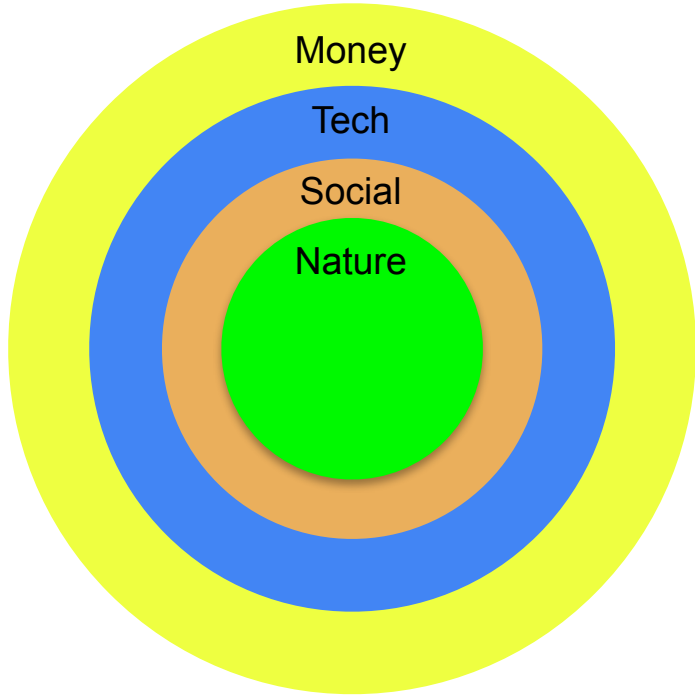




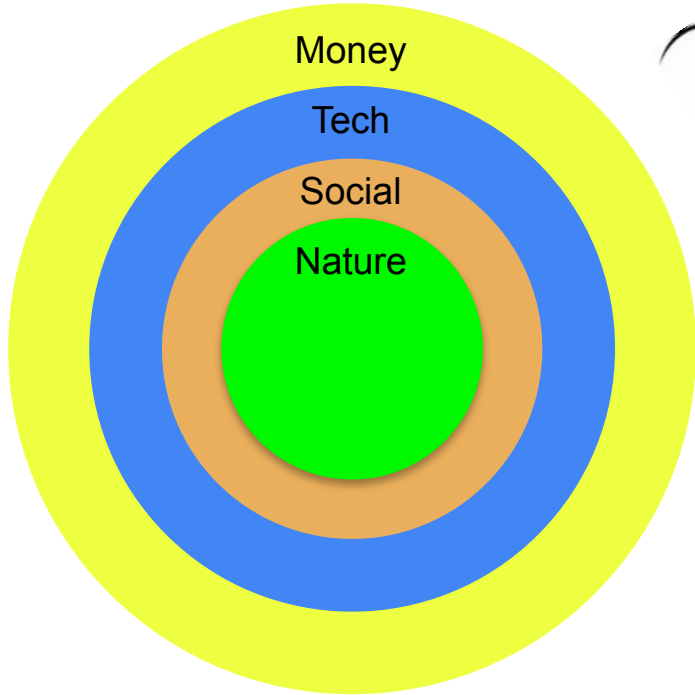
# Leading Innovations: How to Leap in a Crisis

Cesar Jung-Harada  
IDEAFEST 2023 Jakarta

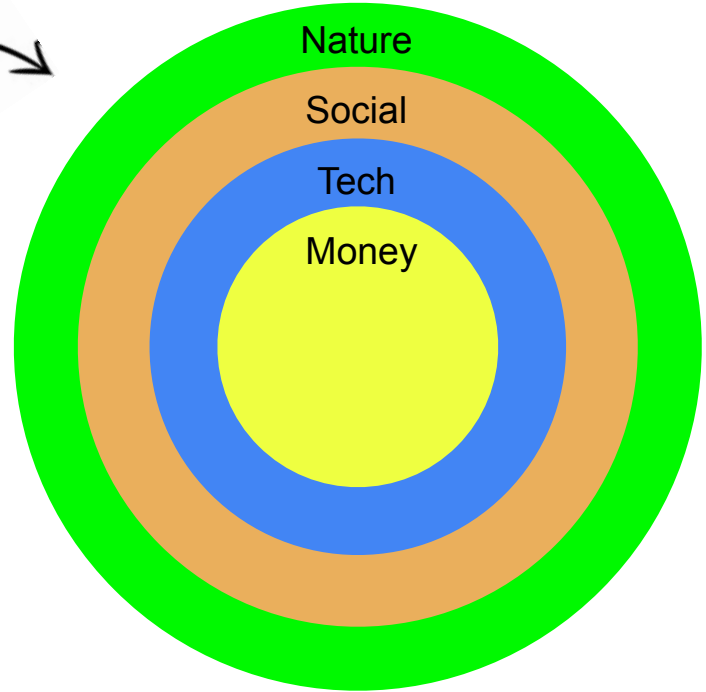




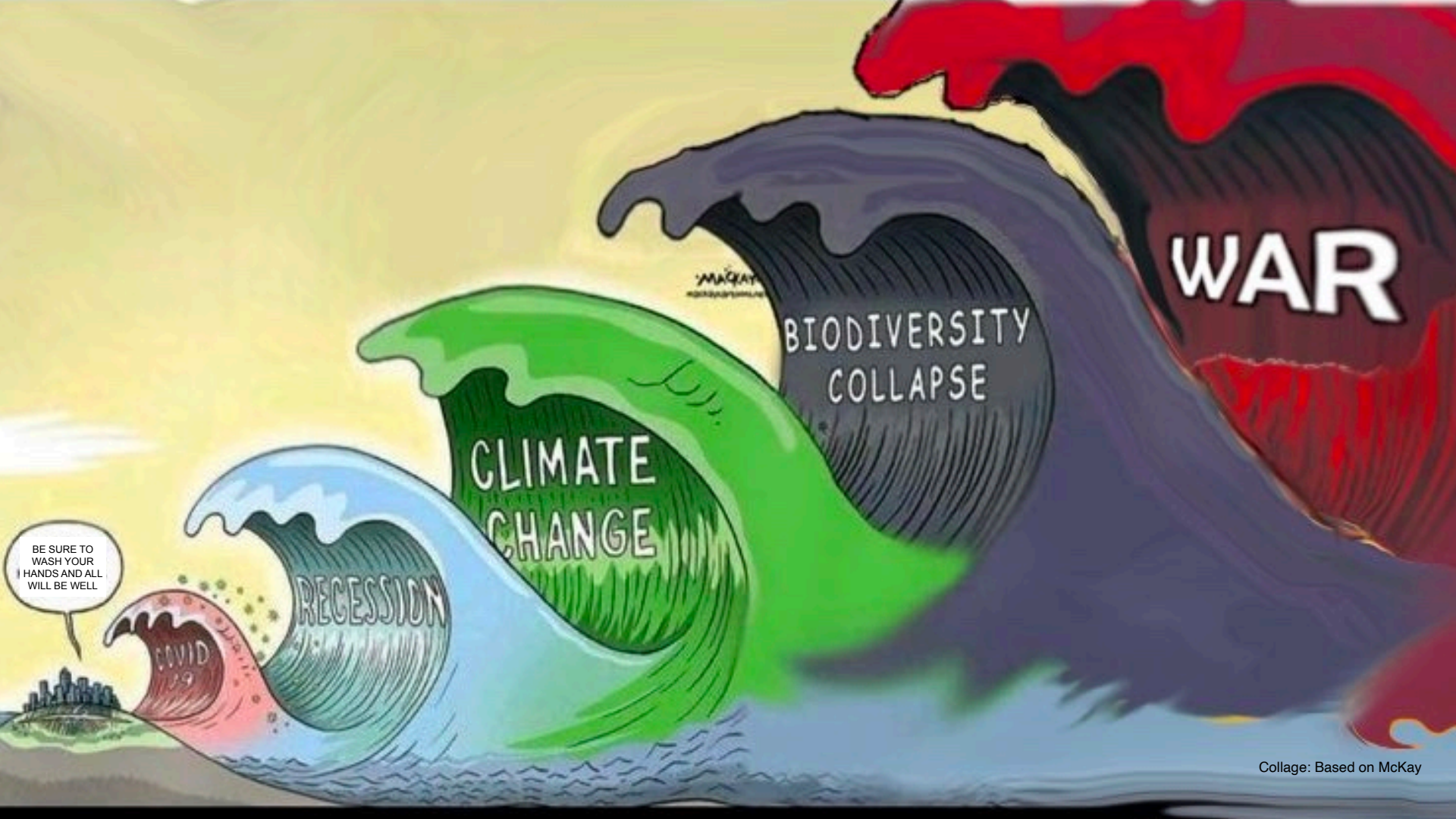
"Money rules the world"



"Money rules the world"



"Nature is our life support system"



BE SURE TO  
WASH YOUR  
HANDS AND ALL  
WILL BE WELL

COVID

RECESSION

CLIMATE  
CHANGE

BIODIVERSITY  
COLLAPSE

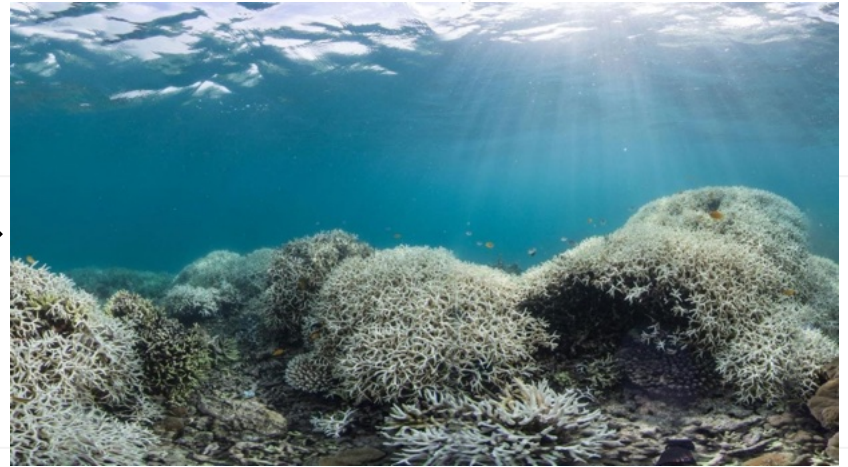
WAR



# 1. Coral

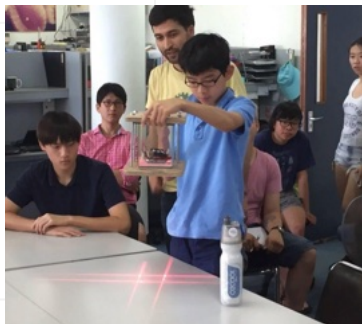
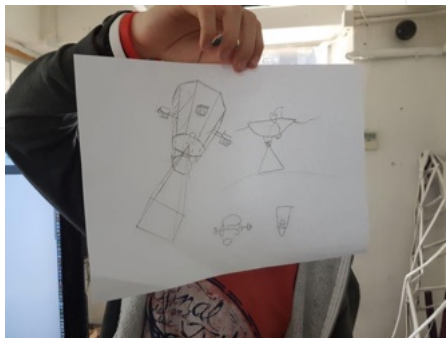


