BRITAE

Building Resilience in Tropical Agro-Ecosystems

5th International Workshop on **Building Resilience in Tropical Agro-Ecosystems**

6th to 18th September 2022

Global Disaster Resilience Centre (GDRC)
University of Huddersfield, UK

Centre for Sustainable Transitions (CST)
University of Central Lancashire, UK

Book of Abstracts of the Research Day

13th September 2022

Global Disaster Resilience Centre,
University of Huddersfield, UK

Edited by
Professor Dilanthi Amaratunga
Professor Richard Haigh
Dr Kinkini Hemachandra
Asitha de Silva

5th International Workshop on

Building Resilience in Tropical Agro-ecosystems

BOOK OF ABSTRACTS OF THE RESEARCH DAY

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PREFACE

Quality Education is one of the sustainable development goals addressed by United nations (UN) which helps to enhance the social, economic, and environmental characteristics of a country. Building Resilience in Tropical Agro – ecosystems (BRITAE) project covers many prioritized areas such as Education, Agriculture, Forestry and Environment. The education sector is vitally important for social and economic development in Sri Lanka (Region 6) and distinguished education in engineering and engineering trends is a key priority (Category A) in Asia. This priority covers environmental protection technology, including solutions relevant to food security and climate change. Because of that, the curricular of BRITAE is mainly focused on the agricultural development of the country with the account of eco-system resilience. Specially, agroecosystem based resilience is evaluated and strategic frame works is developed to enhance the capacity for disaster risk reduction in Sri Lanka. Therefore, the project is aimed at developing joint curricular modules on BRITAE in Sri Lankan universities in order to increase their capacity to continually modernize, enhance the quality and relevance of education of students to the global market needs and to ensure international cooperation in line with the above needs.

The abstract book was prepared as a part of 7th BRITAE Project Management Meeting/ Steering Committee Meeting & 5th International Workshop that Organized by University of Huddersfield and the University of Central Lancashire, United Kingdom. BRITAE is European Commission funded (Erasmus+: Higher Education – International Capacity Building – Joint Projects) project under the grant scheme of the Education, Audiovisual and Culture Executive Agency. Accordingly, this workshop conducted as part of the capacity-building activity for the main higher education institutions in Sri Lanka.

Professor Champa Navarathne - BRITAE project leader
Senior Professor,
Department of Agricultural Engineering,
Faculty of Agriculture,
University of Ruhuna,
Mapalana, Kamburupitiya,
Sri Lanka
Email: champa@agricc.ruh.ac.lk

ABOUT THE WORKSHOP

The International Workshop on Building Resilience in Tropical Agro-Ecosystems-September 2022

Ecological resilience denotes the capability of an ecosystem to uphold main functions and processes in the face of perturbation or disturbance, either by resisting or adapting to change. Such perturbations and disturbances can contain stochastic actions such as fires, flooding, windstorms, insect population explosions, and human activities such as deforestation, tracking of the ground for oil extraction, pesticides sprayed in soil, and the introduction of exotic plant or animal species. Moreover, climate variability and change threaten food security directly—for example, by reducing crop yields—and indirectly, by disrupting the systems and infrastructure people use to access food. Most studies of these issues have so far being focused on the impacts of climate variability or extreme climate events on food production.

However, other aspects of food security such as access, utilization or stability have not received the same attention. As a result, our understanding of the underlying factors that make food systems and communities climate resilient(able to absorb climate shocks and stresses without experiencing emergency situations) is limited. At the same time, disaster response strategies and policies targeting food security mainly focus on predicting and managing direct impacts of climate events on food production at the local level, and rarely contribute to building long-term resilience, especially among poor communities. One of the promising strategies to these dire problems is upgrading of education associated to agroecosystem-based resilience. The main challenge is to consolidate a variety of diverse activities in education quality improvement, such as the delivery of extensive educational programmes and capacity building, continued knowledge sharing, etc.

In order to progress on these efforts, it is necessary to build the capacity and an associated network of experts and institutions. The education sector is vitally important for social and economic development of Sri Lanka (Region 6). In Asia, distinguishing education in engineering and engineering trends is a key priority (Category A). This priority covers environmental protection technology, including solutions relevant to food security and climate change.

Within this backdrop, the BRITAE project is aimed at the development of a joint curricula on building resilience in the tropical agro ecosystem in Sri Lankan universities in order to increase their capacity to continually modernize, enhance the quality and relevance of education of students to the global market needs and to ensure international cooperation in line with the above needs.

With the implementation of the project, it will introduce an innovative curriculum and will strengthen the capabilities of HEIs (Higher Education Institutes) to tackle the challenges associated with agro-based ecological resilience to disasters. This will include an increase in educated people in the agro-based ecological resilience and allied sectors.

This project will be instrumental in greater internationalization across each HEI's research and innovation capacity, including high quality cooperation among different HEIs. The project is expected to enhance the competencies and skills, management, governance and innovation capacities of partners of HEI's academic, management, administrative and technical staff. BRITAE will also strengthen the relationships between HEIs in the region, and the interactions in the context of the wider social and economic environment. Augmenting research capacity building by BRITAE in HEIs is becoming progressively required so that, they can actively play their role as incubators of knowledge and ideas.

