ADB

# 9th International Skills Forum

# Reimagining Education and Skills Development for a New Normal

23 August 2021 • 1–5 p.m. (Manila time)
24 to 27 August 2021 • 2–6 p.m. (Manila time)

# Speakers

ECOLABS
CENTRE OF INNOVATION FOR ENERGY

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**EcoLabs Overview**

*Dr Jayson Koh*
Director
Ecolabs Center of Innovation for Energy

**Modular Cleantech and Sustainability Courses**

*Stanislav Borisov*
Innovation Manager
EcoLabs Center of Innovation for Energy

**Project Shea**
**Next Generational Civilization Kit**

*Rithika Thomas*
Lead for Future Communities
EcoLabs Center of Innovation for Energy

# Agenda

- Introduction to EcoLabs Centre of Innovation for Energy @ NTU
- Modular Cleantech and Sustainability Education by  Energy Practitioners
- Project Shea – Next Generation Civilization Toolkit Project

(Partnership with Co-innovation labs across Southeast Asia)

# Innovation Cluster for Energy

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

ERIAN

"We provide clean energy technologists, start-ups, SMEs and companies with essential translation facilities and technical support to help them successfully commercialise and scale their innovation efforts."

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SEAS
Sustainable Energy Association of Singapore
&
Enterprise Singapore

# Innovation Cluster for Energy

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EcoLabs focus on developing **innovation and business capabilities** of companies and **high** TRL projects through the following programs:

| Translator | Accelerator |
|---|---|
| Direct Innovation Projects<br>(with SMEs/Startups) | Co-Innovation Programs<br>(with Companies, Agencies, etc) |
| Pilots & Testbeds<br>(with Local and global partners) | Start Up Services<br>(Fund Raising, Market Entry, etc) |
| Flagship Projects<br>(with industry leaders) | Global Programs |
| Joint Labs<br>(with corporate partners) | Ecosystem Building<br>(Training, Pitching events, Conferences, etc) |

# Strategic Areas in Sustainability

EcoLabs supports projects in >60 verticals and represents 50+ deep-tech startups at any time

## Urban Mobility

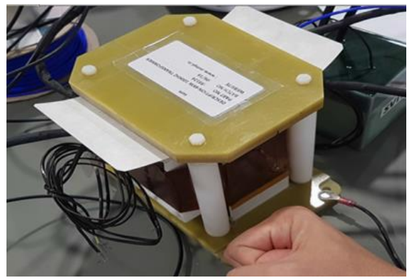
**What We Do**
- EV Charging Infrastructure
- Flash Power Transfer
- Power Trains For Traction
- Range Extender Solutions
- Vehicle To Grid Interaction
- AI & Perception Systems
- Comms & Control Systems
- V2X Systems


## Carbon Reduction

**What We Do**
- Carbon Capture/Storage
- District Design
- Urban Dynamics District
- Cooling Network
- Low Carbon
- Data Centers
- Transport System Design

## Digital Grids

**What We Do**
- Zero Energy Buildings
- Virtual Power Plant
- AC/MV / System Optimizer
- EMS/BMS
- Low Carbon Campus
- Energy Harvesting
- Low Power Devices



## Energy Efficiency

**What We Do**
- High Frequency Transformer
- Multigrid Controller /Systems
- Microgrid Power Devices
- Modelling & AI
- DAC Systems
- DER's, Smart Metering
- Fault Prediction Tools
- Interoperability Systems

## Renewables Integration

**What We Do**
- Multi Energy RE Systems
- Solar, Wind, & Tidal
- Advance Energy Storage
- Hybrid Energy storage
- DC Grid Systems
- Power Devices

## Circular Economy

**What We Do**
- Waste to Energy
- Resource Recovery-Metals
- E Waste
- Low Energy Grade Waste
- Building Materials
- Municipal Solid Waste
- Polymer Recycling

# What makes us unique

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## Our **access to commercial testbeds** remains unmatched in the market

| | |
|---|---|
| NTU-operated sites<br>**4** | Purpose-built testbeds in controlled environment. Sensors are well-deployed and baselines are available |
| Partner sites, Passive<br>**27** | Commercial testbeds open for sustainability testbed proposal |
| Partner sites, Active<br>**8** | Commercial testbeds with comprehensive sustainability program |

# What makes us unique

Our **in-house experts** are world-class and experienced in technology translation

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## 250+ Subject Matter Experts

- collaborating with corporations and SMEs/Startups in wide spectrum of Energy related research programs.
- Recognized by independent and respectable ranking agencies, these researchers are leaders in their category.

#13 Worldwide ranking

QS WORLD UNIVERSITY RANKINGS

By subject:
#3 Material Science
#6 Elecrical and Electronic Engineering
#8 Engineering and Technology
#9 Chemistry
#11 Chemical Engineering
#11 Mechanical Engineering

#38 Worldwide ranking

U.S.News & WORLD REPORT

By subject:
#1 Energy & Fuels
#1 Nanoscience & Nanotechnology
#1 Material Science
#3 Engineering
#3 Chemical Engineering
#4 Chemistry
#4 Electrical and Electronic Engineering

#91 Worldwide ranking

SHANGHAI RANKING ACADEMIC RANKING OF WORLD UNIVERSITIES SINCE 2003

By subject:
#1 Energy Science
#1 Nanoscience & Nanotechnology
#6 Instruments Science & Technology
#8 Material Science
#11 Electrical and Electronic Engineering

Future Mobility

Building Sustainability Solutions

# What makes us unique

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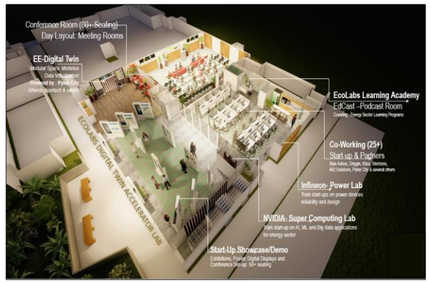
## Our **Ecosystem and Flagship programs** with global industry leaders


ARROW

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MISTLETOE

EMERSON

BLUE ASHVA CAPITAL

**Build capabilities**
on use of advance power devices and translate Arrow know-how on product design, reliability and standardization to SMEs/Start-ups

**Develop of the Singapore's unique indoor** facility for testing energy appliances (load monitoring), cybersecurity, smart meters, EE, Baselining, carbon mapping and open data lab infrastructure

**Deploying smart low carbon solutions of the future housing.** Civilization Kit to empower an individual to live off-grid and enable low carbon housing as future standards of living.

**Build joint capabilities**
on industry energy efficiency applications focused on advanced statistical and machine-learning algorithms, to improve process and asset performance for energy efficiency /carbon footprint reduction.

**Deploying smart low carbon solutions for industries and utilities.** Lab will focus on deeptech technologies on green hydrogen, ammonia, CCUS, recycling and others. We aim to champion 10 founders in next 2 years.