2050: 90% dead



2100: 99% dead

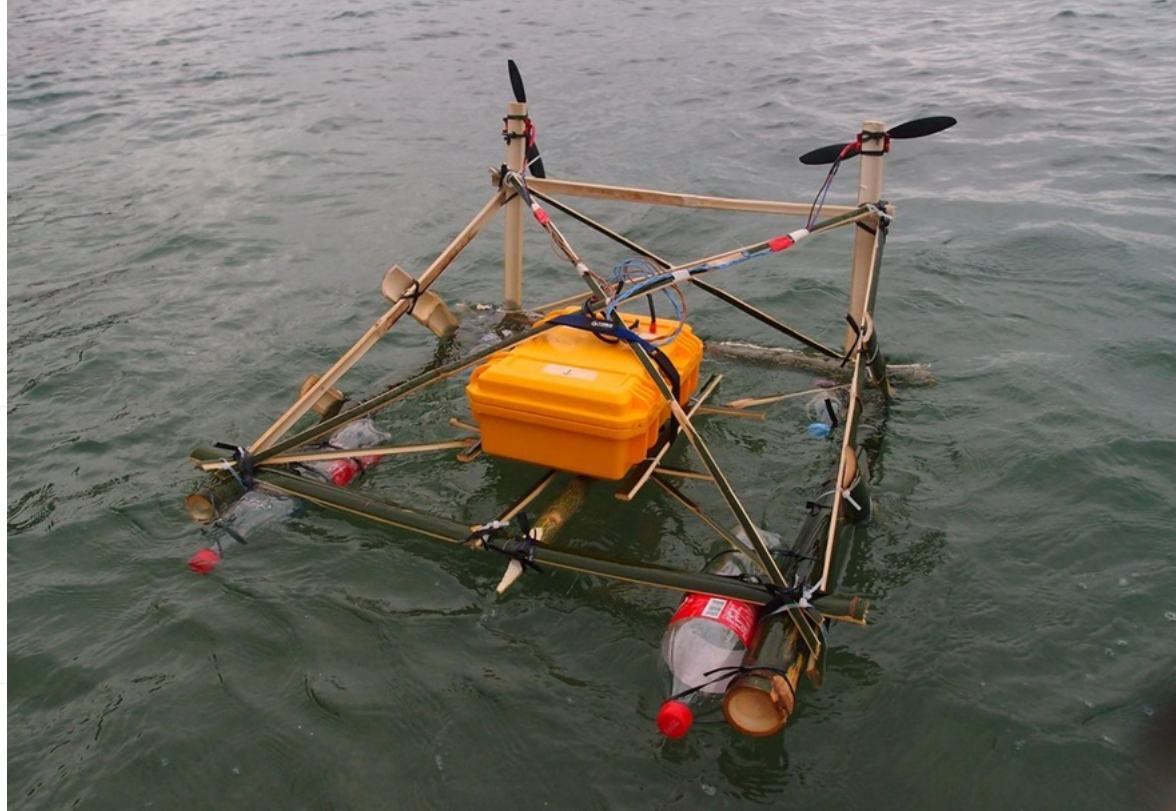




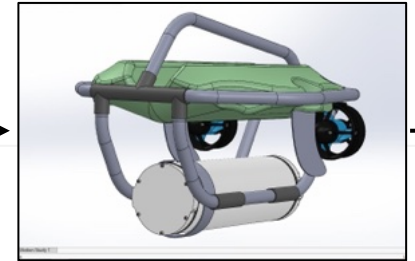
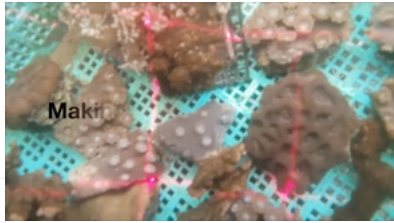




A screenshot of an Instructables page titled "Laser Quadrat for Coral Reef Mapping". The page is from Autodesk, Inc. [US] and has a URL of https://www.instructables.com/6/Laser-Quadrat-for-Coral-Reef-Mapping/. The page shows the title, author information, and a video thumbnail. The video thumbnail shows an underwater view of a coral reef with a red laser grid overlay. The page also has a sidebar with categories and keywords.







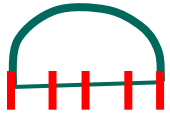
**Quadrat  
2016 June**

**Mindorobot  
2017 July**

**Mustard  
2018 July**

**Turtle  
2020 Mar**

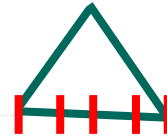




**Bow and  
Arrow  
2020 June**



**Dream  
Catcher  
2020 July**



**Delta Force  
2020 July**

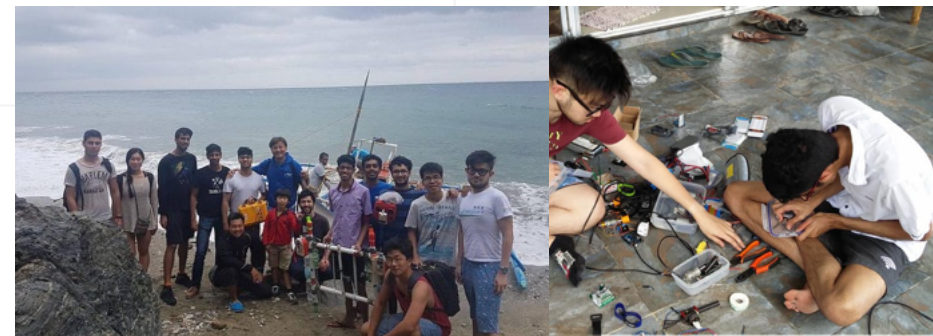
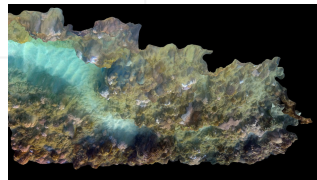
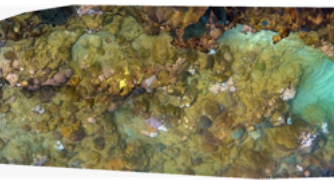


**Ladder  
2020 Aug**





it should be a device






An on-board conveyor belt can retrieve as much as a metric ton of trash a day

Forbes

Subscribe Sign In



**F** PROFILE


## Clearbot

Cofounders, Clearbot

### About Clearbot

Cofounded by Gupta and Goel, Clearbot started in 2019 as a student project to help Indonesian surfers clean up waterways. The Hong Kong-based company builds self-driving electric boats that collect rubbish, perform remote inspections and deliver cargo. With a 20-kilometer range and 200 kilogram payload capability, Clearbot has participated in cleanup projects in Hong Kong and India and won competi

[Read More](#)



Maker Bay



Copyright



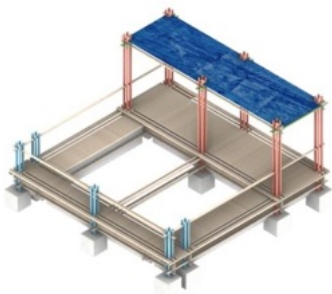
CopyLeft



## 2. Oyster

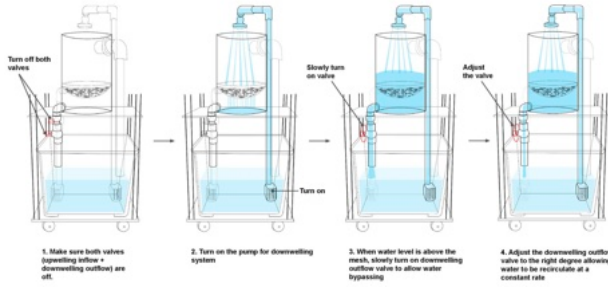


Low cost high tech fish and oyster farming systems  
Potential impact: reduce overfishing, provide better livelihood for coastal, river and lake communities.



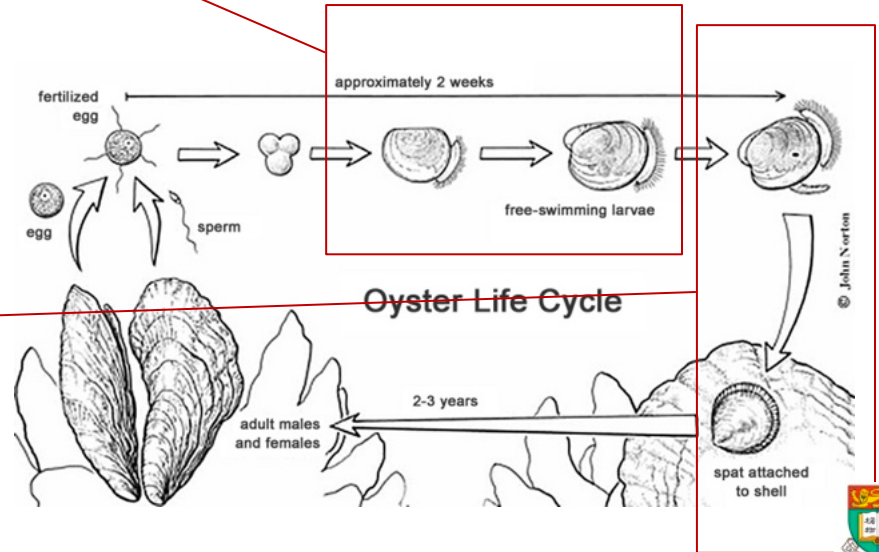
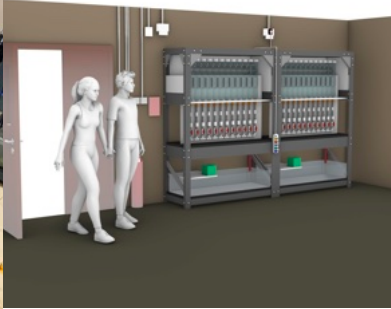


Downwelling system manual guide



This environment mimics the tide movement with upwelling and downwelling. Our specific design allows for fine control and measurement of environmental parameters such as temperature, Ph, dissolved oxygen, salinity and further sample analysis can tell us about the chemistry of the water.

1. Research, Faster parallel testing
2. Usability
3. Continuous digital measurements
4. Remote monitoring











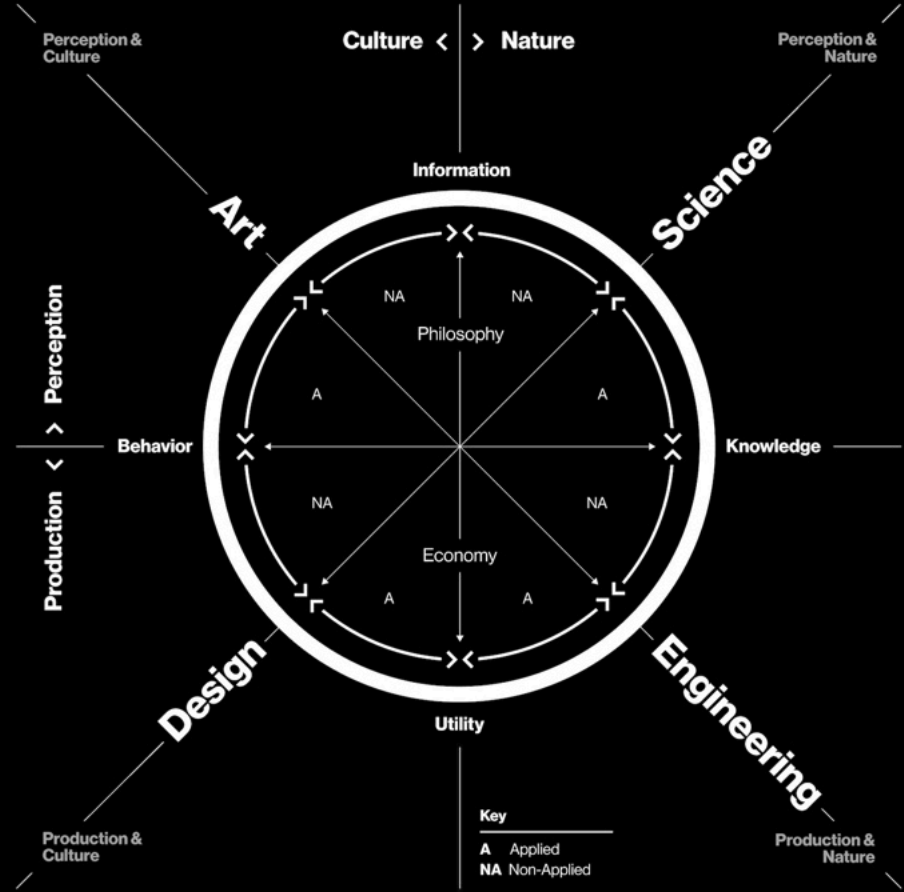


● Science

● Engineering

● Design

● Art



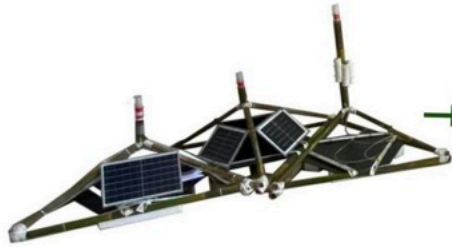
# 3. Mangrove



What if we could make  
Bagaimana jika kita dapat membuat



## Produce



Seawater solar electrolysis  
(green hydrogen production)

## Store



Low pressure  
storage

## Distribute



Local production  
Local distribution

## Use

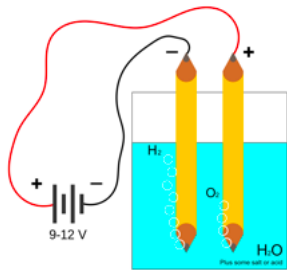
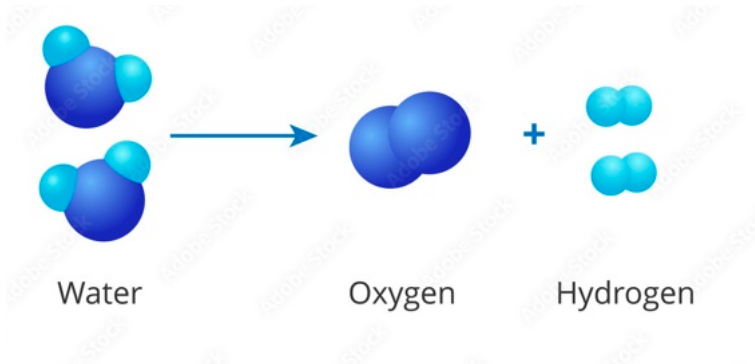


Would replace  
- Gasoline for vehicle  
- Electricity for home and work  
- Cooking gas

