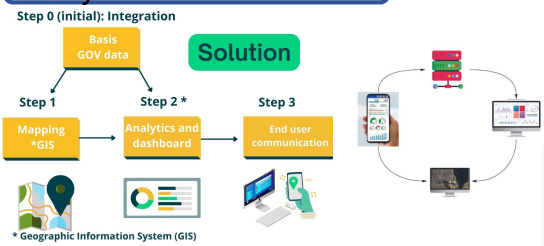
11 SUSTAINABLE CITIES AND COMMUNITIES

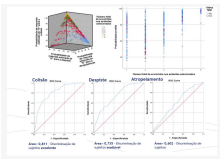
ROTA 2030

The project - Database - PRF - Brazil



System - Flowchart





System background

Conclusions – Results expected

Identify the main factors: gravity impact, type of victim involvement, accidents, intervening vehicles
external features, driver actions e additional information.

From using the system: The citizen will have a tool to help prevent accidents, and public and private authorities will gain a tool that will allow quick decision-making, minimizing risks and increasing resilience.

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