Making HEIs the centre for innovation and generation of ideas is critical for development. In BRITAE, we do hope that the knowledge gap in the agro-based ecological resilience in the tropical area is profound and Sri Lanka is suffering from a lack of knowledge, research and development in this area. Consequently, it is expected to improve the capacity to produce knowledge domestically with the help of international experiences and lessons learnt. The

proposed project fits with national and Institutional strategies and policies on a number of aspects such as access to higher education, preparedness for future climate-associated disasters, internationalization and modernization, etc. ensuring sustainability.

As part of the project objectives, several high-level international workshops are planned to support capacity building among higher educational members. This workshop in that context, directly supports this objective by providing them opportunities to get experience by visiting programme countries and involving and sharing their research experiences. Accordingly, this workshop has been organised by the programme country partners from the United Kingdom. The University of Huddersfield and the University of Central Lancashire will co-host and organise this ten-day workshop, which includes research presentations, key notes, site visits and the BRITAE project steering committee meeting . As part of this 10 day workshop, a research day will be held on the 12th September 2022 at the University of Huddersfield, and this Book of Abstracts include the research initiatives that are presented on the day, including the key note speeches.

Prof. Dilanthi Amaratunga
Prof. Richard Haigh
Dr. Kinkini Hemachandra
Asitha de Silva

University of Huddersfield BRITAE team
Global Disaster Resilience Centre,
University of Huddersfield, UK
September 2022

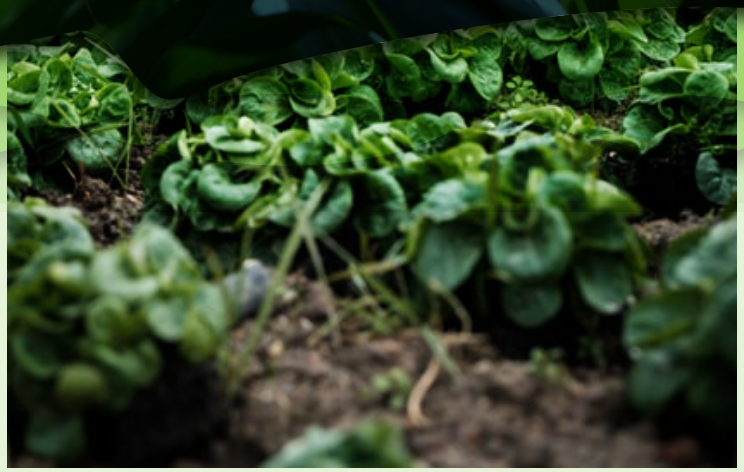
ABOUT THE BRITAE PROJECT

BRITAE

Building Resilience in Tropical Agro-Ecosystems

University of HUDDERSFIELD
Inspiring global professionals

Website
https://www.britae.lk/



Research problem

Ecological resilience denotes to the capability of an ecosystem to uphold main functions and processes in the face of perturbation or disturbance, either by resisting or adapting to change. Such perturbations and disturbances can contain stochastic actions such as fires, flooding, windstorms, insect population explosions, and human activities such as deforestation, tracking of the ground for oil extraction, pesticide sprayed in soil, and the introduction of exotic plant or animal species. Moreover, climate variability and change threaten food security directly—for example, by reducing crop yields—and indirectly, by disrupting the systems and infrastructure people use to access food.

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One of the promising strategies to these dire problems is upgrading of education associated with agroecosystem-based resilience. The main challenge is to consolidate a variety of diverse activities in education quality improvement, such as the delivery of extensive educational programmes and capacity building, and continued knowledge sharing. In order to progress on these efforts, it is necessary to build the capacity and an associated network of experts and institutions.

Project outcomes

The project will strengthen ecosystem resilience development activities that will increasingly build the capacity of professionals to develop a masters degree programme curriculum. Consequently, it will place universities at the centre of national development. Planned outputs include:

1. BRITAE–Capacity building framework development
2. Development of new curriculum
3. Establishment of Smart Agro-ecosystem based Resilience Center for teaching, learning, research and dissemination (SARC)
4. Development and implementation of Building Resilience in Tropical Agro-Ecosystem Master's program
5. Quality assurance and monitoring
6. Dissemination and exploitation of results

The research aims to

BRITAE aims to develop joint curricula modules on building resilience in tropical agro ecosystem in Sri Lankan universities. In doing so, it seeks to increase their capacity to continually modernise, enhance the quality and relevance of education of students to the global market needs and to ensure international cooperation.

Project Objectives:

1. Understand the knowledge gaps in agroecosystem-based resilience through a comprehensive survey framework
2. Develop a joint innovative and adaptive MSc curriculum on tropical agroecosystem based resilience aiming at food security and climate change impacts
3. Develop a Smart Agroecosystem based Resilience Center for teaching, learning, research, and development
4. Develop and implement an online student service platform by blending European practices in education from participating EU universities to program country universities
5. Implement Master's degree program in Building Resilience in Tropical Agroecosystems
6. Prepare academic and administrative staff in the HEIs to undertake innovative research that will contribute to increased ecological resilience to disasters
7. Increase international cooperation by partner HEIs on research programs that tackle ways to increase societal resilience to disasters
8. Reinforce educational and scientific networking among EU and PC universities in the BRITAE
9. Disseminate the project progress, successes, and outcomes

Partners

University of Ruhuna (Lead)
Sri Lanka

Partner Institutions

- University of Colombo, Sri Lanka
- University of Sabaragamuwa, Sri Lanka
- University of Sri Jayewardenepura, Sri Lanka
- University of Moratuwa, Sri Lanka