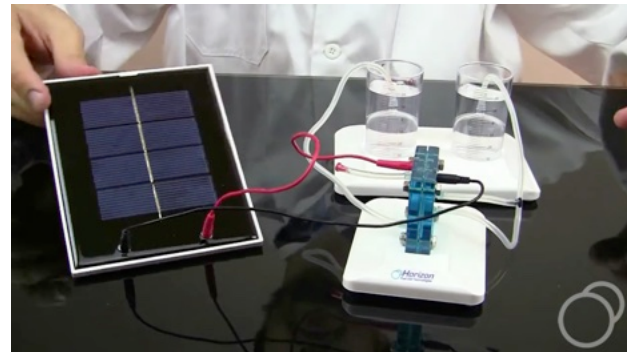
Water







[https://en.wikipedia.org/wiki/Electrolysis\\_of\\_water](https://en.wikipedia.org/wiki/Electrolysis_of_water)





Using LPG, the average household uses:

**Per month:**

- 4 x 3KG LPG canisters per month
- Cost: 60000 IDR (3% mean income)



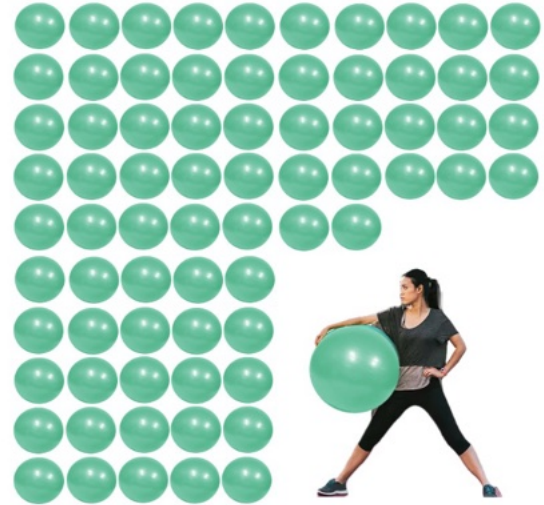
**Per day:**

- 13% of a 3KG LPG canister

Using hydrogen, we would require:

**Per month (\*)**

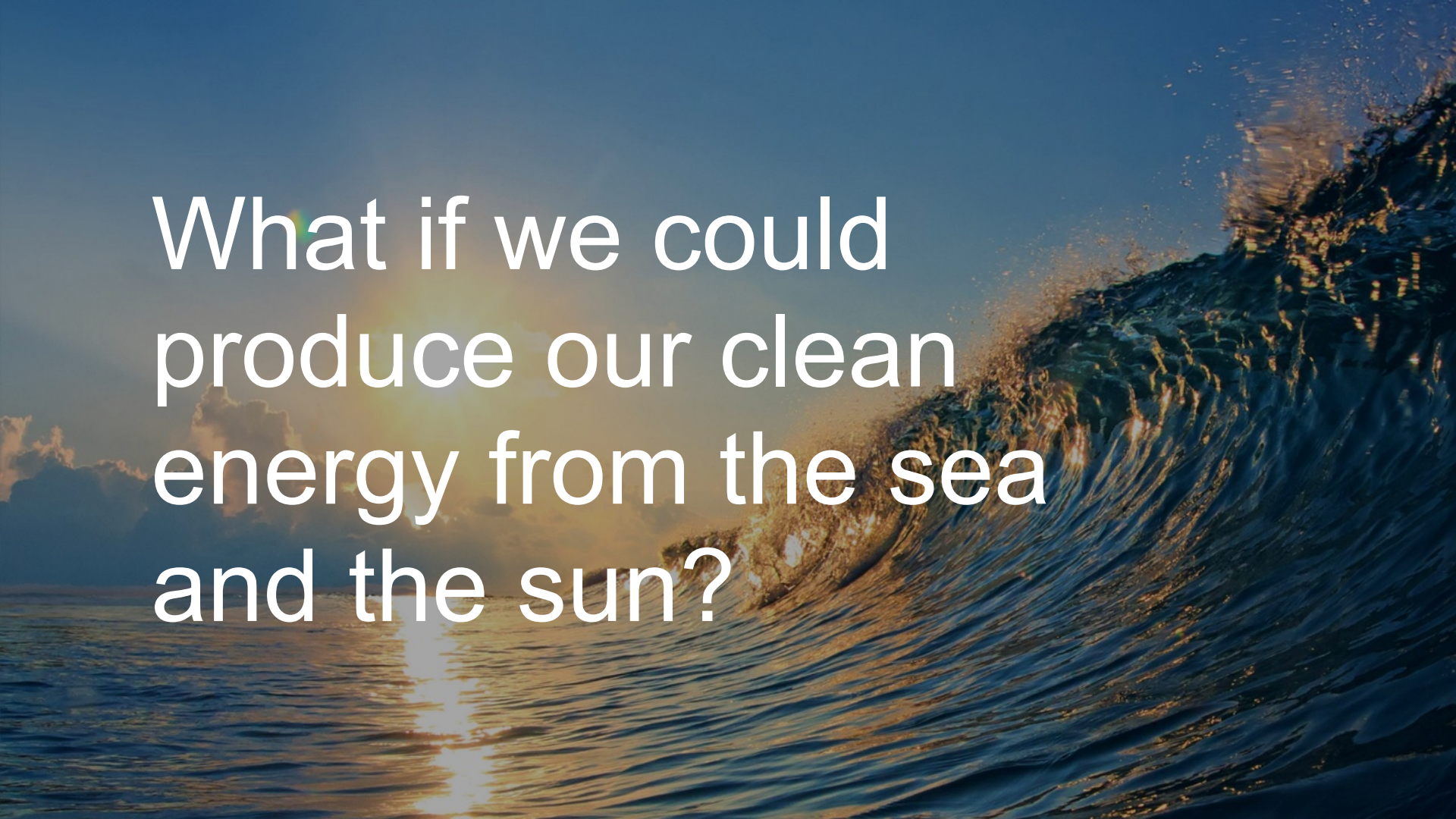
- About 71 yoga balloons (75 cm diameter)



**Per day:**

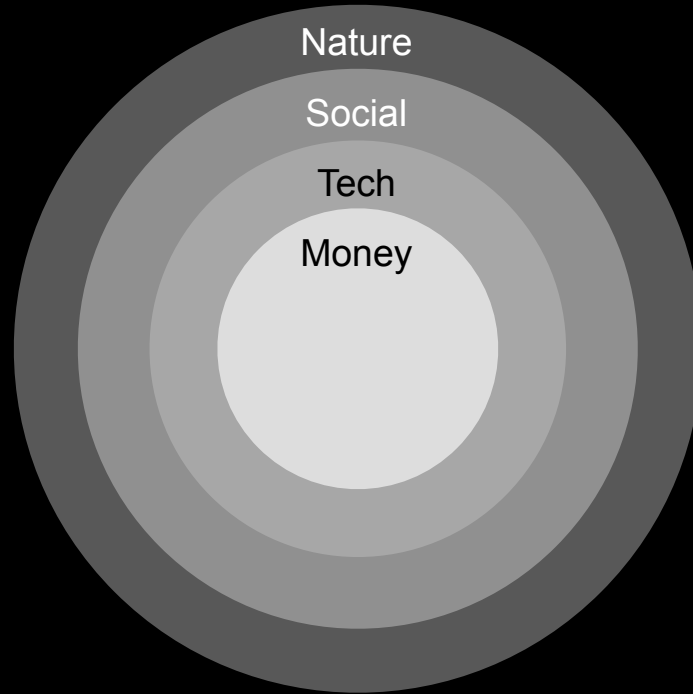
- About 2.5 balloons (75 cm diameter)
- Compressed at 35 bars: 1 scuba tank 15L



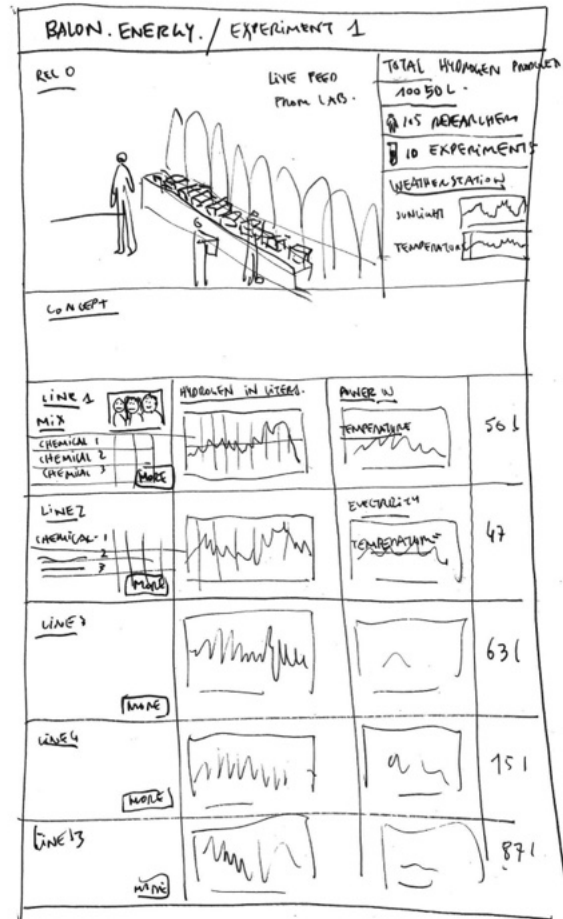
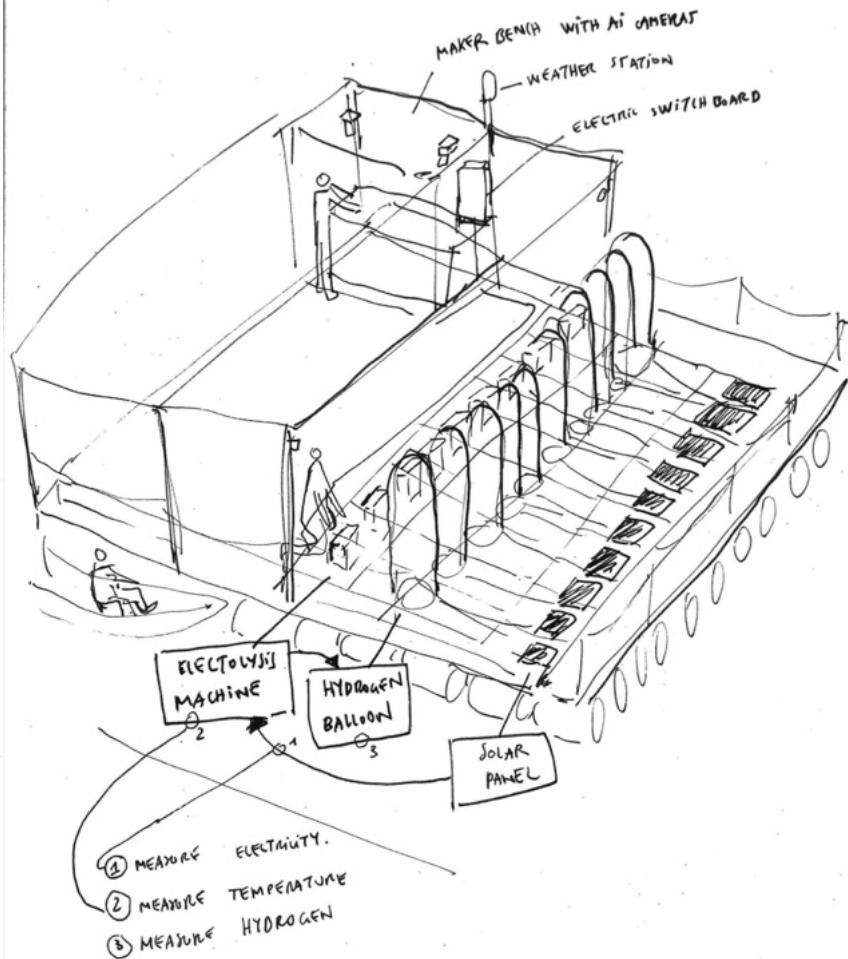


What if we could  
produce our clean  
energy from the sea  
and the sun?





Holy grail of renewable energy?