ADVANCE POWER DEVICES & IOT LAB

DIGITAL TWIN EE OPEN DATA LAB (@CTO)

LOW CARBON HOUSING (@SJ NTU SITE)

DIGITAL TWIN IND EE PLATFORM

FOUNDERS LABS (LOW CARBON TECHNOLOGIES)

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# Modular Cleantech and Sustainability Education

## by Energy Practitioners



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# Tailored Courses and Trainings

## From

- Industry Experts (ERI@N)
- Technology Experts (NTU)
- Commercialization Experts (EcoLabs)
- Implementation Experts (Start-ups)

## To

- Corporates
- Universities
- Investors
- Governments

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# Energy Practitioners Examples

## Industry and Technology Experts (300+)

**Prof Madhavi Srinivasan**
Energy Storage and Nanoscale Materials

**Prof Chan Siew Hwa**
Hydrogen & Fuel Cells

**Mr Yann Grynberg**
Smart & Sustainable Building Technologies

**Dr Anshuman Tripathi**
Future Mobility Solutions (AVs & EVs)

## Tech Commercialization Experts (20+)

**Mr Mahesh Kumar**
15+ years of experience

**Dr Jayson Koh**
15+ years of experience

**Ms Rithika Thomas**
7+ years of experience

**Mr Stanislav Borisov**
10+ years of experience

## Implementation Experts (50+)

| RE Integration | Carbon Reduction | E-Mobility |
|---|---|---|
| T-RECs.ai | NanRise Pte Ltd | A-Fahren |
| FLOW TECH | TEALE | Xnergy |
| RESYNC | BOTSYNC | mobility |
| Salus Nanotechnologies | KVIKOO | RUSHOWL |
| CANOPY POWER | nEXERGY | anzene |

| Green Buildings | IOT, Bid Data & AI | And many more |
|---|---|---|
| EverConn | PYLON CITY | General Aeronautics |
| arloid. | Cavill | ALT |
| TFI TRANSFERFI | AiQuon | DATAKREW |
| Qi Square | PRINTED POWER | ENERGY SMART SOLUTIONS |
| VORTEC | Vigti Smart solution | SOLUTIONS |



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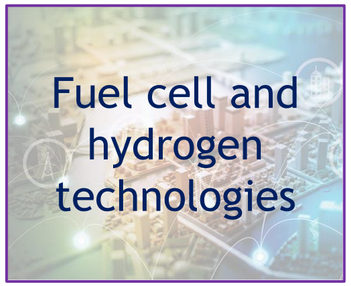
# Modules as Building Blocks












- Each **Module** is ~1 day training
- **Modules** can be combined into **Courses**

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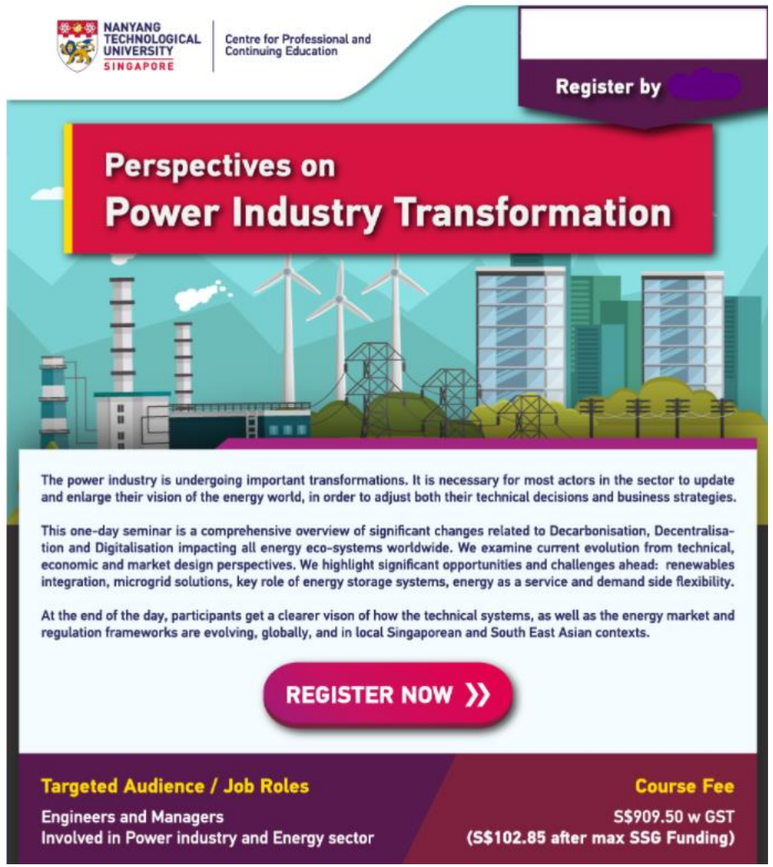
# Module Example

## Power Industry Transformation




From

Anne-Soizic Ranchere

Industry Experts (ERI@N)

RESYNC

CANOPY POWER

PYLON CITY

Implementation Experts (Start-ups)

To

Corporates

Investors

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# Course Example

## Energy Systems and the Future of Energy

### Modules

- A New Energy World
- Towards flexible energy markets
- Decarbonization challenges & scenarios
- Digitalization: intelligent energy management
- Decentralization: towards smart electricity grids resources
- Energy Innovation Ecosystem: Transformative Use Cases

### From

Subodh Mhaisalkar

Industry Experts (ERI@N)

Alessandro Romagnoli

Technology Experts (NTU)

Mahesh Kumar

Commercialization Experts (EcoLabs)

FLOW TECH

TFI TRANSFERFI

ETAVOLT www.etavolt.com

Implementation Experts (Start-ups)

### To

Universities: NTU MBA

NANYANG TECHNOLOGICAL UNIVERSITY

Nanyang Business School

# Course Example

## For Industry Professionals

| | | | | | | |
|---|---|---|---|---|---|---|
| A New Energy World | Renewable Energy Systems in Smart Grids | Sustainable Energy Systems in Building | Digitalisation and AI |  |  |  |
| Key Technologies for Energy Transition | Energy Storage Systems | Smart Multi-Energy Systems | Fuel cell and hydrogen technologies |  |  |  |
| Power Industry Transformation | Power Electronic Converters | Electric and Autonomous Vehicles | Commercialization of Energy Innovations |  |  |  |



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# Interested to learn more about

## Modular Cleantech and Sustainability Education
## By Energy Practitioners

# Let’s get in touch

stanislav.borisov@ntu.edu.sg

jayson.koh@ntu.edu.sg

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# PROJECT SHEA

## NEXT CIVILIZATION KIT



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**27%**
**TOTAL**
POPULATION
LIVE IN
URBAN AREAS