Programme Institutions

- Vilnius Gediminas Technical University, Lithuania
- Tallinn University of Technology, Estonia
- University of Huddersfield, UK
- University of Central Lancashire, UK

Contact information

Global Disaster Resilience Centre,
School of Applied Sciences, University of Huddersfield

Principal investigators

- Professor Dilanthi Amaratunga
  d.amaratunga@hud.ac.uk
- Professor Richard Haigh
  r.haigh@hud.ac.uk

Researcher

- Kinkini Hemachandra
  k.hemachandra2@hud.ac.uk

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EVENT ORGANISATION

University of HUDDERSFIELD
Inspiring global professionals

GLOBAL DISASTER RESILIENCE CENTRE, UNIVERSITY OF HUDDERSFIELD, UK

A global leader in multi-disciplinary research, education and advocacy to improve the resilience of nations and communities.

At the Global Disaster Resilience Centre (GDRC) we are working with stakeholders at the global, national and local level to make this happen. This work includes the support of stakeholders towards achieving the outcome and goal of The Sendai Framework for Disaster Risk Reduction 2015-2030, and its coherence with The Paris Agreement of the United Nations Framework Convention on Climate Change, and the 2030 Agenda for Sustainable Development. GDRC is based at the University of Huddersfield's School of Applied Sciences. Our vision is for a society that has the capacity to resist or change in order to reduce hazard vulnerability and to continue functioning physically, economically and socially when subjected to a hazard event.

The University of Huddersfield is a public research university located in Huddersfield, West Yorkshire, England. It has been a university since 1992, but has its origins in a series of institutions dating back to the 19th century. It has made teaching quality a particular focus of its activities, winning the inaugural Higher Education Academy Global Teaching Excellence Award, and achieving a Teaching Excellence Framework (TEF) Gold Award, both in 2017. The Gold Teaching Excellence and Student Outcomes Framework (TEF) award recognised that the University of Huddersfield delivers consistently outstanding teaching, learning and outcomes for its students. It is of the highest quality found in the UK. In 2020 the University was ranked joint first in England for the proportion of its staff with a teaching qualification. The university's excellence has been evidenced by winning many awards such as winning the second in the country for National Teaching Fellowships, which mark the UK's best lecturers in Higher Education, winning a total of 18 since 2008. Winning the triple proof of teaching excellence; our staff rank in the top three in England for the proportion who hold doctorates, who have higher degrees, and hold teaching qualifications (HESA 2022). We are joint first in the country for National Teaching Fellowships, which mark the UK's best lecturers in Higher Education, winning a total of 20 since 2008 (2022 data). The university has world-leading applied research groups in biomedical sciences, engineering and physical sciences, social sciences and arts and humanities.

The University has six academic schools: Applied Sciences, Arts and Humanities, Huddersfield Business School, Computing and Engineering, Education and Professional Development and Human and Health Sciences. The Global Disaster Resilience Centre is part of the School of Applied Sciences, located within the Department of Biological and Geographical Sciences, including Forensic Biology and Geography. The University of Huddersfield is a growing centre of research and excellence, and we always push the boundaries of knowledge.

CENTRE FOR SUSTAINABLE TRANSITIONS (CST), UNIVERSITY OF CENTRAL LANCASHIRE (UCLAN)

Centre for Sustainable Transitions (CST) was established in 2019, as part of the UCLan's strategic investment in research excellence to reinforce its position as a leading research and knowledge transfer institution in England's North West. The CST brings together Engineers, Social Scientists, Architects and Psychologists to work on the systemic challenges presented by climate change. CST carries out research across these different disciplines to create new conceptual, theoretical and methodological innovations that integrate and move beyond discipline-specific approaches towards the transdisciplinary. The centre uses the United Nations Sustainable Development Goals (SDGs) to frame the ongoing radical socio-technical transformation for pursuit of a sustainable society. We explore the challenges that contemporary modern societies face, and seek to understand the systemic changes required to meet these challenges and transformations. CST explores a wide range of local, national and global scale issues that hold significance to both current and future generations. Through transdisciplinary work, the center provides unique perspectives, creative ideas and research towards developing technical and socially sustainable solutions, responses to change, and modes of production and consumption.

Founded in 1828 and granted University status in 1992, UCLan is a modern university based in Preston, Lancashire, UK. Today the University is one of the UK's largest with a student and staff community approaching 38,000. Internationally the University has academic partners in all regions of the globe, and it is on a world stage that the first-class quality of its education was first recognised. The University has an increasingly thriving campus in Cyprus delivering UCLan programmes and original research within a Central Lancashire environment and culture. University has been at the forefront of developing degrees in emerging disciplines such as Fashion and Forensic Science to an evolving portfolio of Dentistry programmes to meet emerging sector needs. Undergraduate Medicine has now been added to that list, a course being delivered in one of the UK's most modern and inclusive Medical Schools. The University encourages and nurtures originality, from its ground-breaking energy management partnership with British Aerospace Marconi Electronic Systems (BAESystems) to its launch of the world's first International Fashion Institute and the UK's first MBA in Fashion, to its proud record of student business start-ups – a sector-leading 60% of which are still thriving after three years. Research in innovation and performance is at the heart of this research within UCLan. As a result of its growing portfolio and research and innovation activities, UCLan was the winner of the Times Higher Education Awards (2018) in three categories – Excellence and Innovation in the Arts, International Collaboration of the year and Most innovative contribution to Business-University Collaboration.