# Hydrogen Research

"Renewables take up precious land resources. Green hydrogen production is not scalable"



**Offshore**



"Compression can cost up to 40% of Hydrogen energy budget, and dealing with compressed gases is dangerous and expensive"



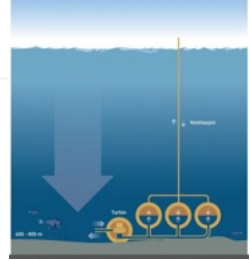
**Low Pressure Storage**



"Compression can only be done by mechanical means"



**Underwater Ambient Pressurization**



"Even green hydrogen production uses toxic and rare chemicals"



**Non-toxic Catalyst**





# Mangrove Research

“Energy production always creates pollution and damages biodiversity”



Increasing Dissolved Oxygen



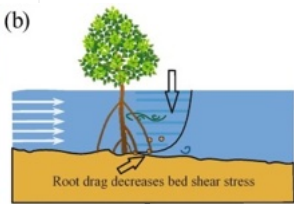
“Planting Mangrove is slow and tedious”



Automate Mangrove Planting



“Many mangrove die out of erosion”



Develop Biodegradable Anti Erosion Mesh



“Mangrove grow too slowly”



Optimize soil composition for fast growth

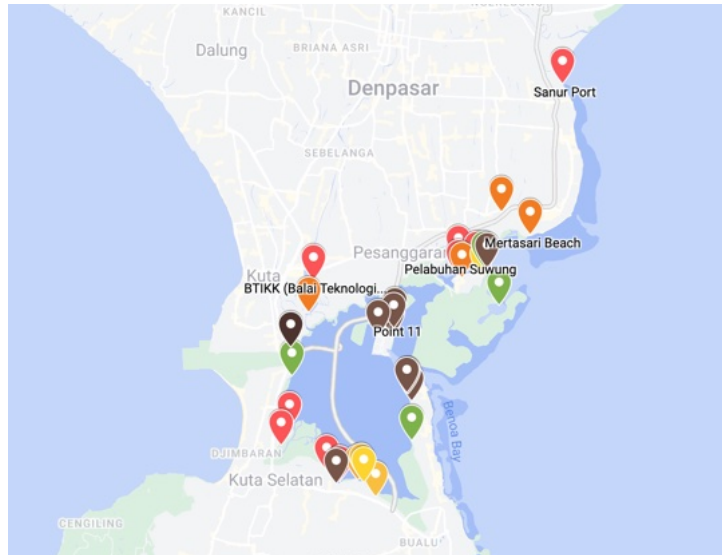


<https://www.nature.com/articles/s41598-021-88119-5>  
<https://www.landsapediscount.com/Geocell-Erosion-Control-Products-s/1948.htm>  
[https://earth.org/data\\_visualization/the-true-value-of-mangroves/](https://earth.org/data_visualization/the-true-value-of-mangroves/)  
<https://coastalconservatory.com/how-to-grow-mangroves/>

# Sites Inspected

## Criteria:

1. Water Depth & Quality
2. Safety
3. Public Accessibility
4. Community
5. Environmental Impact

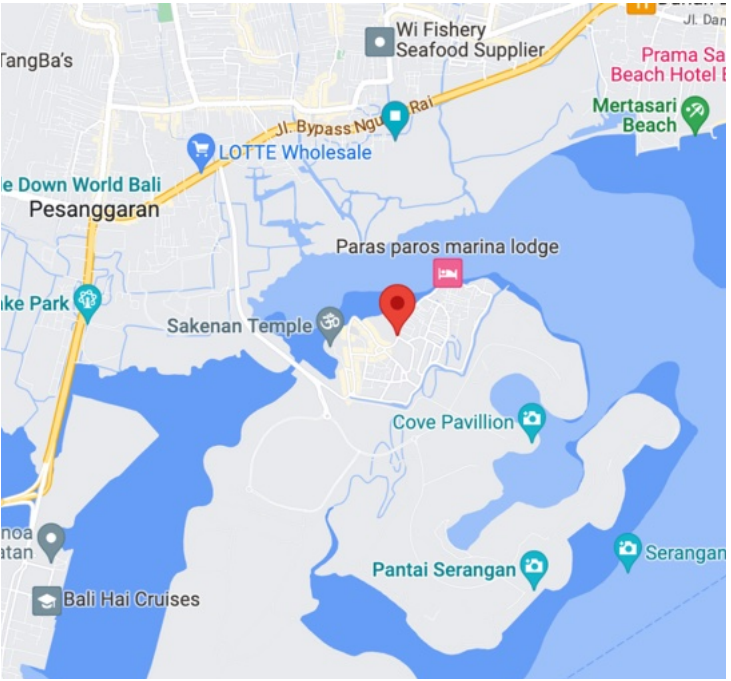


<https://tinyurl.com/2tfp284s>

## Comparing Potential Locations

Aa Name	Σ Score	# Water	# Safety	# Accessi...	# Commu...	# Environ...	
Pelabuhan Suwung <input type="checkbox"/> 1	47	10	9	10	9	9	
Kampoeing Kepiting	46	9	9	10	9	9	
North Serangan	45.5	8	9	9.5	9	10	
Pura Taman Ratu Kakian	45.5	10	9	8	9.5	9	
Wana Segara Kerith	43	10	9	4	10	10	
BTIKK Waterfront	42	10	10	10	6	6	
Kelompok Nelayan Ersar	41.5	9	5	9.5	9	9	
Sanur Port	40	9	8	10	5	8	
Segara Marine - nearby	39.5	8	8.5	8	7	8	
Embung Sanur	35	9	6	10	5	5	
Mertasari beach	35	9	3	9	6	8	
Sanur Beach	34.5	8	6	8.5	4	8	
Rekreasi Kano	34	6	4	5	9	10	
Mertasari harbour	33	8	3	9	6	7	
Serangan Harbour	32	8	6	7	5	6	
Mangrove Kelan	28	4	4	8	4	8	

# Site Selected: North Serangan



8°43'28.1"S 115°14'00.8"E



# Mangrove Biodiversity



*Avicenia lanata*



*Bruguiera gymnorrhiza*



*Ceriops tagal*



*Rhizophora apiculata*



*Sonneratia alba*

## Biota



*Macrophthalmus*



*Ilyoplax*



*Tetraodon erythrotenia*



*Butis butis*



*Liza subviridis*

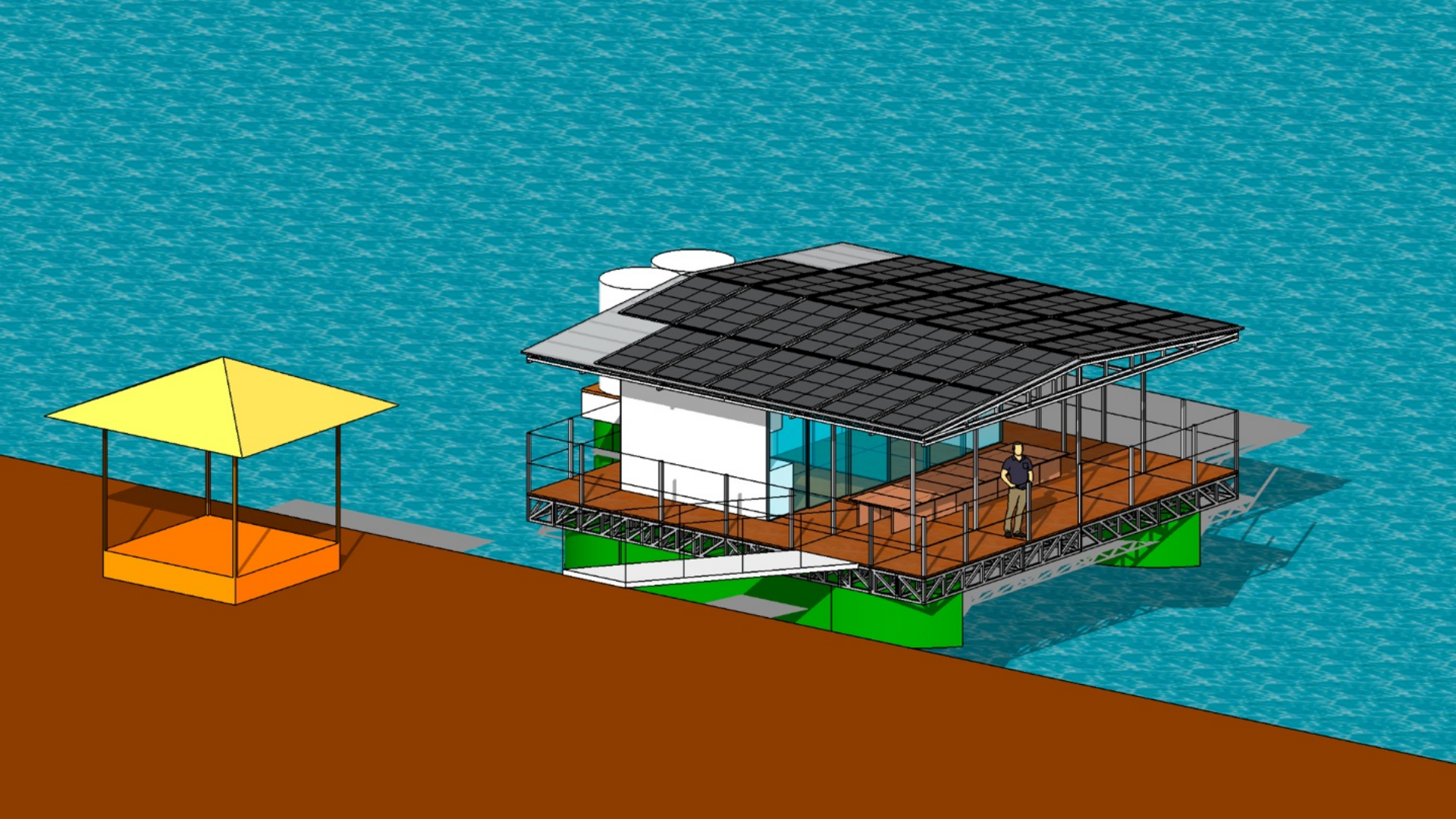


Monitor Lizard

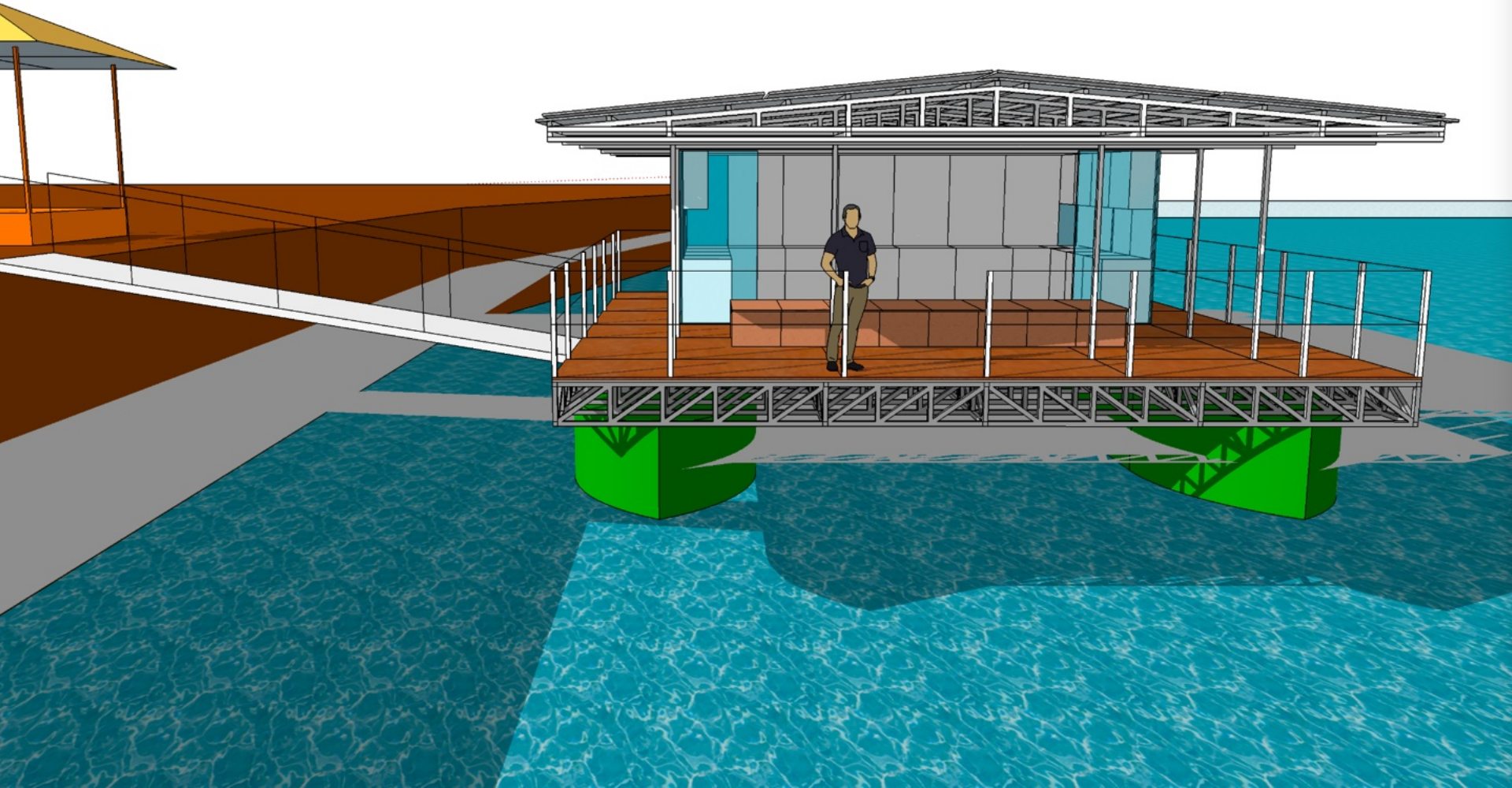


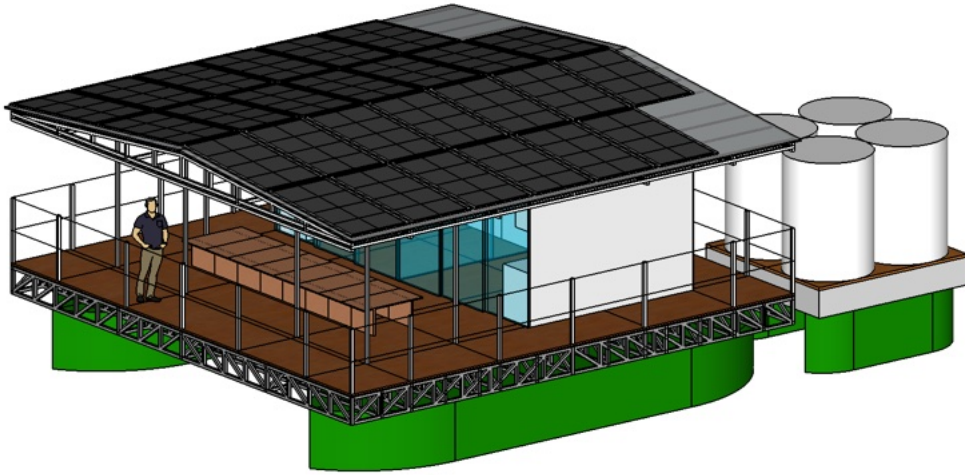












## Platform

- Dimension: 9 x 9 m, 3 m Height
- 10 KW capacity
- Capacity: 15-20 people for workshops & activities