**1.6**
**BILLION**
LIVE IN
INADEQUATE
HOUSING
WORLDWIDE

# 87% CITIES WORLDWIDE ARE UNAFFORDABLE

**3 BILLION**
WILL NEED
ACCESS TO
HOUSING IN
2030

**440**
**MILLION**
AFFORDABLE
HOUSES
NEEDED BY
2025

PHOTO BY DEVON WILSON ON UNSPLASH

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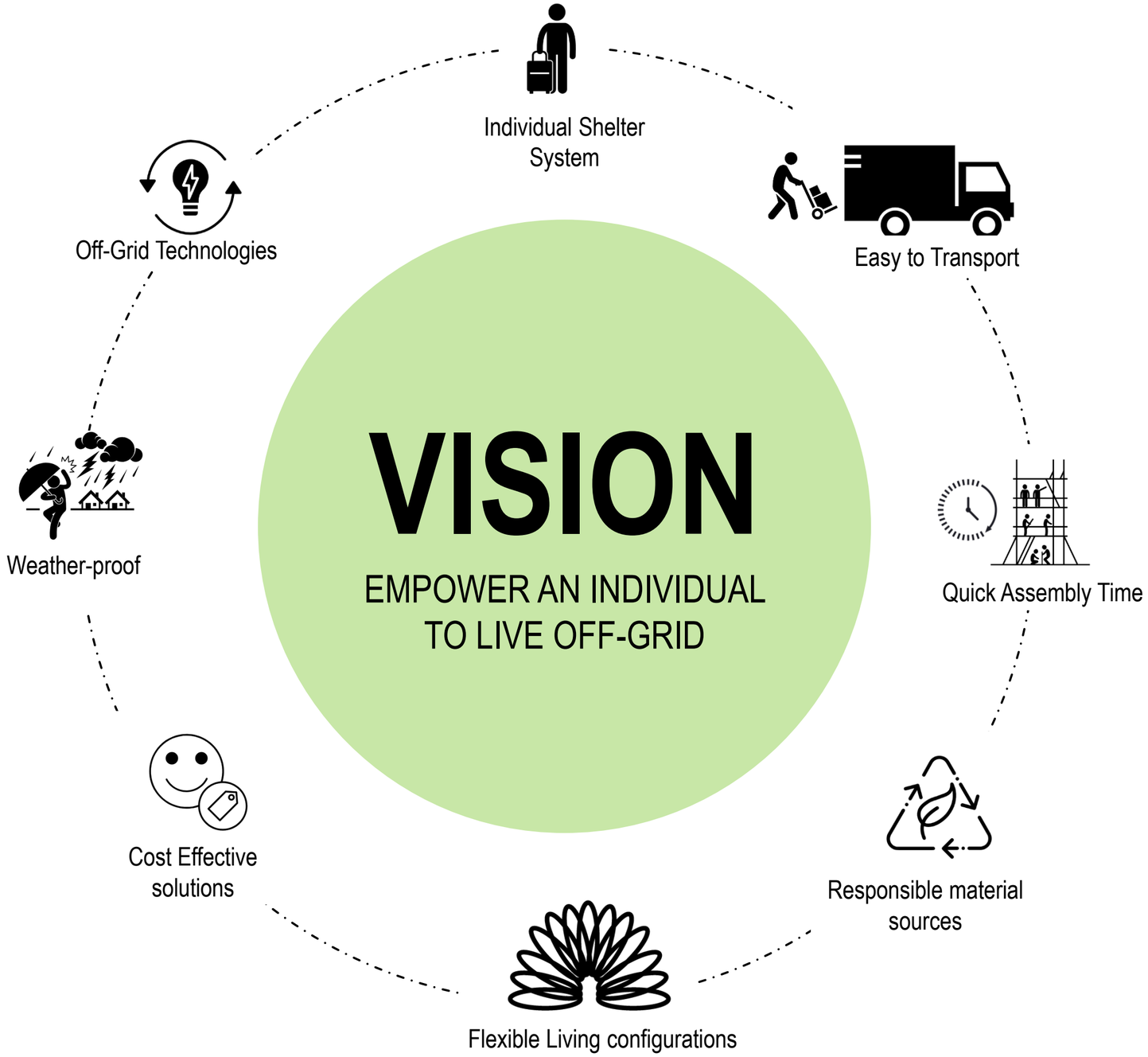
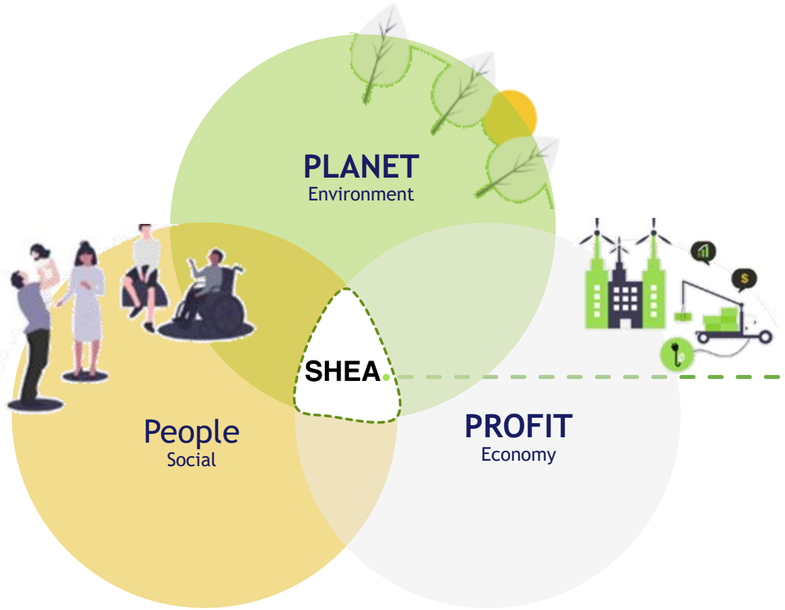



ICONS FROM NOUN PROJECT

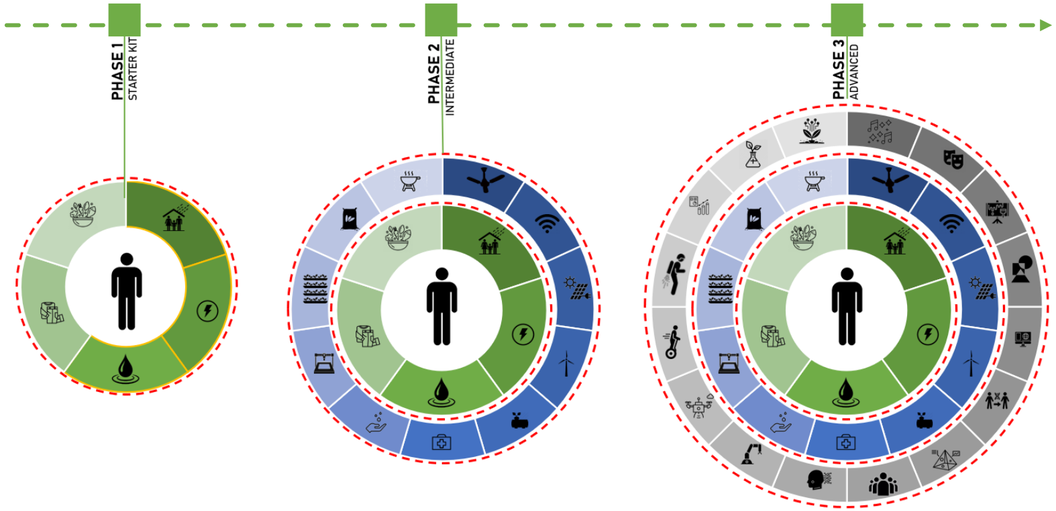
# INTEGRATED SYSTEM'S THINKING






## Co-creative Approach

- 350 PARTICIPANTS
- 10+ LOCAL STARTUPS
- 75+ IDEA GENERATED
- 12 COMMUNITY LEADERS



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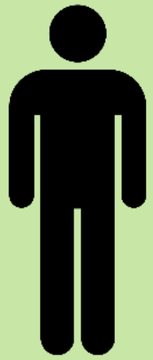