The University of Central Lancashire (UCLAN) in Preston was founded in 1828 as the Institution for the Diffusion of Knowledge. Since those early days, it has grown into one of the UK's largest universities with a staff and student community approaching 38,000 and an employment-focused course portfolio containing over 350 undergraduate programmes and nearly 250 postgraduate courses. The University has an established research reputation with world-leading or internationally excellent work taking place within the areas of Business, Health, Humanities and Science.

As a truly global institution with an established campus in Cyprus, UCLAN's student body includes 120 nationalities and its partnership network extends to 125 countries. In 2021 the Centre for World University Rankings placed UCLAN in the top 7 per cent of all worldwide universities.

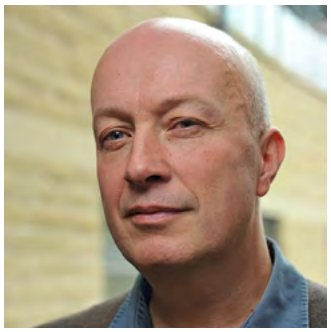
The University has a strong focus on continually improving the student experience. According to the 2020 Student Welfare League Table, UCLAN is ranked first for the money invested into student wellbeing services. Its soon-to-be-completed masterplan redevelopment has created an attractive and inviting, world-class campus in Preston which is helping to create jobs, kick-start regeneration and attract inward investment into the City.

INTERNATIONAL JOURNAL OF DISASTER RESILIENCE IN THE BUILT ENVIRONMENT

The International Journal of Disaster Resilience in the Built Environment (IJDRBE) aims at developing knowledge and capacity in strategic and practical aspects of disaster risk reduction, response and reconstruction to reduce the impact of natural and anthropogenic hazards. The journal publishes original and refereed material that contributes to the advancement of the research and practice and provides contributing authors with an opportunity to disseminate their research and experience to a broad audience. IJDRBE is the only journal to promote research and scholarly activity that examines the role of sustainable construction and urban development to anticipate and respond to hazard events that damage or destroy the built environment.

KEYNOTE SPEAKERS

DR. JOHN LEVER



Dr John Lever is an interdisciplinary social scientist with a background in sociology, human geography and latterly management. Before moving to the University of Huddersfield, he worked in the School of Geography and Planning at Cardiff University and for Cities Research Centre at UWE: Bristol. Throughout this period, his research interests revolved around 'sustainable communities' and 'sustainable food systems' - and he was involved in several ESRC and EU funded projects, including Welfare Quality and Dialrel. Dr Lever's current research interests revolve around sustainable food systems, religious food markets, and refugee (food) entrepreneurs. He has been commissioned by NGOs, local authorities, and food certification bodies in the UK and beyond, and has completed work funded by BA/Leverhulme, among others. The question driving much of his research is: What can food tell us about people, place and politics? Dr Lever holds an ESRC funded PhD in Public Policy, and his work continues to have an underlying policy focus. Before he became an academic, John worked for Oxfam in fairtrade for a number of years.

PROF. LIZ TOWNS-ANDREWS

Liz trained as a chemist and has a PhD in crystallography and has particular research interests in biophysics and biomimetics. Liz has an MBA from the Open University and is a Fellow of the Institute of Physics. She has extensive experience of working at the academic-industry interface and worked in the Science and Technology Facilities Research Council (STFC) for 25 years. She was Director of Innovation for STFC before joining the University of Huddersfield and led the development of the national Science and Innovation campuses at Harwell in Oxfordshire and Daresbury in Cheshire. Liz is 3M Professor of Innovation and Director of External Engagement in the Huddersfield Business School and was, until December 2020, Director of Research & Enterprise at the University. She led the development of the University's research and enterprise strategies, and established the 3M Buckley Innovation Centre. Liz has secured significant amounts of external funding to support University/Business engagement and has supported academics to identify opportunities for collaborative research and strategic partnerships. Liz has extensive networks and was Chair of the Yorkshire Universities Industry Strategy Group until September 2020 and was a member of the Leeds City Region Local Enterprise Partnership Business Innovation and Growth Panel. She received a Queen's Award for Enterprise Promotion in 2013 for establishing the 3M Buckley Innovation Centre. In 2016, she was the winner of the Yorkshire, North East and Scotland Forward Ladies/HSBC Women in Business STEM award and was elected Chartered Companion of the CMI in 2017. Liz received an OBE in the 2020 New Years Honours list for services to Business, to Enterprise and to Public and Private Sector Collaboration.