# Activities

## Research



Energy



Marine Biology



Geography - Seagrass



Environmental Pollution

## Education



STEM Workshops with Local Schools



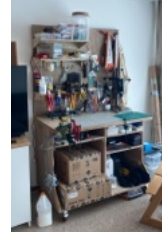
Community Training Skills  
Development, and Certifications

Alternative Tourism Education

## Community Service



Electric Bike  
Charging Station



Makerbench &  
Repair Shop



Fishkeeping

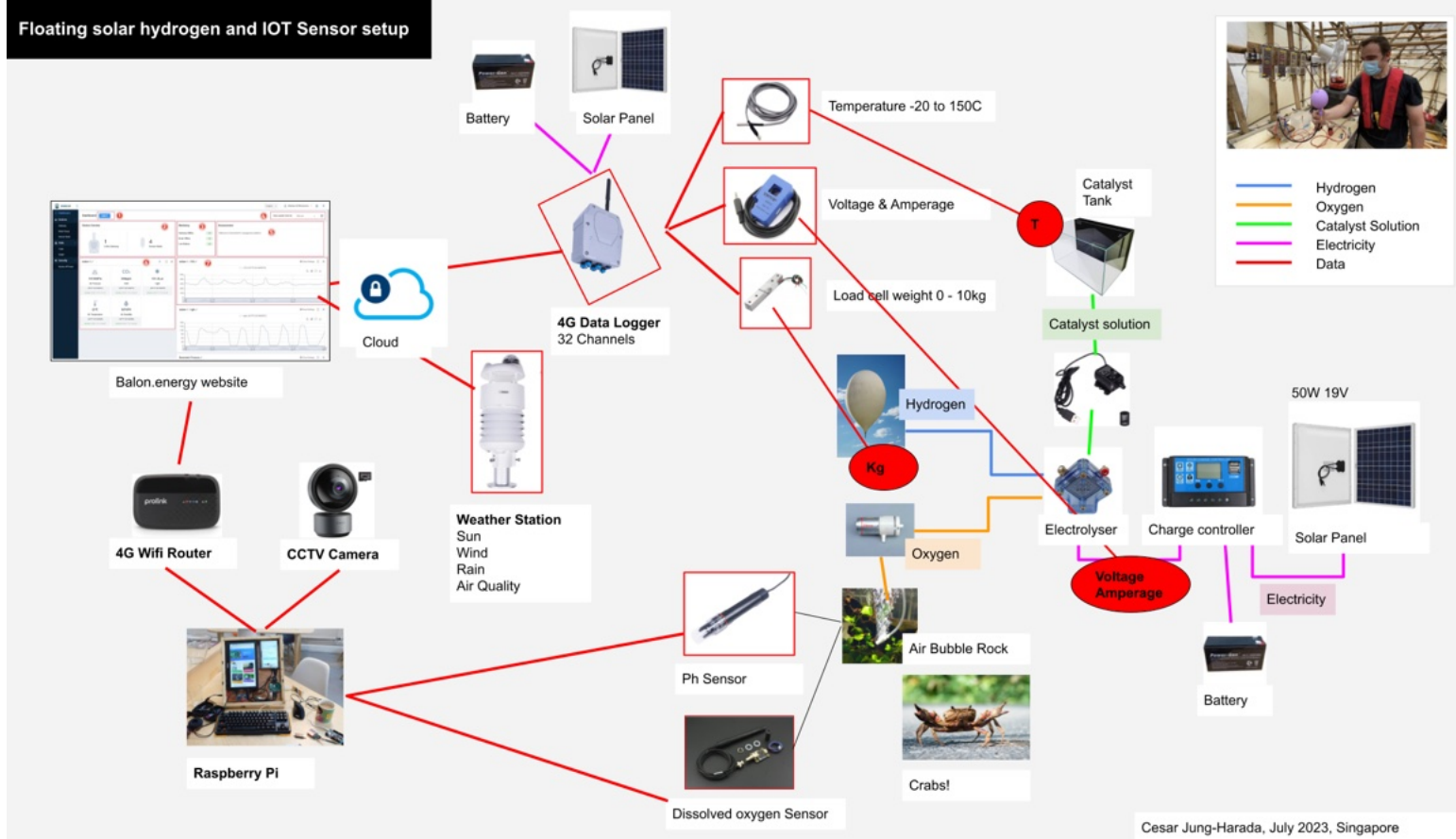


Mangrove  
Plantation  
Wildlife  
Monitoring

Mangrove Business Incubation



# IOT (Internet of Things) and Use of AI



# Real-Time Open Data



Testing IOT Systems  
Aug 2023, Bali



Dashboard <https://sensecap-demo.seeed.cn/#/index>

# Publication & Open Science

The screenshot shows a ResearchGate page for a conference paper titled "Developing green hydrogen low-cost research and development platform in Bhutan" by Cesar Jung-Harada, Jinger Zeng, and Ohnmar Kyaw. The paper is dated July 2023 and has a DOI of 10.5281/zenodo.8171638. The abstract discusses the power sector's role in Bhutan's revenue and the challenges of seasonal power shortages, suggesting green hydrogen as a solution. The page includes an abstract and figures section with a figure showing a diagram of a power generation system and a photograph of a hydroelectric dam. The figure is captioned "Figure content uploaded by Cesar Jung-Harada" and includes a Creative Commons license icon.

Marine Biology

Blue Carbon

Anthropology, Design

Engineering

Business

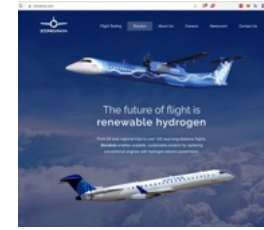
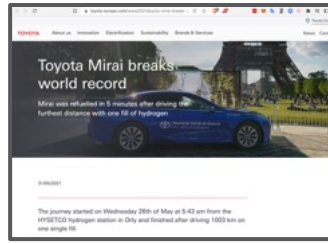
International Renewable  
Development

[https://www.researchgate.net/publication/372912249\\_Developing\\_green\\_hydrogen\\_low-cost\\_research\\_and\\_development\\_platform\\_in\\_Bhutan](https://www.researchgate.net/publication/372912249_Developing_green_hydrogen_low-cost_research_and_development_platform_in_Bhutan)

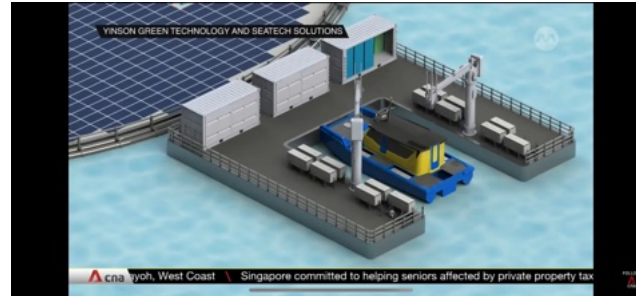
<https://www.notion.so/cesarjungharada/Conference-Paper-published-From-Bali-Indonesia-to-Thimphu-Bhutan-Transferring-experimental-knowled-03db6d339bc54acaac7377d8058ce7d8>



# Industrial usages of Hydrogen



Taking inspiration from the hydrogen trains being run in countries like Germany and China, Indian Railways now plans to roll out hydrogen-powered trains on its narrow-gauge heritage routes by December this year, starting from "completely green". Currently, the railway is working to build a prototype of a hydrogen fuel-based train at the Northern Railway workshop which will undergo tests on the Sonapatna section in Haryana.



Electrification of all harbour crafts by 2030, Singapore

<https://www.notion.so/cesarijungharada/Electrification-of-all-harbour-crafts-by-2030-Singapore-7a713f99ba464d1593382a2e435f7d4b?pvs=4>





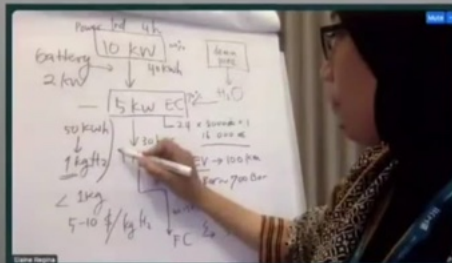
**Prof. Dr-Eng. Eniya Listiani Dewi,  
B.Eng., M.Eng**

Head of New and Renewable Energy Resources Development  
Division – PTPSE – TIEM BPPT (22 February 2014 to 20 July 2014)  
Founder and President of the Indonesian Association of Fuel Cell and  
Hydrogen Energy (2015 until now)  
Director of Materials Technology Center – PTM – TIEM BPPT (21 July  
2014 to 27 September 2015)  
Deputy Head of BPPT for Agro-Industrial Technology and  
Biotechnology (28 September 2015 to 5 February 2018)  
Deputy Head of BPPT for Energy and Materials Information  
Technology (February 5 2018 to present)  
President Commissioner of PT Garam Persero (29 December 2017  
until now)



eniyalist 5h  
III Ava Max • My Way

When me met at Bali we do  
short discussion, then...



eniyalist 5h  
III Sia • Unstoppable





# Large Investment in Floating Solar



South-East Asia's biggest floating PV installation is under construction by Masdar and Indonesian energy company PT PJB. The two companies secured a PPA for the project with state electricity company Perusahaan Listrik Negara (PLN) in January 2020. The agreed tariff is \$0.0581/kWh.

Abu Dhabi-based renewable energy group [Masdar](#) and Indonesian energy company PT PJB have reached financial closing for the 145 MW Cirata Floating Photovoltaic Power Plant on a 225ha section of the Cirata Reservoir in West Java, for which the two companies secured a long-term power purchase agreement with local state-owned electricity company [Perusahaan Listrik Negara](#) (PLN) in January 2020.

[Link to article](#)

**paxel**  
Paketmu Sehari Sampal

**SOLUSI COLD CHAIN**  
DOOR TO DOOR

LEBIH EFISIEN TANPA STYROFOAM



Kirim di Sini!

**JOIN OUR AUDITION**  
**JAKARTA**  
SABTU-MINGGU, 23-24 SEPTEMBER 2023  
NMC STUDIO@NMC STUDIOS

Home > Info Sawit > Segera Beroperasi Pembangkit Biogas Baru dari Pabrik Kelapa Sawit

# Segera Beroperasi Pembangkit Biogas Baru dari Pabrik Kelapa Sawit

11 September 2021



Badan Pengkajian dan Penerapan Teknologi (BPPT), yang tengah mengembangkan potensi limbah cair kelapa sawit atau POME sebagai bahan baku Biogas yang bisa digunakan sebagai bahan bakar pembangkit listrik.(dok. BPPT)

**Pekanbaru, Gatra.com** - PT Perkebunan Nusantara V menargetkan selesainya pembangunan empat pembangkit tenaga bio...

... (BPPT) dalam memanfaatkan limbah cair atau Palm Oil Mill Effluent (POME) pabrik kelapa sawit dan antraknakan dapat beroperasi pada tahun 2021 ini.