# TARGET

SHEA PROTOTYPING LAB
ENABLED BY TECHNOLOGY

| | Current State | Future State |
|---|---|---|
| SPACE | $36m^2$ [1] | 45% |
| ENERGY | 15kWh [2] | 20% ↓ |
| WATER | 143L [3] | 35% ↓ |
| WASTE | 0.87kg | 10% ↓ |

**REFERENCE 1**: HDB,2017
**REFERENCE 2:** SINGAPORE ENERGY STATISTICS 2018
**REFERENCE 3:** PUB,2017
**REFERENCE 4:** NEA 2017

# CO-CREATIVE APPROACH

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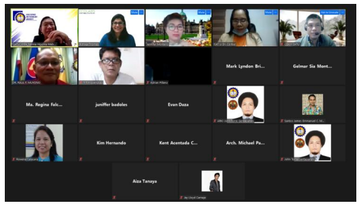
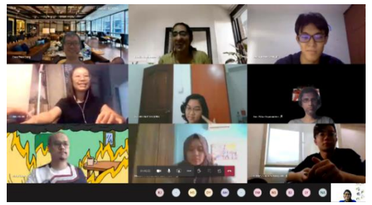




## TEST & DEPLOY INNOVATIVE TECHNOLOGY

### SHELTER & MATERIAL TECHNOLOGY

- Construction Technology
- Recycle Materials

### WATER TECHNOLOGY

- Rainwater harvesting
- Drinking Water
- Grey Water
- Black Water

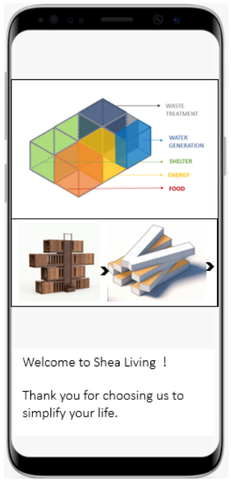
### FOOD TECHNOLOGY

- Local Species
- Harvesting Maintenance
- Hybrid Solutions
- Smart Monitoring

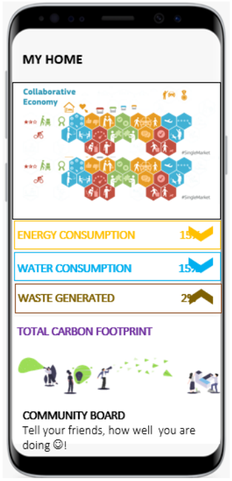
### ENERGY TECHNOLOGY

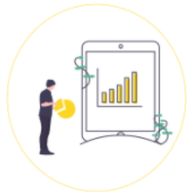
- Renewable Sources
- Battery Storage
- Passive Technology
- Energy Management

## EMPOWERING YOUR YOUR CARBON IMPACT



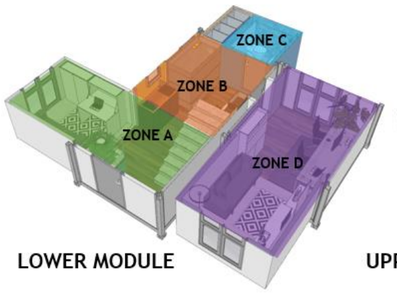




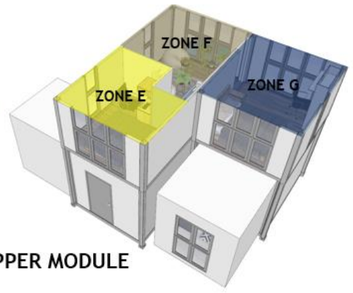


Measure Lifestyle


Take Action


Earn Rewards



LOWER MODULE



UPPER MODULE

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# SHEA CO-INNOVATION LABS

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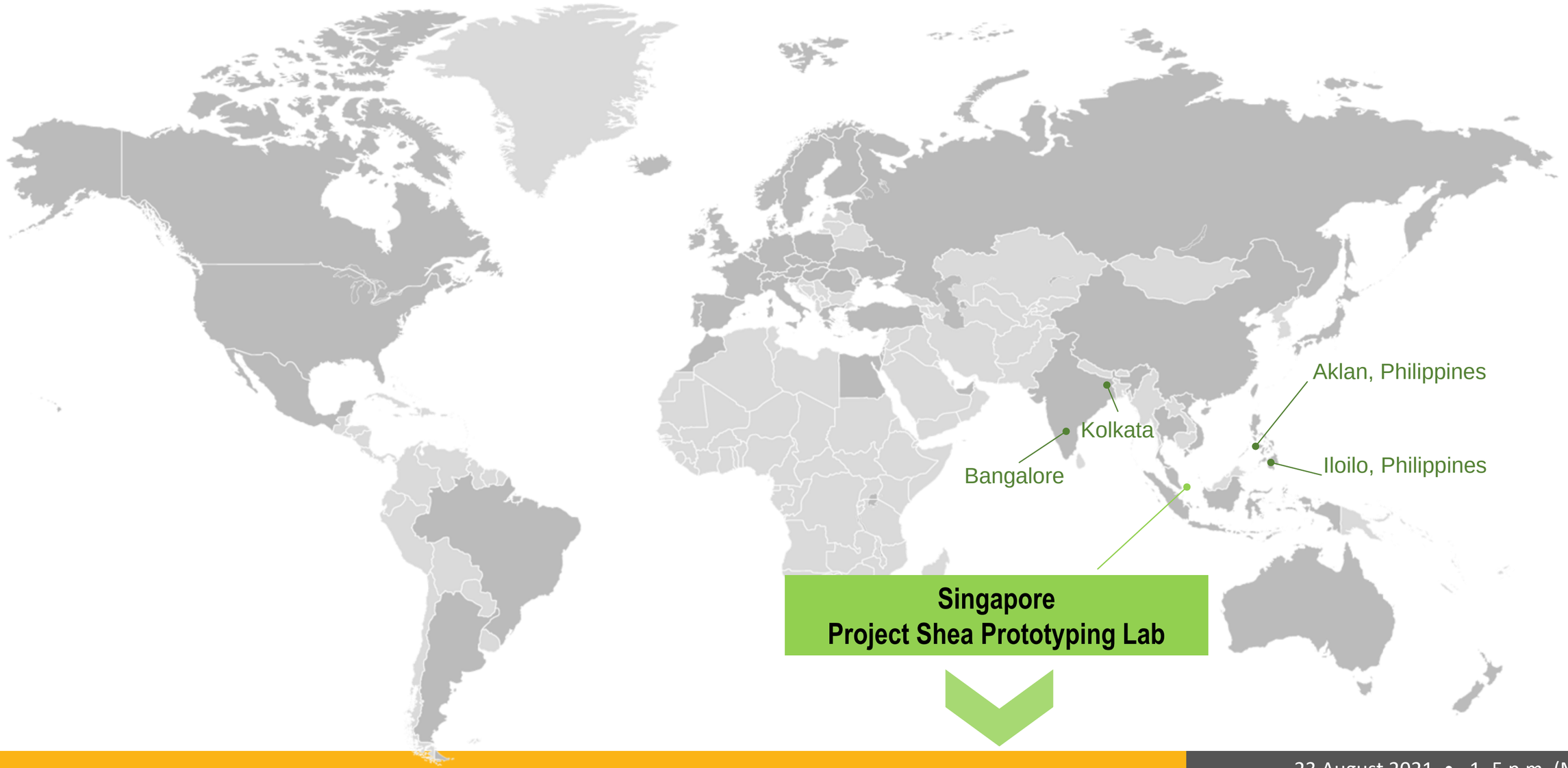