RESEARCH DAY ABSTRACTS

ASSESSMENT OF PEDAGOGICAL COMPETENCIES FOR DELIVERING A MASTER'S DEGREE PROGRAM ON TROPICAL AGROECOSYSTEMS

D.A.M. De Silva*[1], M. Esham[1], C.L. Liyanage[2], L. Khajenoori[2], A. Carmichael[2], M.S. Elapata[1], B.M.R.L. Basnayake[1], A.M.S.M.R.S.G. Bandara[1]

[1] *University of Sabaragamuwa, Sri Lanka*
[2] *University of Central Lancashire, United Kingdom*

*Corresponding author: desilva.achini@yahoo.co.uk

Abstract

Pedagogic capabilities of higher education institutions are important to strengthen their capacity for adopting student-centred learning techniques (SCLT). The planned Master of Science in Building Resilience in Tropical Agroecosystems will adopt a blended mode of teaching based on student-centred and outcome-based teaching. The study aimed to assess the pedagogic capabilities of partner universities and identify gaps in implementing SCLT in delivering the planned program. Data were collected by using a self-administrated questionnaire and review of program review documents. The sample consisted of both academic and administrative staff members of the local partner universities. The results revealed that all the partner universities were adopting a diverse range of SCLT approaches in their current programs. Among the approaches blend learning, e-learning, collaborative learning and online learning were the most popular SCLT approaches. However, MOOCs are not a popular platform for course offerings. The challenges for the implementation of MOOCs included limitations with ICT resources, slow internet speed and connectivity and lack of trained personnel. To deliver the course offerings they were using discussions, presentations, question and answer sessions, quizzes, and demonstrations in addition to the conventional classroom lectures. However, there is a lack of adoption of innovative techniques such as simulations, mental models, index cards and panels. Course model sharing across universities was not a well-known practice among most of the partner universities. Written examinations, class presentations, take-home assignments, theses and viva-voce, test/quizzes and coursework were the most common assessment methods. Exhibition/demonstration and peer evaluations were not common assessment methods used by partner universities. The psychological learning environment was satisfactory; however, capacity building is necessary to improve it to cater for the demands of postgraduate education. Student recruitment for postgraduate programs takes place via websites, social media, and newspapers. Students were provided with online facilities for registration by all partner universities. Commonly all partner universities were reasonably equipped to develop and deliver the envisaged postgraduate program. However, it is important to bridge the pedagogical competencies of partner universities such as the development of SCLT approaches specially to deliver via MOOCs, assessment methods and teaching material development, course module sharing and resource sharing across partner universities. Further, it was necessary to strengthen the ICT infrastructure to cater for hosting the MOOCs platform, marketing, and promotion of the envisaged master's program through innovative platforms and enhance administrative staff capacity to facilitate the implementation of the program.

Key Words: ***Agroecosystems, MOOCs, Pedagogic Capabilities, Student-centered Learning Techniques***

COMMUNITY-BASED KNOWLEDGE AND LOCAL ENVIRONMENT: THE SCOPE OF DISASTER RISK REDUCTION AND MITIGATION

A. De Silva*[1], R. Haigh[1], D. Amaratunga[1]

[1] *Global Disaster Resilience Centre (GDRC), Department of Biological and Geographical Sciences, School of Applied Sciences, University of Huddersfield, United Kingdom*

*Corresponding author: a.desilva@hud.ac.uk

Abstract

Community-based practices, ecosystems-based adaptation, and ecosystem-based disaster risk reduction are some of the contemporary areas of disaster management which focus on the local environment and community-based knowledge. There are many approaches to community-based disaster risk reduction strengthened by both local and international policies, mainly focusing on implementation and monitoring levels. However, the integration at the decision-making level is yet minimal. Local communities know about the dynamic processes of their local environment and how disasters behave within these environments. Therefore, it is essential to integrate community-based knowledge to understand the disaster dynamics before the planning stage. Accordingly, this study aims to explore the knowledge of communities in understanding the disasters within their local environment. The study adopted a case study approach based in Sri Lanka, where members of local communities who reside in landslide and flood-prone areas were interviewed. Key findings were extracted based on a thematic analysis, and the conclusions were drawn after a few validation interviews. The results highlighted that apart from a few members of the communities, people have limited knowledge about their local environment and the environmental processes. Apart from the knowledge transferred by the relevant authorities and the basic awareness of their surrounding environment, there is limited new knowledge to be extracted from the communities about the behaviour of disasters. Some experts believe that due to the commercial economy, industrialization, and service-oriented job markets, people are detaching from their local environment. People do not have time to observe and engage with their local environmental processes, which has resulted in the decaying of knowledge of the local communities. Therefore, preservation of the limited community-based knowledge is something important under disaster preparedness when making communities resilient.

Keywords: ***Community-based Knowledge, Local Environment, Disaster Risk Reduction***

MITIGATING HYDROMETEOROLOGICAL HAZARD IMPACTS THROUGH IMPROVED TRANSBOUNDARY RIVER MANAGEMENT IN THE CILIWUNG RIVER BASIN

G. Clegg*[1], R. Haigh[1], D. Amaratunga[1], H. Rahayu[2]

[1] *Global Disaster Resilience Centre (GDRC), Department of Biological and Geographical Sciences, School of Applied Sciences, University of Huddersfield, United Kingdom*

[2] *Institute of Technology Bandung, Indonesia*

*Corresponding author: g.clegg@hud.ac.uk

Abstract

The Ciliwung River is located on the island of Java, Indonesia. The capital city of Jakarta, located downstream, experiences frequent and often severe flooding. Extreme flooding in January 2020 was reported to have resulted in 66 fatalities, and the displacement of 36,000 people.

The causes of flooding in Jakarta are multiple, originating from physical factors, such as the city's location on a coastal delta, and its tropical climate which brings heavy precipitation. Anthropogenic factors, such as the high levels of urbanisation and socio-economic conditions, also play a role. In combination, these factors mean that addressing the flood risk is a complex task.

The Ciliwung River can be considered transboundary, in that it crosses multiple provincial and district borders. To successfully mitigate flood risk, an integrated, basin-wide approach is required, where different actors can work together. However, current arrangements mean that these administrations often work independently, and at present, the governance of the river basin is fragmented.