<https://www.gatra.com/news-522425-info-sawit-segera-beroperasi-pembangkit-biogas-baru-dari-pabrik-kelapa-sawit.html>

**TETAP TERHUBUNG**

- Fans LIKE
- Followers FOLLOW
- Subscribers SUBSCRIBE
- Subscribers FOLLOW

**IFLS by REFO KOMPAS GATRA MOBILE GUARDIAN**

Indonesia Future of Learning Summit 2023 (IFLS)

THE POWER OF AI FOR LEARNING

**DISKON 10%** menggunakan GATRA 10

Daud Kurnia Founder Negeri AI | AI Explorer  
Pepita Gunawan Director, REFO  
Ketut Yoga Miklos Sunarto  
Steven Santoro Director, Learning & COACH

**5 OKTOBER 2023**





<https://trends.directindustry.com/dunlop-grg/project-121457-131869.html>



Nordic Water Supply Waterbag



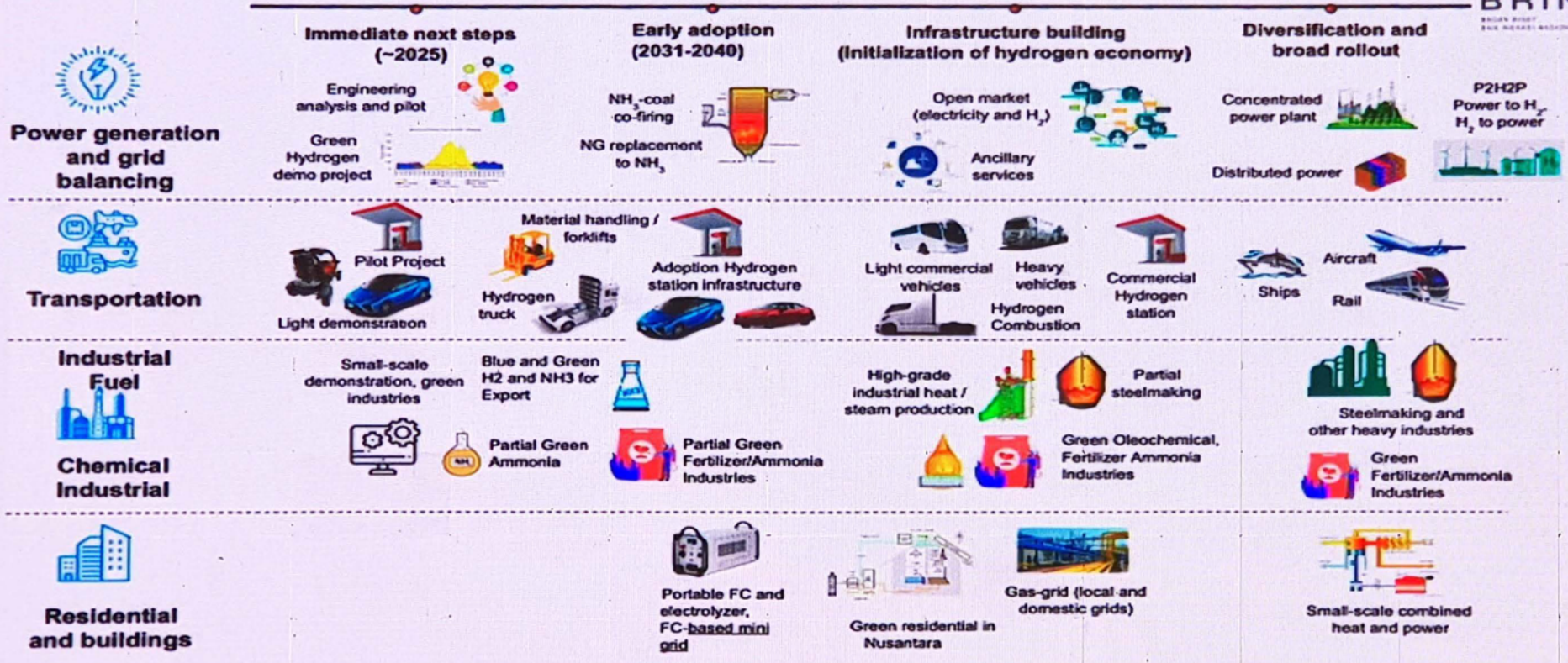
<https://trends.directindustry.com/dunlop-grg/project-121457-138787.html>



# Indonesia roadmap for hydrogen by Prof Eniya Listiani Dewi



## Possible H<sub>2</sub> Application Roadmap in Indonesia

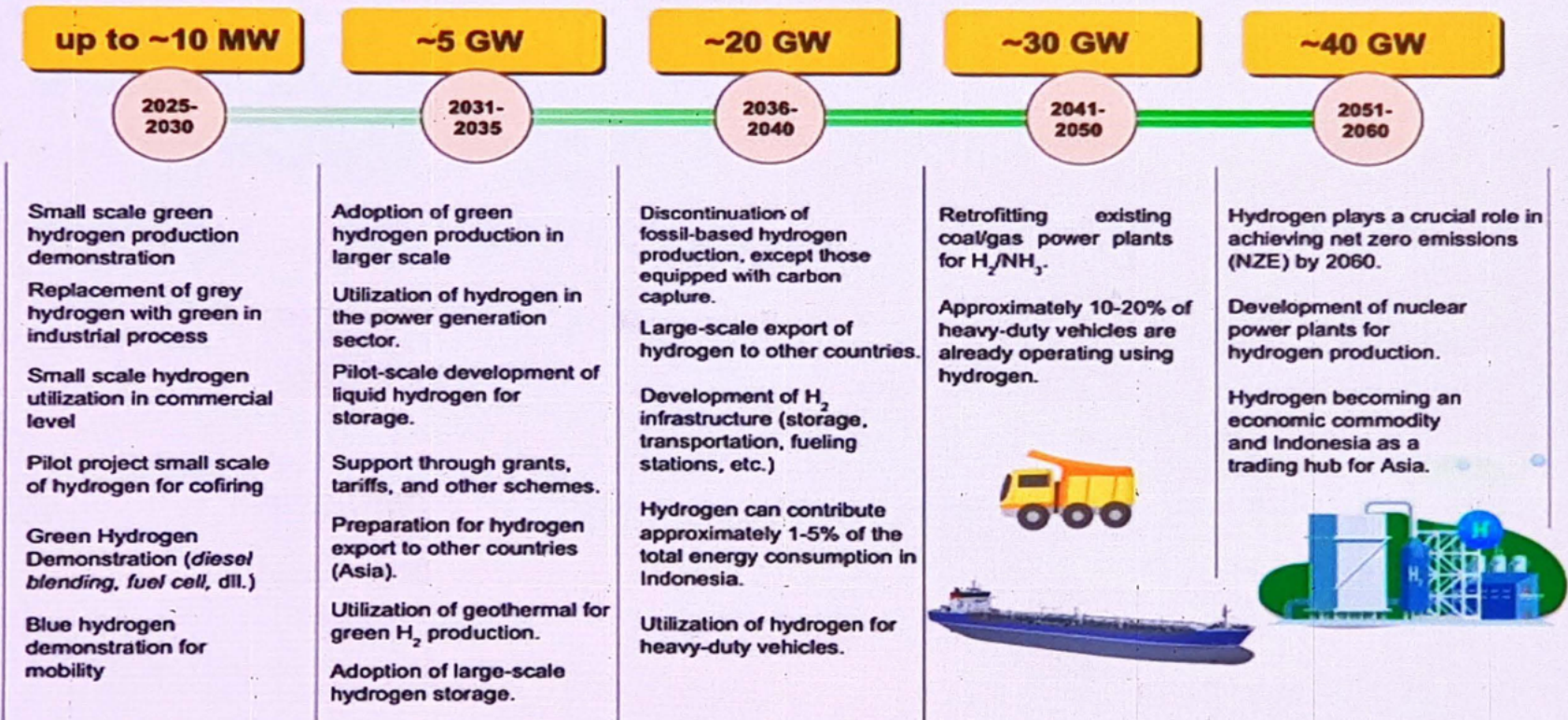




# Indonesia roadmap for hydrogen by Prof Eniya Listiani Dewi



## Hydrogen Development Scale



# The Team, The Institutions



Cesar Jung-Harada  
Singapore Institute of  
Technology  
*Principal & Lead Researcher*



Ni Made Dwidiani  
Universitas Udayana  
*Material Science Researcher*



Alvaro Cassinelli  
City University of Hong Kong  
*Physics, Design Researcher*



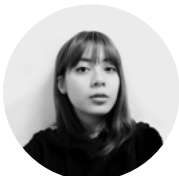
Tomas Diez  
Meaningful Design Group  
*Project Lead*



Prof. Eniya Dewi Listiani  
National Research and Innovation  
Agency (BRIN)  
*Fuel Cell & Hydrogen Expert*



Jinger Zeng  
Fab Lab Bali  
*International Relationship  
Manager*



Elaine Regina  
Fab Lab Bali  
*Project Coordinator*



Eka Prawira  
Fab Lab Bali  
*Technical Specialist 1*



Lukman Rizkika  
Fab Lab Bali  
*Technical Specialist 2*



Tafia Sabila  
Fab Lab Bali  
*Project Manager*



Vinny Vironika  
Fab Lab Bali  
*Finance & Administration*



Athina Dinda  
CAST Foundation  
*Communication & Outreach*





**INPUT**



**ACTIVITY**



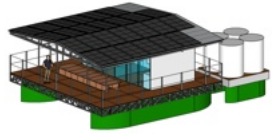
**OUTPUT**



**OUTCOME**



**IMPACT**



**CAST  
Foundation/  
MDG**

**Fab Lab Bali**

**Research**

University /  
Research Institutions

Research  
Industrial Applications  
Business Opportunities

Knowledge  
Clean Energy Supply  
Business

**Education**

Vocational Schools

Skills Development  
Certifications  
Job Opportunities

Jobs / Employment

**Tourism**

Banjar People

Locals  
Global Visitors

Economic Development  
Better Environment:  
Restored Mangrove,  
Enhanced Biodiversity