# VIBRANT INNOVATIVE COMMUNITY

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | SJ SURBANA JURONG

SJ-NTU Corporate Lab

jtc Breaking New Ground

IMAX™

PYLON CITY

dp durapower

ALLOCATE SPACE

Suntar

AERONERO™ life.water.

uHoo

FLOW TECH

change:WATER

SDG X VENTURES

SWA SINGAPORE WATER ASSOCIATION

DREAM IMPACT 夢創成真

TATA TATA POWER

The Cha Project

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NCEC NTU Clean Energy Club

SINGAPORE POLYTECHNIC | SP

YSI young sustainable impact

AAUCO GLOBALUNIVERSITYINCUBATOR

DiGiKREF

SCHOOL OF ART, DESIGN AND MEDIA

ADM

COMMISSION ON HIGHER EDUCATION 1994 OFFICE OF THE PRESIDENT OF THE PHILIPPINES

AKLAN STATE UNIVERSITY · PHILIPPINES · INSTRUCTION RESEARCH EXTENSION PRODUCTION LABOR IS HONOR 1918 BANGA, AKLAN

SOUTHERN LEYTE STATE UNIVERSITY · 1946 ·

ILOILO SCIENCE AND TECHNOLOGY UNIVERSITY 1905 ILOILO CITY

AALIM MUHAMMED SALEGH ACADEMY OF ARCHITECTURE OH LORD INCREASE ME IN KNOWLEDGE



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DESIGN
ARCHITECTS &
SOLUTIOINING

+

MISTLETOE
FUNDING
PARTNER

# DEPLOYING SMART LOW CARBON SOLUTIONS OF THE FUTURE

7 LOCAL
STARTUPS

4 LOCAL SMES

5 INTERNATIONAL
COLLABORATIONS

10 COMMUNITY
PARTNERS

**ITERATION 1**

# SHEA – PROTOTYPING LAB

## ECOSYSTEM

Local and international startups, professionals and 350+ active youth community working towards solving problems through a system's thinking approach and aligning to the UN SDG goals.

## INVENT | SHOWCASE | TEST

One-stop proof-of-concept prototyping lab for start-ups, SMEs & innovators to Off-grid technologies.

## PARTNERS

Extensive lists of partners in the domain of clean technology, Energy, water, waste and sustainable living.

PROJECT **SHEA.**

# TESTING DECENTRALIZED PLUG N PLAY SYSTEMS & SOLUTIONS, FOR AN INDIVIDUAL

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## SHELTER & MATERIAL TECHNOLOGY

Construction Technology

Recycle Materials

## ENERGY TECHNOLOGY

Renewable Sources

Battery Storage

Passive Technology

Energy Management

ROVILUS
Energize Perfection

SUNWAYS GLOBAL

PYLON CITY

## FOOD TECHNOLOGY

Local Species

Harvesting Maintenance

Hybrid Solutions

Smart Monitoring

alesca life

SOPHIE'S BIONUTRIENTS

## WATER TECHNOLOGY

Rainwater harvesting

Drinking Water

Grey Water

Black Water

Suntar

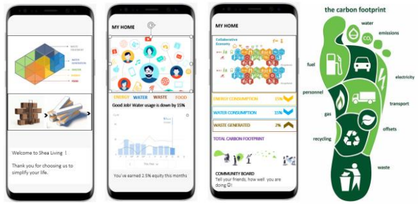
ChangeWATER

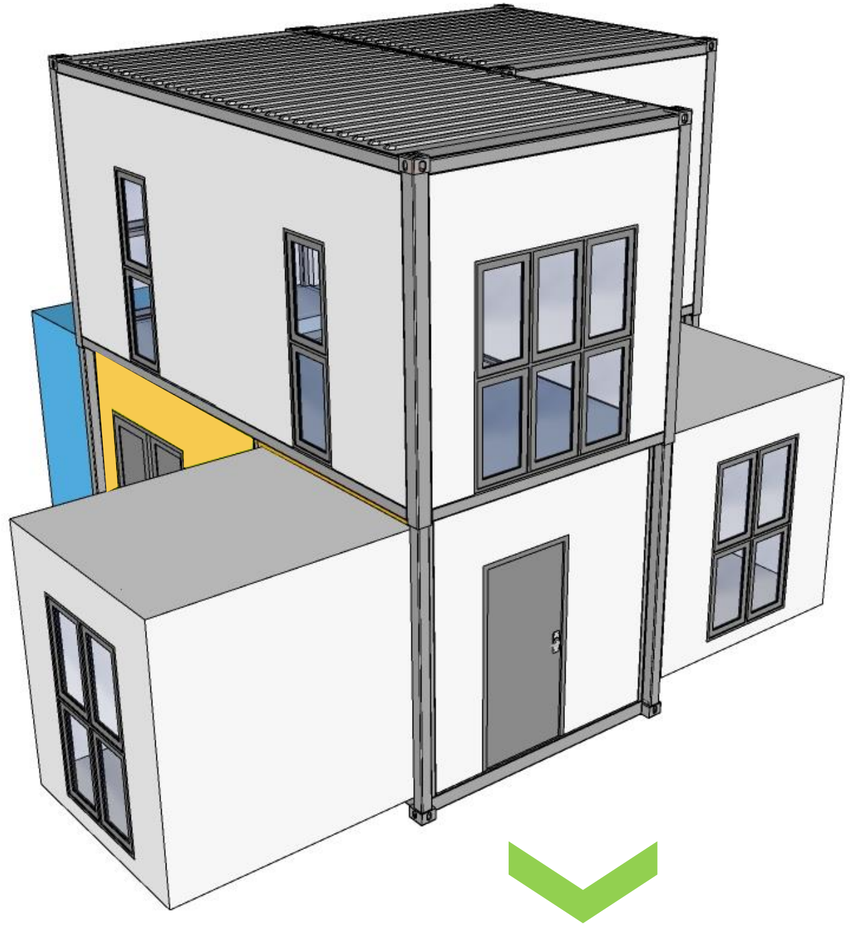
AERONERO
life.water.