The aim of the project is to inform plans for improved transboundary river management in order to mitigate the flood hazard in the Ciliwung River Basin. Existing governance arrangements were investigated through interviews and focus group discussions with basin stakeholders, and literature reviews. Several challenges which hinder effective flood governance in the basin were identified, including vertical and horizontal coordination issues, fragmented sectoral working, and limited capacity of local governments. Recommendations to overcome these challenges include clarifying roles and responsibilities, and strengthening coordination mechanisms.

Keywords: ***Disaster Governance, Flood, Flood Drivers, River Basin Management, Transboundary River Management***

NATURE-INSPIRED SOLUTIONS FOR DISASTER RISK REDUCTION IN COASTAL REGIONS

N. Dias*[1], R. Haigh[1], D. Amaratunga[1], C. Malalgoda[1]

[1] *Global Disaster Resilience Centre, School of Applied Science, University of Huddersfield, UK*

*Corresponding author: n.dias@hud.ac.uk

Abstract

Nearly 2.4 billion people (about 40%) of the world's population live within 100km of the coast. Even though people increasingly inhabit the coastal zones, they are highly vulnerable to a range of natural hazards, including storm surge, tsunami, coastal erosion and coastal flooding. Such hazards can have a devastating impact on coastal communities around the world and are responsible for many deaths and loss of livelihoods. A range of interventions have been developed to address such threats, including hard and soft engineering, and early warning systems. These have been able to effectively reduce disaster risk in many cases, but often fail to protect communities, as evidenced by the increasing number of people affected and levels of economic losses. A variety of nature-based approaches have also been promoted in global policy agendas for disaster risk reduction (DRR) in coastal regions, including the Sendai Framework for Disaster Risk Reduction 2015-30, which provides an opportunity to integrate Nature-Based Solutions (NBS) into national and local disaster risk reduction strategies. There are already examples of NBS being implemented in DRR applications, for example growing mangroves and forest vegetation along the coastal belt as an eco-engineering solution for nature based coastal defences. Although there has been growing interest in NBS for DRR, there has limited attention on the use of nature inspired solutions (NIS), despite its effectiveness in addressing other societal challenges. An initial review of the literature reveals some related examples, such as using the structure of termite mounds to inspire internal climate control systems for buildings, using native marine organisms to inspire more resilient concrete structures, or using nature's principles to support resilient infrastructure design. However, the knowledgebase is sporadic and the concept is not prominent in current global agendas linked to DRR. There is an opportunity and a need to explore whether nature can inspire innovative solutions to help tackle increasing disaster risk in coastal communities. NIS have learnt from nature, and nature confers resilience to its systems. Therefore nature-inspired human-built systems are inherently resilient to disturbances and could be an ideal solution for coastal DRR. Further, nature-inspired designs are based on shape rather than materials. This can help minimise material expenditure, and this cost-effectiveness could offer significant benefits.

Keywords: ***Coastal Hazards, Nature Based Solutions, Global Agendas, Nature Inspired Solutions***

AGRO-ECO SYSTEMS AND ADAPTIVE SOLID WASTE MANAGEMENT IN CRISIS SITUATIONS: A CASE STUDY OF TWO SELECTED LOCAL COUNCILS IN COLOMBO, SRI LANKA

N. Fernando*[1], M. De Silva[2]

[1] *Social Policy Analysis and Research Center, University of Colombo, Sri Lanka*
[2] *Department of Sociology, University of Colombo, Sri Lanka*

*Corresponding author: nishara.fernando@gmail.com

Abstract

The significance of solid waste management as a key element of agro-eco systems increased with the emergence of concepts such as "Circular Economy" and "Bioeconomic Strategy" that advocate sustainable and cyclical approaches of consumption and disposal. Nevertheless, crisis situations, such as the onset of the COVID-19 virus, can exert a significant external pressure on traditional solid waste management mechanisms, making them fall short. The research at hand attempts to comprehend (a) the causal factors behind the collapse of traditional waste management mechanisms at the onset of COVID-19, (b) adaptive measures employed by the formal waste management mechanisms and (c) the adaptive coping strategies residents employed to cope with waste. Two local councils of the Colombo district were selected for the study and the survey method and in-depth interviews were utilized to collect data from residents and officials. Quantitative data was analyzed using univariate and multivariate analytical techniques, while the thematic analysis method was used to analyze qualitative data. The high infection rates of the waste workers, inadequate supply of protective gear and disinfectants for workers, stigmatization of waste workers as potential transmitters of COVID-19 and the prohibition of waste collection by informal workers were identified as key causal factors that disrupted traditional waste management mechanisms. The traditional municipal solid waste management mechanisms have adopted strategies such as reducing the frequency of waste collection, introducing new waste collection and management protocols and supplying protective wear and disinfectants to workers. Moreover, residents have adopted strategies such as changing consumption patterns, producing organic fertilizer at home, disposing of waste illegally in public spaces and burning and burying waste.