**Services**

Banjar People

Community Activation

# Benefits



**Bali as the Pioneer of  
Hydrogen R&D Production**



**Utilization of Bali's Local  
Natural Resources**



**Long-Term Environmental  
Monitoring**



**Green Workforce for Locals**

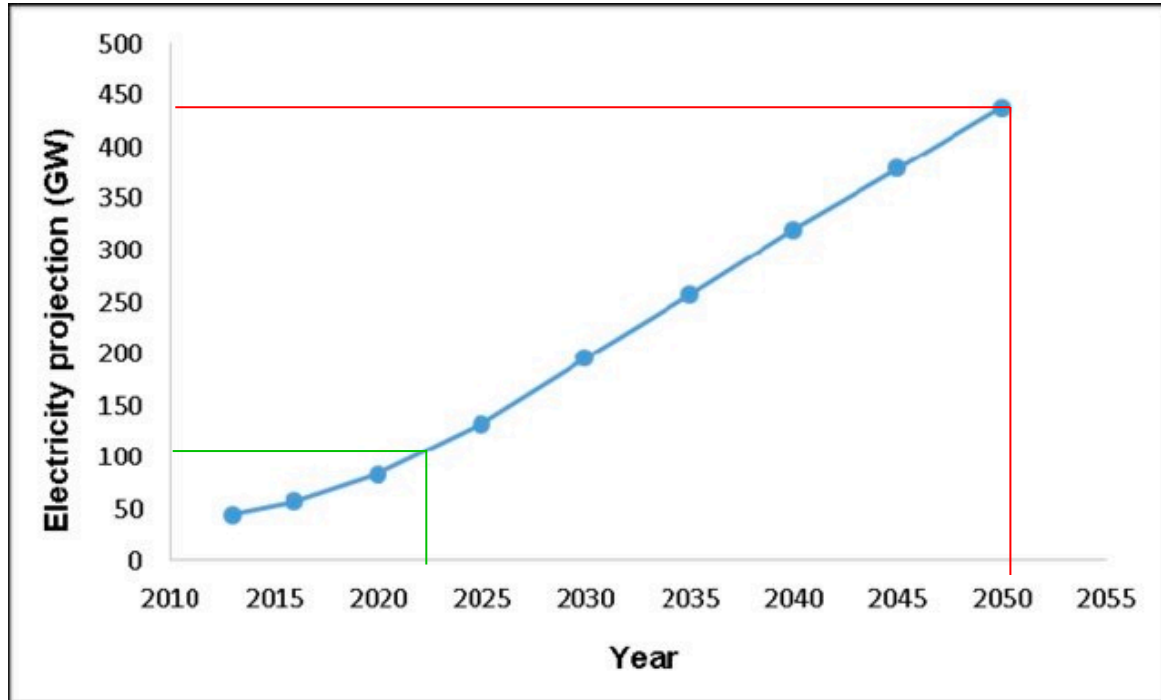


**Citizen Science Movement**



**Alternative Tourism**

# Indonesia Energy Need



X 4

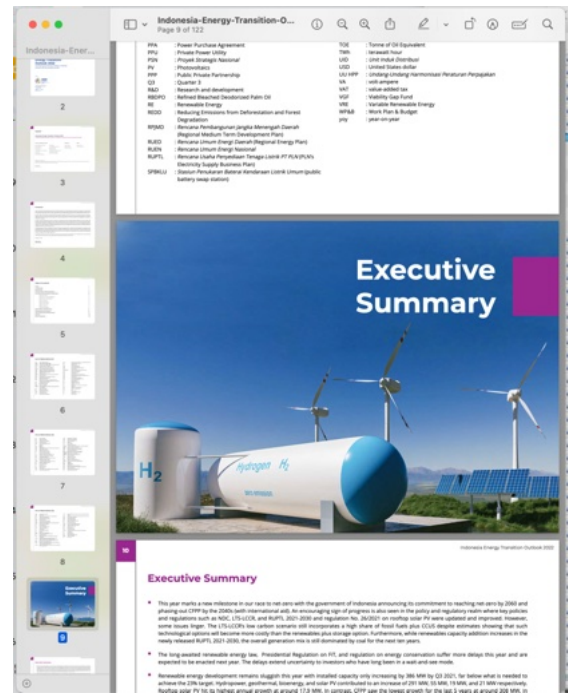
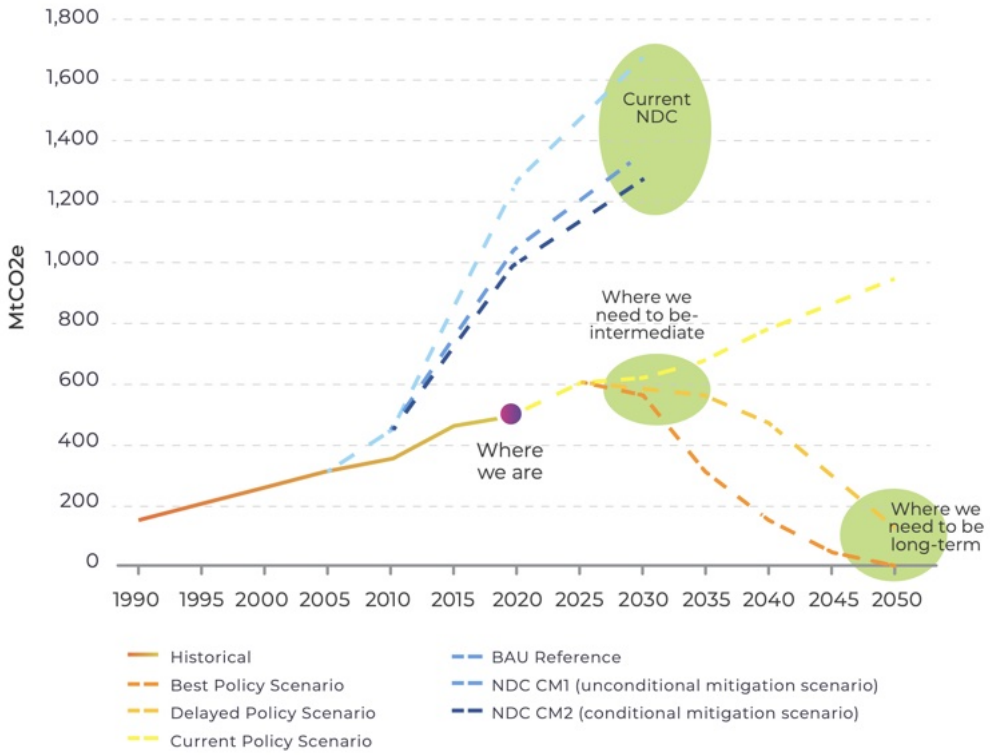
By 2050

Electricity demand prediction in Indonesia. Source: "Design of Building Lighting Management System with Increasing Solar Shine Penetration for Climate Change Mitigation". October 2016. [Link](#)



# The Goal and The Gap

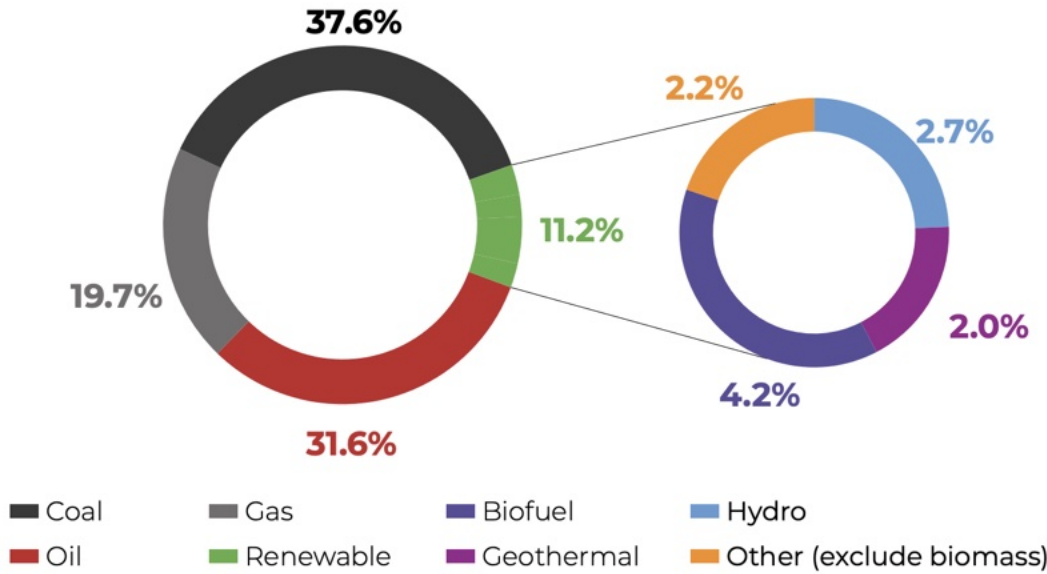
Energy sector historical emissions and emission reduction pathways in NDC



Indonesia Energy Transition Outlook.  
<https://iesr.or.id/wp-content/uploads/2022/01/Indonesia-Energy-Transition-Outlook-2022-IESR-Digital-Version-.pdf>

# Energy Production Sources

## Indonesia primary energy mix (Q3 2021)



“Through its Nationally Determined Contribution (NDC), Indonesia aims to reduce greenhouse gases (GHG) emissions by 29% (voluntarily) or 41% (with international support) compared to the business-as-usual scenario by 2030. Current NDC, however, is far from what is needed to achieve the Paris Agreement. • The energy sector has become the second largest emitting sector in Indonesia by contributing to 34% of total emissions in 2019 and is projected to turn into the largest emitter by 2030 if no decarbonization efforts are carried out. • Considering the climate urgency, deep decarbonization should become one of the Indonesian government’s top priorities for the next three decades. Decarbonization should also be seen as an opportunity to modernize the overall economy, avoid costs of climate damages, improve air quality, prevent premature deaths, reduce healthcare costs, increase energy efficiency, secure water and food availability, and preserve biodiversity.” Indonesia Energy Transition Outlook.

<https://iesr.or.id/wp-content/uploads/2022/01/Indonesia-Energy-Transition-Outlook-2022-IESR-Digital-Version-.pdf>

# Indonesia: The World's Largest Archipelagic Country





# Indonesia: Well Endowed with Sunlight

SOLAR RESOURCE MAP

## PHOTOVOLTAIC POWER POTENTIAL INDONESIA



Long term average of PVOUT, period from 2007 (1999 in the West) to 2016

Daily totals:	3.0	3.4	3.8	4.2	4.6
Yearly totals:	1095	1241	1387	1534	1680

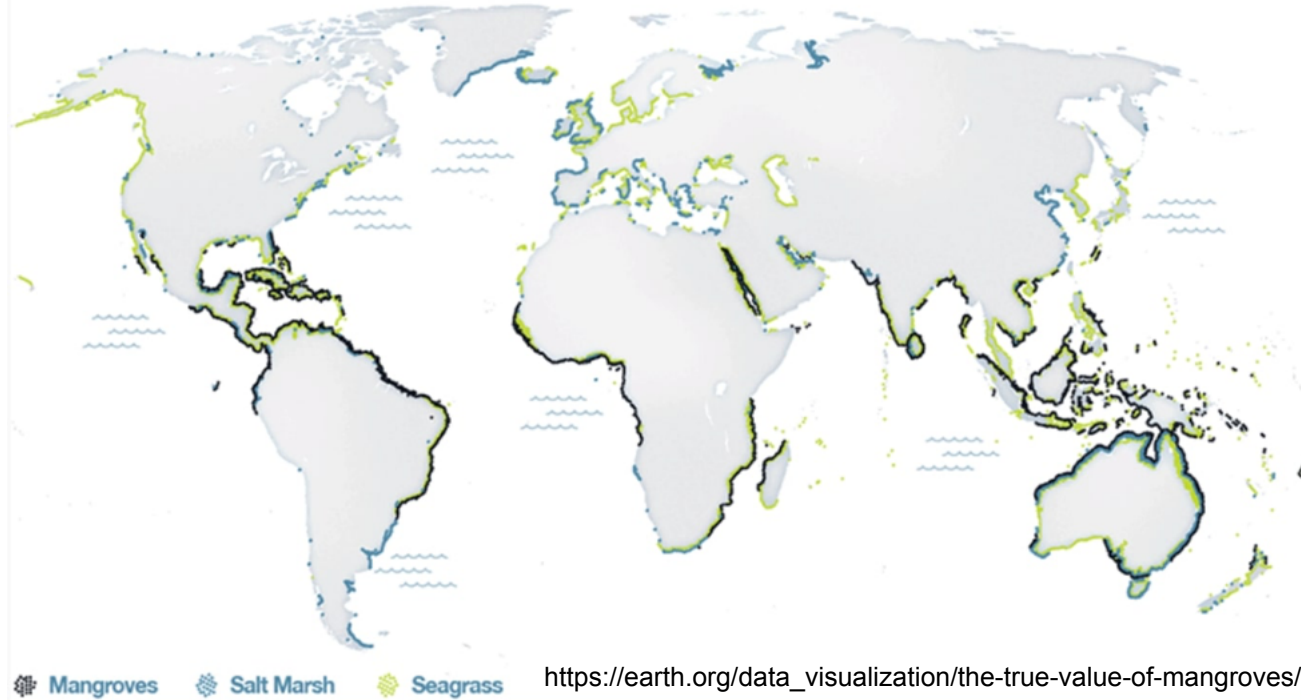
kWh/kWp

Indonesia gets an “average radiation intensity about 4.8 kWh/m2 a day and an average radiation length of 12 hours a day” ([Octavianti, et al., 2018](#)).

This map is published by the World Bank Group, funded by ESMAP, and prepared by Solargis. For more information and terms of use, please visit <http://globalindonesia.info>.

# Indonesia: World's largest Mangroves and CO2 Sequestration Potential

## Global Distribution of Blue Carbon Ecosystems

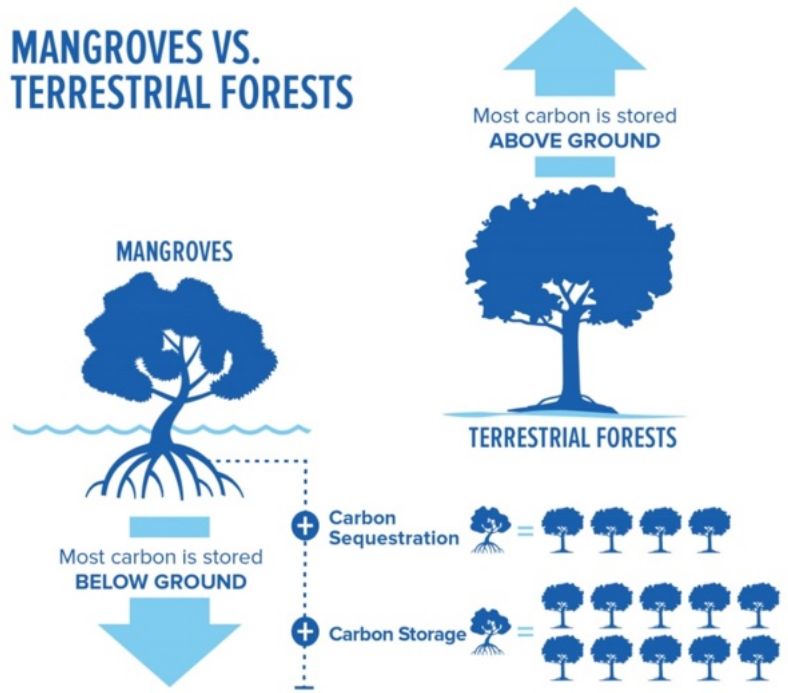


Countries with municipalities with most mangrove surface area

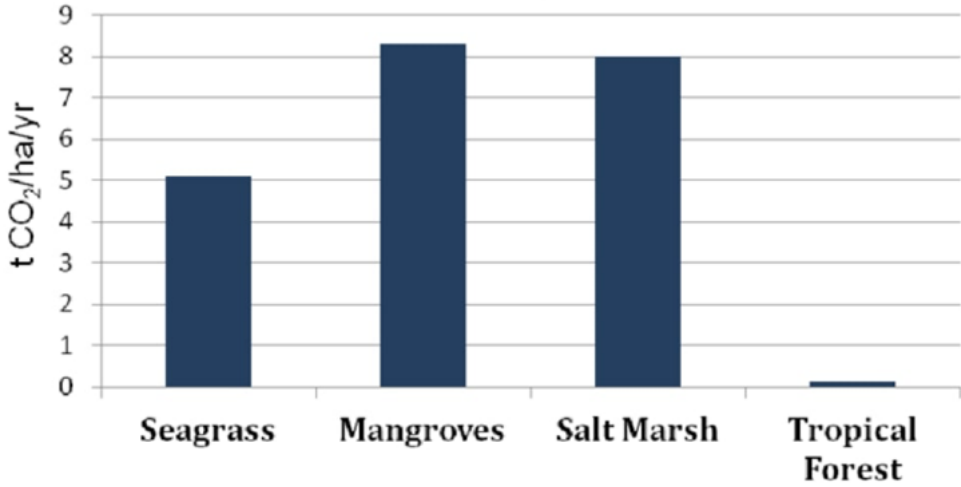
Percentage	Country
27.18	Indonesia
7.98	Brazil
4.99	Malaysia
3.54	Papua New Guinea
2.8	Nigeria
2.07	Myanmar
3.18	Australia
1.75	USA
1.56	Bangladesh
1.31	Mexico
2.47	Venezuela
1.05	Gabon
0.95	Ecuador
0.88	Colombia
0.77	Cameroon
0.76	French Guiana
0.61	India
0.57	Philippines
0.56	Sierra Leone
64.98	Total