SWA
SINGAPORE WATER ASSOCIATION

## OTHER TECHNOLOGY

## DASHBOARD - RESOURCE IMPACT



# Go Live! 2021


# CO-INNOVATION



## CIVILISATION STARTER KIT

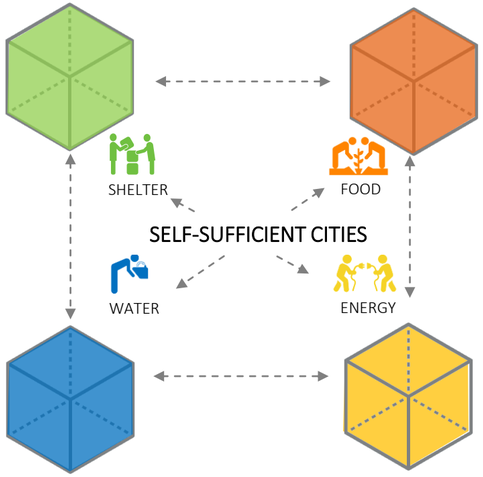
A step towards designing the sustainable future through involvement of stakeholders from varying backgrounds of life.

## COMMUNITY BUILDING

Achieving our vision requires collective effort of society as a whole. Be part of our community to lead the change, drive sustainability and grow.

- Democratise Designing & Building Future Communities
- Tap on Innovation from Youth, Education, Start-up for Engineering

**NEXT GENERATION CIVILISATION KIT**

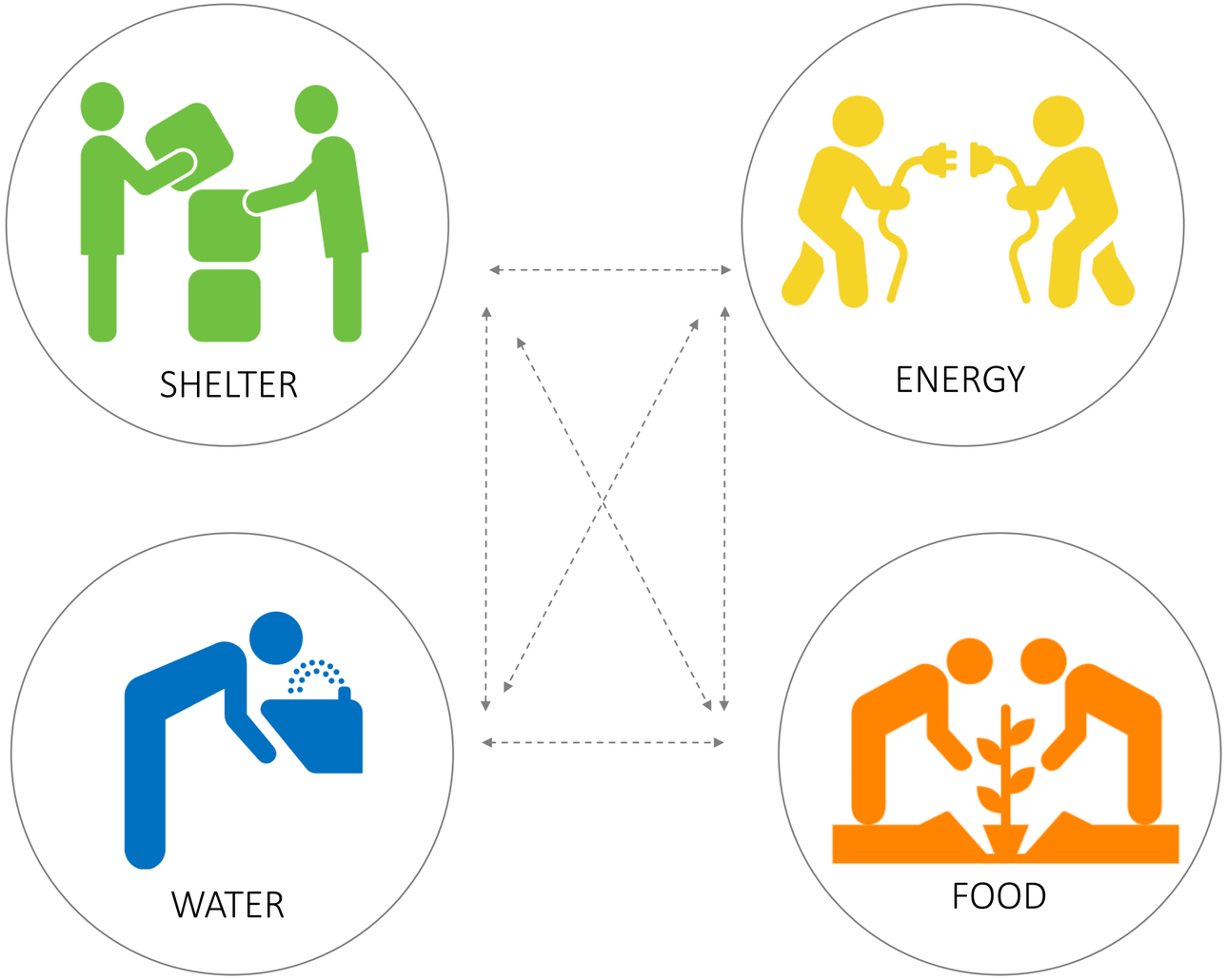


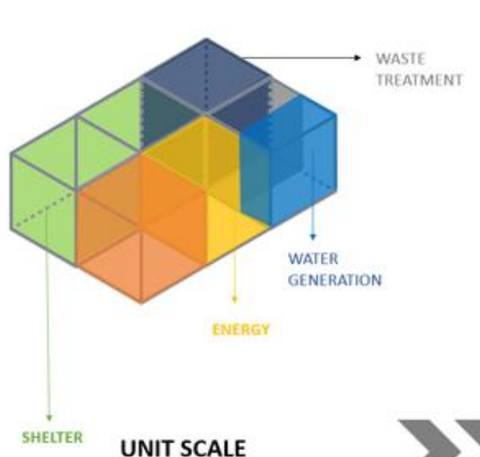

## GUIDING ENGAGEMENTS PRINCIPLES

- BREAK BARRIERS OF THINKING
- INNOVATE WITHOUT FEAR
- HEALTHY COMPETITION & COLLABORATION
- RESPONSIBLE & EMPATHY BUILDING
- MAKER CULTURE
- DIVERISTY & INCLUSION UNIVERSAL DESIGN