Key words: ***Agro-eco Systems, Adaptive Solid Waste Management, Crisis Situations, COVID-19***

UNIVERSITY-INDUSTRY PARTNERSHIP MODEL FOR AGRO-INDUSTRY INNOVATION: SRI LANKAN AND EUROPEAN EXPERIENCES

T.G.K.D. Samaraweera[1], C.M. Navaratne*[1], G.Y. Jayasinghe[1]

[1] *Department of Agricultural Engineering, Faculty of Agriculture, University of Ruhuna, Sri Lanka*

*Corresponding author: champa@agricc.ruh.ac.lk

Abstract

Universities are the major stakeholders in the national innovation system (NIS), which aims to disseminate new knowledge for economic and social benefits through the commercialization of commodities, services, processes, and other artifacts. University-industry partnerships (UIP) are also vital for innovation in the current global economic competitiveness. The Sri Lankan agro industry makes a major contribution to the country's economy by assuring food security, generate employment, and alleviating rural poverty. This study was conducted to: (a) appraise the state of UIP for agro-industry innovation; (b) distinguish communication strategies to link businesses and universities in order to develop real-time solutions for challenging industrial problems; (c) gather international best practices in order to formulate a model for UIP for agro-industry innovation; and (d) propose a model to enhance UIP for agro-industry innovation. To discover their best practices in order to develop a UIP model, a literature review, a questionnaire survey, and a discussion with two experts from the University of Central Lancashire, UK were performed. The questionnaire survey comprised 60 industry representatives from the agriculture industry in addition to 30 academics from nine state institutions in Sri Lanka, including those with agricultural, technological, and university business linkage (UBL) cells. Furthermore, to collect primary data, two different questionnaires were employed. The Wilcoxon signed rank test and descriptive statistical methods were used to analyze the data. According to comments from academics, an overwhelming majority of them (80%) took involved in cooperative initiatives for agriculture industry innovation. The majority of those with industrial aspirations (67 %) do not take part in collaborative projects with universities for agro-industry innovation. Academic and industry players claim that the country's current policies and level of government involvement are insufficient to improve UIP. The Knowledge Transfer Partnerships (KTP), business incubators, and innovation vouchers are examples of best practice models used internationally. According to the research, Sri Lanka's level of university-industry collaboration in agro-industrial innovation was insufficient. According to the literature, websites, social media platforms, and video conferencing are all effective communication tools for collaborative projects. A Sri Lankan university industry partnership model (SUIP-Model) was created to strengthen university industry collaborations for agro-industry innovation by gaining international expertise.

Keywords: ***Agro-Industry Innovation, Knowledge Transfer Partnerships, University–Industry Partnerships, University Industry Collaboration Models, University Business Linkage Cells***

DEVELOPING A SMART WATER MANAGEMENT SYSTEM TO STRENGTHEN THE RESILIENCE IN AGROECOSYSTEMS IN SRI LANKA

H.A.D.G.S. Jayathilaka[1], R.L.H.L. Rajapakse[1], C.S.A. Siriwardana[1], R.M.B.S. Rathnayaka[1]

[1] *Department of Civil Engineering, University of Moratuwa, Sri Lanka*

[*]Corresponding author: chaasi@uom.lk

Abstract

Being a tropical nation, Sri Lanka has already suffered from the adverse impacts of climate change on agriculture, and in response to that, numerous interventions have been initiated over the past few decades to build resilience in Sri Lanka's agroecosystems to enhance food productivity and security. Climate Smart Irrigated Agriculture Project is such an intervention launched in 2019 aiming at improving the climate resilience of rural farming and productivity of irrigated agriculture in climatically vulnerable 11 districts in the dry zone of Sri Lanka. This project sought to implement climate-resilient agriculture systems to climate-induced extremes in the selected hotspots of Sri Lanka. A smart water management system will be developed as an outcome of this project to adapt to the climate change extremes. Three vulnerable hydrological river basins in the dry zone of Sri Lanka were selected as the pilot project areas, further focusing on the watersheds and sub-watersheds of the basins. A detailed hydrological assessment of the project area was carried out as the initial phase of this project to identify baseline conditions with associated basin-specific characteristics and develop a rainfall-runoff model for basins and sub-watersheds within the project area. As the next step, studies were carried out for the individual tanks and cascades to generate a detailed database relating to the physical/hydrological characteristics of the irrigation system. A water management model was developed utilizing the Water Evaluation and Planning software as the final step of the developing water management system. The generated smart water management system can identify the scale of the various interventions required to improve irrigation from the viewpoint of improving the efficiency in cascade agroecosystems. Moreover, this system can be used to estimate the supplies needed for the individual tanks in near-real time and to decide the storage capacity requirements with more data related to the cropping pattern in the area, further improving the climate resilience and response capacity of the system to aggravated extreme storm conditions under changing climate situations.

Keywords: ***Agriculture, Irrigation, Food Security, Climate Change, Mitigation, Adaptation***

DESIGN AND FABRICATION OF A USER FRIENDLY, DISASTER RESILIENT SOLAR POWERED PROTOTYPE PASTEURIZER TO PURIFY FLOOD AND RAIN WATER

B.A.V.P.N. Jayatissa*[1], N.M.M.S.B. Navaratne[1], C.L. Liyanage[2], R. Liyanage[3]

[1] *Department of Food Science & Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka*
[2] *School of Engineering, University Central Lancashire, United Kingdom*
[3] *Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Sri Lanka*

*Corresponding author: piumalijayatissa09@gmail.com

Abstract

The most frequent natural hazards that occurs in Sri Lanka are droughts, floods, wind storms, coastal erosion and landslides. A rise in inadvertently happening events such as natural disasters as a result of climate change is frequently posed a considerable loss to Sri Lanka's economy in terms of materials and human health. According to Sri Lankan context, floods are more of common catastrophe than other natural disasters. Couple of reasons remarkably govern this man made-unfortunate situation in Sri Lanka, such as Unplanned urbanization, increasing in flood-prone areas as a result of land filling particularly marshy and low lands, in proper maintenance of water drainage systems and development of infrastructures while neglecting potential flood risk.