# Indonesia: Mangrove and Carbon Sequestration

## MANGROVES VS. TERRESTRIAL FORESTS



## Annual Carbon Sequestration Rate



[https://earth.org/data\\_visualization/the-true-value-of-mangroves/](https://earth.org/data_visualization/the-true-value-of-mangroves/)



# The Urgency



No time frame given but Health Minister Budi G Sadikin said respiratory cases went up 4x compared to the pandemic period

Previously, the Jakarta health office said between January to July there's a monthly average of 100k respiratory cases in the capital



KOMPAS.com  
JERAWA MELIHAT BUMBA

nasional.kompas.com

Menkes Ungkap Kasus ISPA di Jakarta Naik Jadi 200.000 akibat Polusi Udara  
Menkes Budi Gunadi ungkap kasus ISPA di Jakarta meningkat dari 50.000 jadi 200.000 karena polusi udara. Ia sebut klaim BPJS Kesehatan akan naik juga

BUSHFIRE WARNING An emergency warning is in place for a fire at Darwin River in the NT. Keep up to date with ABC Emergency

## Government urges Jakarta's residents to wear masks and work from home as air pollution worsens

By Helena Souths and Natasya Salim  
Posted 10h ago, updated 4h ago



### Top Stories

In 1936, George Buttle wrote a number on a piece of paper and bought White Island. Now his grandsons give evidence

Rental vacancy rates falling and tipped to remain at 'extremely low levels'

From beach to bush: Australian Geographic's 2023 best nature photos

Trump flies home after arrest, mugshot in Georgia

Eighteen people have been indicted alongside Donald Trump in Georgia.

### AIR QUALITY IN JAKARTA

## The cost of air pollution in Jakarta

\$4 Billion Per Year

In healthcare costs for citizens of Jakarta.

(BREATHEASY, 2010)

4.8 Years

Reduction in Life Expectancy for citizens of Jakarta.

(AIR QUALITY LIFE INDEX, 2020)

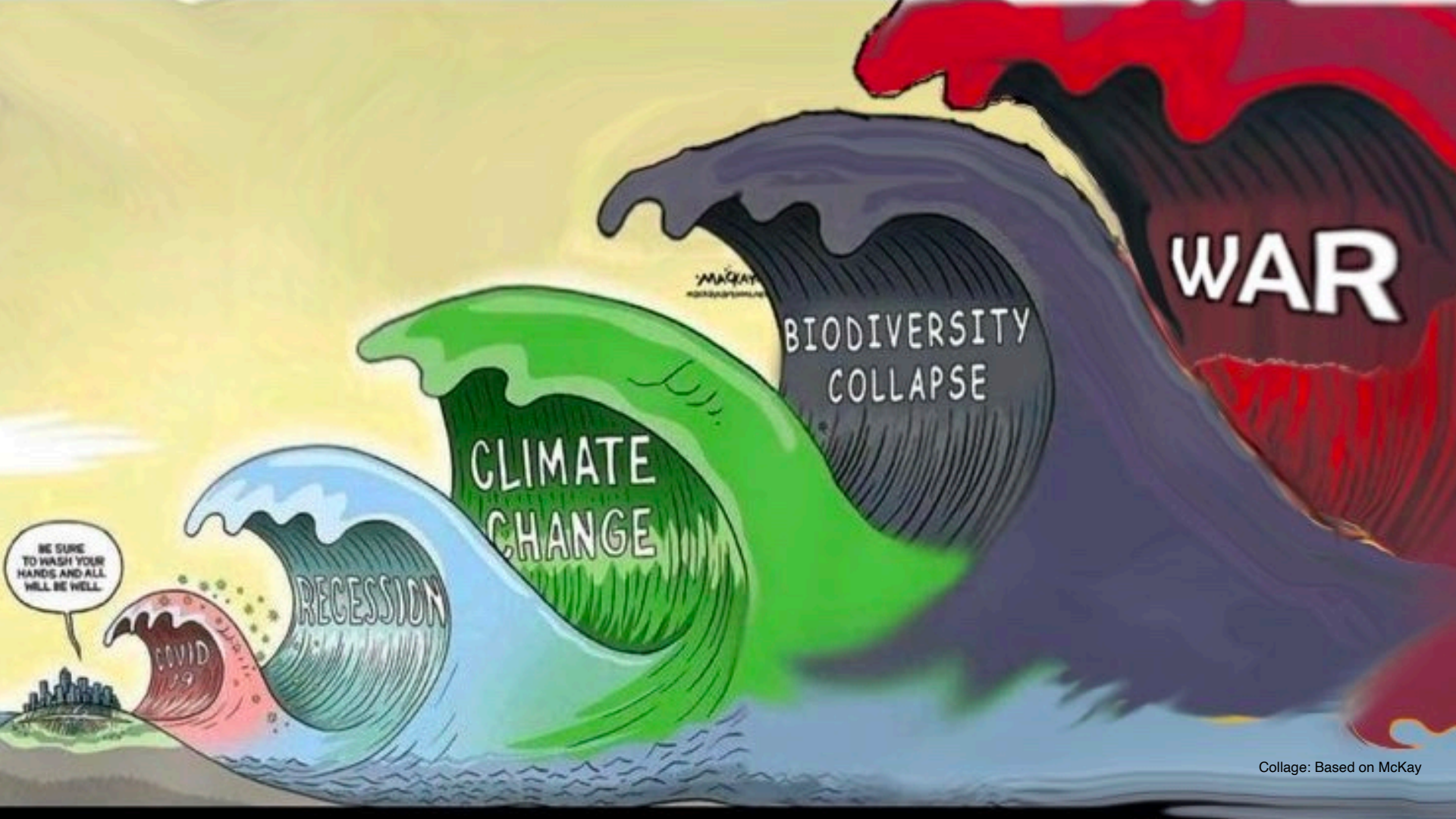
5.5 Million Cases

Of air pollution related illness in Jakarta in 2010.

(BREATHEASY, 2010)

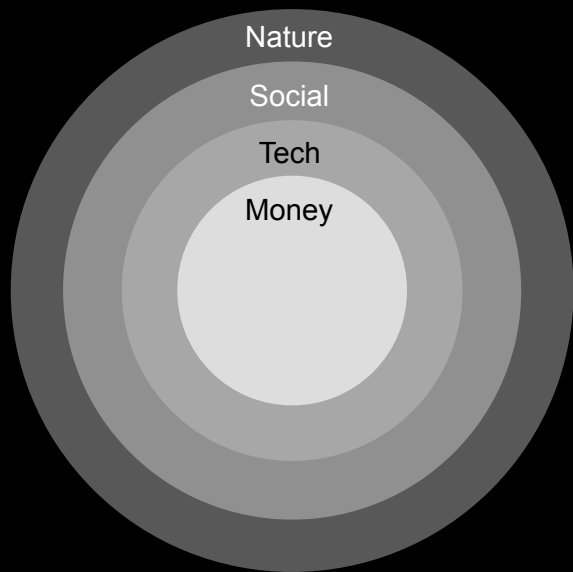


*“Yes, the planet got destroyed. But for a beautiful moment  
in time we created a lot of value for shareholders.”*

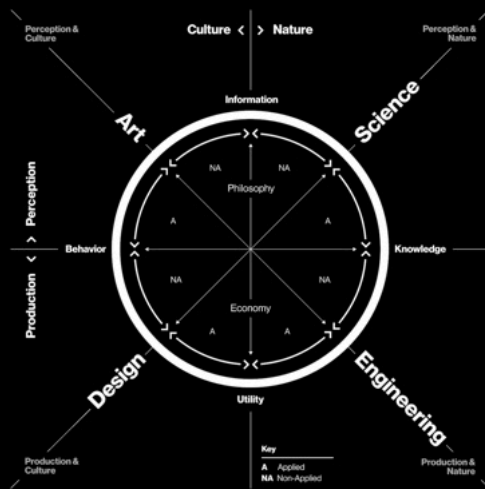


Collage: Based on McKay





The correct order of priority



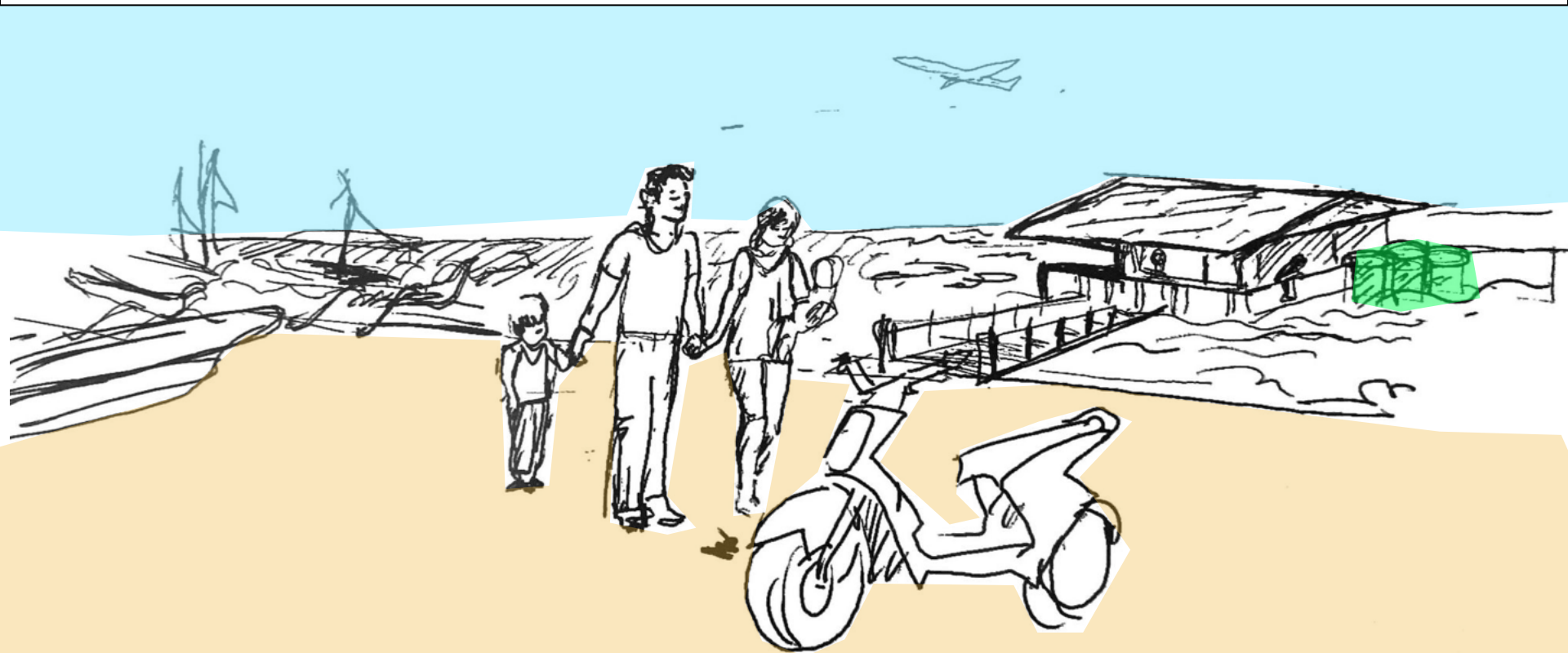
Art & Science



Open Science

# Hydrogen Hijau untuk masa depan yang sehat dan lestari

## Green Hydrogen For a Healthy Future





# Leading Innovations: How to Leap in a Crisis

Cesar Jung-Harada  
IDEAFEST 2023 Jakarta