# ITERATION X – SYSTEMS OF CHANGE



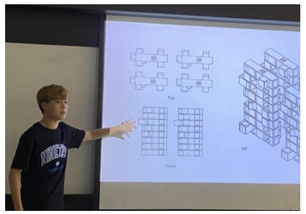


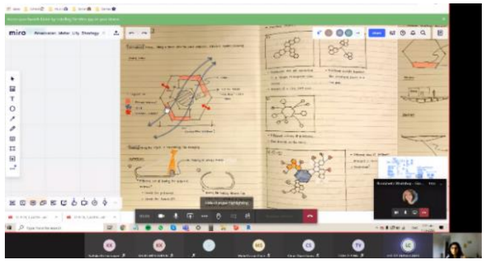
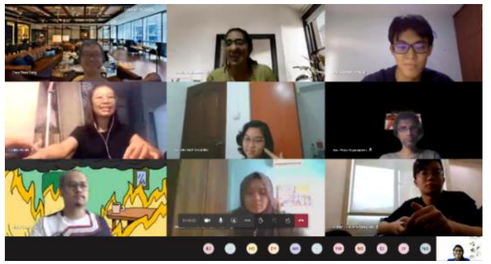










# Collaboration with University & Youth Organizations

***10+ ENGAGEMENT WITH ACADEMIA, YOUTH ORGANIZATIONS AND STUDENTS***

- INTERNATIONAL PARAMETRIC COMEPTITION
- SHEA SHELTERS- A SYSTEM FOR NIMBLE-  SCHOOL OF ART, DESIGN & MEDIA, NTU. (EDUCATIONAL MODULE)
- BIOMIMETIC WORKSHOP- SINGAPORE POLYTECHNIC (OPEN MODULE)
- PROJECT SHEA- CHED PHILIPPINES (OPEN/ EDUCATIONAL MODULE)
- PROJECT SHEA- INTERNATIONAL STUDENT COMPETITION
- PROJECT SHEA- NEXT GENERATION CIVILISATION KIT – WINTER WORKSHOP - INDIA. (OPEN MODULE)
- PROJECT SHEA- NEXT GENERATION CIVILISATION KIT – WORKSHOP - SINGAPORE POLYTECHNIC (OPEN MODULE)

# JOINT EDUCATIONAL PROGRAMME

ECOLABS CENTRE OF INNOVATION FOR ENERGY

ADB

UNIVERSITIES

YOUTH ORGANIZATIONS

INNOVATORS OR MARKERS

LEARNING BOOT CAMP

## LEARNING

- Boot camp with Guiding Principles
- Customized Course Creation & Framework

NATIONAL COMPETITION PROTOTYPE

## DEPLOYMENT

**Prototype :**

Iterative Sustainable Unit Building Innovative Building Construction Solutions – flatpack, modular and stackable with integrated

- Renewable Energy Systems
- Cooling Solutions
- Portable Off Grid Water
- Waste Systems

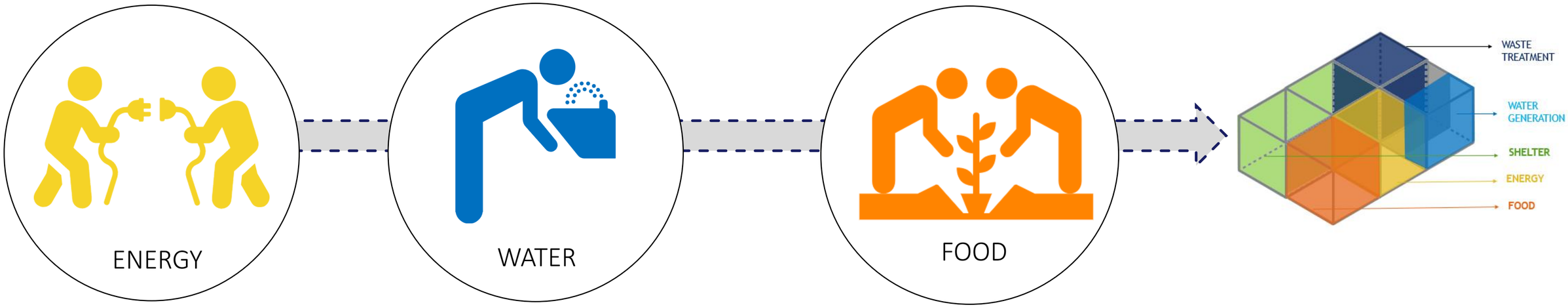
## CO-INNOVATION & EXPERIMENTATION

**Co: Innovation:**

Testing and Deployment Humanity Centric Technological Solution and Digital Twin Simulation to measure and nudge user behaviour

# LOCAL INNOVATION CALLS





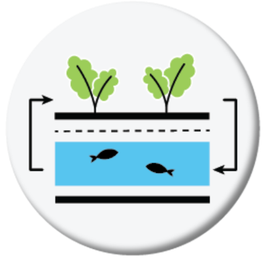


Renewable energy

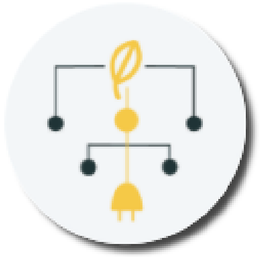

Battery Storage


Rainwater Harvesting


Drinking Water


Hybrid Systems


Local Plant Species


Energy Management


Passive Technology


Greywater Recycling


Black Water Recycling


Smart Controls and Monitoring


Harvesting / Maintenance Techniques

Design a comprehensive solution which caters to the habitual needs of an individual on a (bath, cooking and work) and can be scaled to the larger spatial needs of the community in terms of water, food and energy

- Identify local habitual patterns & construction techniques consumption trends
- Flat Pack Portable & Compact
- Short Assembly Time
- Weatherproof



23 August 2021 • 1–5 p.m. (Manila time)
24 to 27 August 2021 • 2–6 p.m. (Manila time)

# PROJECT BASED LEARNING WITH PHILIPPINES COMMISSION ON HIGHER EDUCATION

ADB
CENTRE OF INNOVATION FOR ENERGY

## ○ Modular Narrowcast Collaboration with CHED

### SELF SUFFICIENCY EMPOWERING THE NEW NORMAL

INTERNATIONAL COLLABORATION ON MODULAR EDUCATION

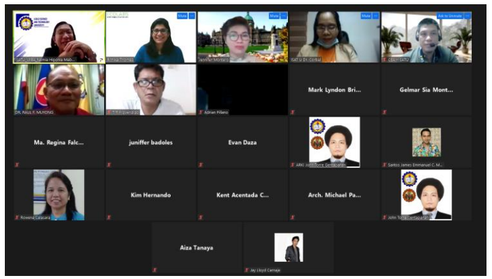

**Endorsed by CHED**

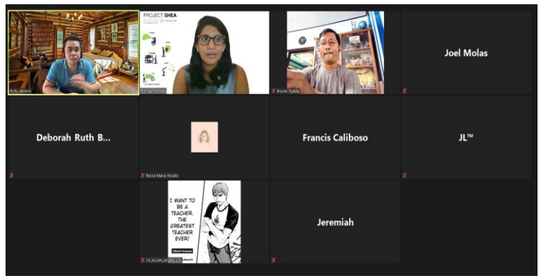
**Philippines Chapter of Project Shea to build awareness about sustainability and future resilience endorsed and supported by CHED**. Our domain of education and awareness building focuses on sustainability, science, technology, design and innovation. In this regard, we would like to propose the following collaboration.