The phenomenon, flooding is usually considered as a significant natural vulnerability causing diseases, damage and loss to life, property, and infrastructure as well as disruption of public order along with food safety and security. Nevertheless, flood can cause dangerous landslides, loss of crops and livestock, spillage of raw sewage and animal (fecal) waste, and accelerate spew of industrial and urban toxic materials along with mingling food and food waste into waterways. Aftermath of flooding endangered human's chore of routine life style, resulting a significant and serious risk to anyone who exposed to floodwater, particularly it hampers the quality of drinking water. However, pasteurization needs more energy, skilled labors, sophisticated and expensive machineries and more space and it needs more capital as well. Moreover, cleaning of contaminated water is encountered with several risks and problematic environmental issues in developing countries like Sri Lanka due to lack of technologies, inadequate resources, high cost of thermal energy and adverse effects on climate change.

Hence in order to get rid of these adverse consequences, solar powered, low cost and user-friendly pasteurizer is a timely requirement and design and fabrication of it will be a breakthrough for purifying of contaminated water as a disaster resilience for drinking purpose of downtrodden and vulnerable communities.

For this invention "Peltier Technology" has been used and when electrical current passing through the Peltier system, one end of it getting extremely hot and other end getting extremely cold. This phenomenon is already compatible with the principle of pasteurization process. However, since flood water and rainy water is also contaminated with some water soluble impurities, a water filter system also developed to remove those impurities available in the water. Thereafter, cleaned water will be circulated through the pettier system to get the drinkable water.

Key Words: ***Peltier, Contaminated Flood Water, Natural Disaster, Pasteurization, Microorganism***

EVALUATION OF THE GLOBAL POLICIES AND FRAMEWORKS APPLICABLE FOR TROPICAL AGRO-ECOSYSTEMS RESILIENCE

K. Hemachandra*[1], D.Amaratunga[1], R.Haigh[1], A. De Silva[1]

[1] *GDRC, Department of Biological and Geographical Sciences, School of Applied Sciences, University of Huddersfield, UK*

*Corresponding author: k.hemachandra2@hud.ac.uk

Abstract

Among agro-ecosystems, tropical agro-ecosystems significantly contribute in delivering development agendas in several ways. Despite its significant at the global and national level, tropical agro-ecosystems are frequently challenged by climate change, globalisation, industrialisation, population growth and market interventions. Resilient agro-ecosystems hence receives considerable attention within the global policy context. However, the applicability and support for tropical agro-ecosystems resilience have been lagged.

Hence, the study was conducted as a part of an initial research to identify the applicable global policy agendas supporting tropical-agroecosystems resilience. The study conducted a documentary review based on relevant global policies covering the Sendai Framework for Disaster Risk Reduction (SFDRR), 2030 Agenda for Sustainable Development, the Paris Agreement, and the New Urban Agenda. The thematic extraction method was used to identify key thematic areas across policies.

The study revealed that the term agro-ecosystem is not directly used in the content of the SFDRR yet provision is given through several other sectors to make resilience agro-ecosystems. Within the scope of agro-ecosystems, agricultural lands and practices can be converted as disaster risk reduction measures which has multiple benefits towards agriculture and risk reduction. On the other hand disaster loss consider the losses of agro-ecosystems. Moreover, under the SFDRR has highlighted the importance of Eco-DRR applications and ecosystem based adaptation measures. Therefore, aspects of building agro-ecosystem resilience can be directly considered under the SFDRR. In comparison, the Agenda for the SDGs focusses on key thematic areas sustainable agriculture, agricultural productivity, resilient agriculture and agricultural research.

The Paris Agreement does not explicitly outline the role of agriculture. Nevertheless, it makes clear that the global community must address climate change's effects on agriculture to build resilience and enhance food security globally. Though there is no direct mention of the term agro-ecosystems in the Paris agreement, a strong background to adopt such measures were provided. Recognizing the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change.

Finally, the New Urban Agenda highlights the pivotal importance towards bridging urban and rural communities in the planning and development of food systems. Under the concepts of sustainable urban management New Urban Agenda has provided opportunities to enhance agro-ecosystem resilience in urban settlements. However, there are limited use of direct terminologies in the New Urban Agenda, yet integrating with 2030 agenda for sustainable development it has provided wide range of opportunities for the agro-ecosystem resilience in urban contexts.

The key message delivered across these global policies is the importance of food security to end hunger and making sustainable food supply through increasing agricultural productivity in a sustainable manner. These findings will provide essential inputs for guiding regional and national policies for agro-ecosystems resilience for a sustainable future. Nevertheless, little attention was given specifically on the importance of tropical agro-ecosystems, and their resilience mechanisms. This can be highlighted as a challenge for countries which mainly depend on tropical agro-ecosystems and for the global food supply. Hence, further research can be conducted to highlight the need of updating such global policy frameworks to levelling up their gaps.

Keywords: ***Agroecosystems, Policies, Disasters, Resilience***

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