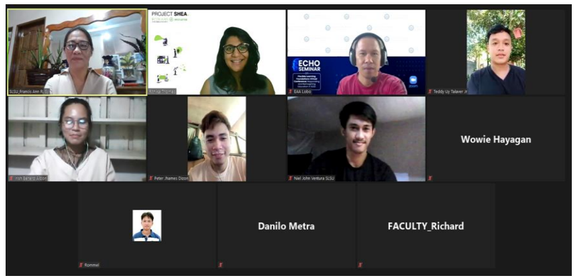
**Multidisciplinary Teams :** Engineering (Building related), Design, Sociologists, Business Students, and Multi-Media

**Methods of Communication:** Voice Calls, Video Messengers


| | Durations | Topics Covered |
|---|---|---|
| | Week 0 | • Train & Mentor Faculty with Guiding Principles<br>• Understand the Local Context<br>• Synergize Skill Sets of University Staff & Student<br>• Define Weekly Learning Goals for Student Syllabus |
| Phase 1 | Week 1 | • Launch the online brief<br>• Project Shea Learning Kit & Ecolabs Lecture Series<br>• Student Team Formation |
| | Week 2,3 | • Research Phase<br>• Contextualize the problem<br>• Identify & Define Challenges<br>• Conceptual Ideas/Sketches etc.<br>• Set Unique Learning Targets with References |
| | Week 6 | • Submit Presentations of Literature Study and Initial Ideas<br>• Videos of the Process |
| Phase 2 | Week 7 | • Ecolabs Team shortlists ideas & Discussion |
| | Week 8,9,10 | • Finalize the designs &<br>• Design Fabrication/ Supporting Calculations<br>• Working Prototype |
| | Week 11,12 | • Presentation to Ecolabs Team with Working Prototypes Proposal |
| | Week 14 | • Student Submit to the Competition |
| Phase 3 (TBC) | Week XX | • Working Prototype in Philippines to be transported to Singapore |




# INDIA : FLAT PACK MODULAR HOUSING FOR INFORMAL SETTLEMENTS

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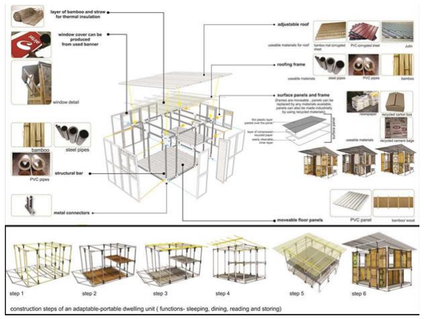
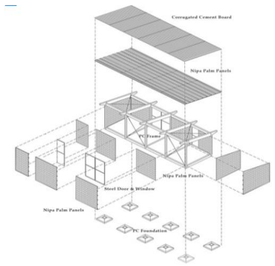
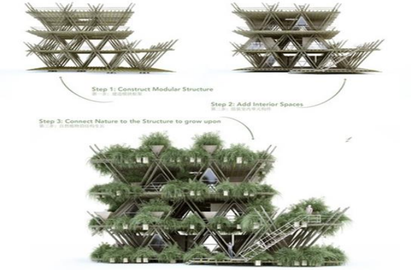
The Cha Project · POD STRUCTURES · JIA STUDIOS · SHEA.

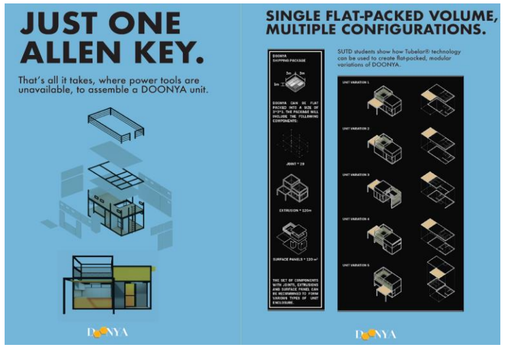




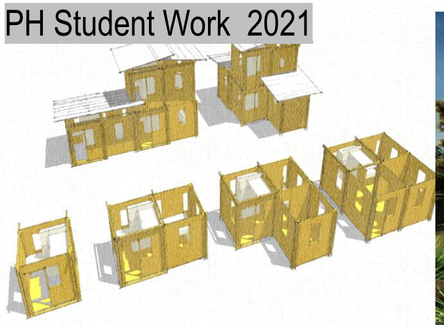



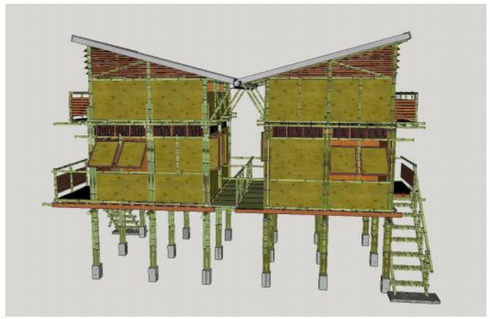



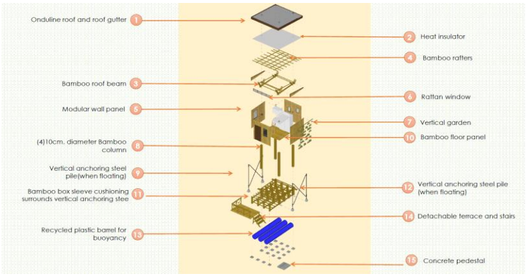

## LOCALISED SOLUTIONS FOR GLOBAL CHALLENGES


PH Student Work 2021









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## POTENTIAL PARTNERSHIP

**ASEAN Chapter**

- Nation wide Collaboration with University, Academia & Youth Organization
- Project Deployment & Test Sites for Future Iterations
- Integration of Infrastructure Capabilities & Testing Plug N Play Solutions

**Co-Innovation Funding & Testing Opportunities**

- Energy Efficient Solutions
- Sustainable Cooling Solutions
- Smart & Digital Infrastructure
- Small Scale Innovations in Water, Waste Treatment and Food Systems

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# JOIN US TO BUILD RESILIENT, SELF SUSTAINING COMMUNITIES OF THE FUTURE

# PROJECT **SHEA.**

rithika.thomas@ntu.edu.sg

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# MARCH TOWARDS DECARBONIZING WORLD

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