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# **Empowering the Society for a Sustainable Future: Strategies for Promoting SDG Education in the Asia-Pacific Region**

— IEEE Region 10 —  
Educational Activities Committee

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# Acknowledgement

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- The Hong Kong Sustainable Campus Consortium

# Workshop Rundown

- (Brief) What is SDG?
- (Macroscopic)  
The integration of SDGs into educational curricula through AI
- (Microscopic)  
Engage new learners on SDG through game-based learning



# What is SDG?



# Sustainable Development Goals



Transforming our world: the 2030 Agenda for Sustainable Development (UN Resolution A/RES/70/1)  
(We support the Sustainable Development Goals)

# Sustainable Development Goals

## PEOPLE

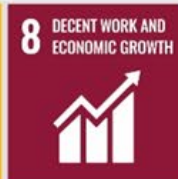
End poverty and hunger, and ensure dignity and equality. and in a healthy environment.



Social

## PROSPERITY

Ensure prosperous and fulfilling lives in harmony with nature



Economic

## PLANET

Protect the planet and natural resources and climate



Environment

## PEACE

Foster peaceful and inclusive society



Fostering peace and partnerships

## PARTNERSHIP

Implement the agenda through a global partnership



## Overall score



## Legend

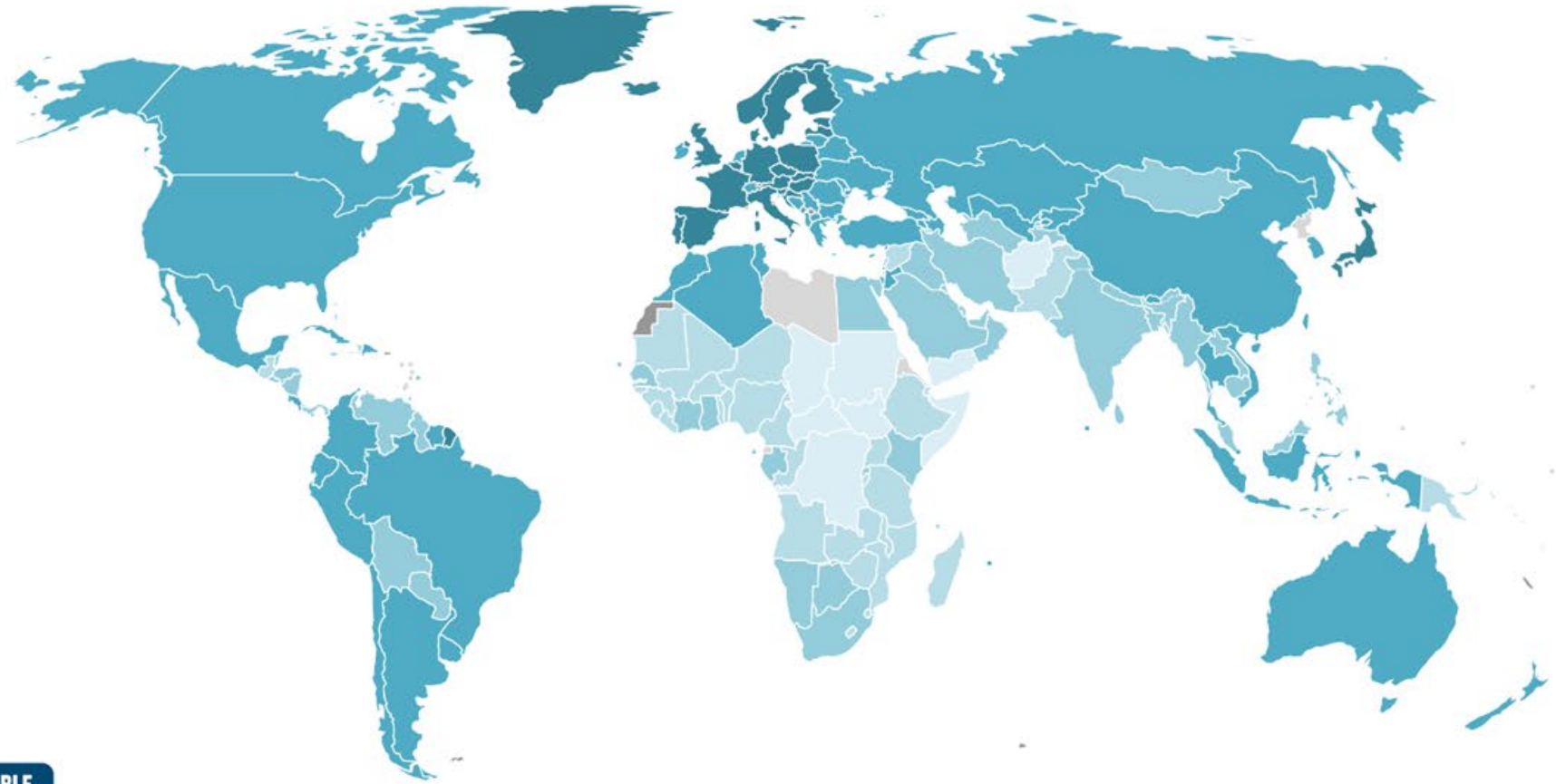
Click on a country to see its performance.

- > 80
- 70 - 80
- 60 - 70
- 50 - 60
- < 50
- Information unavailable

## Description

The overall score measures the total progress towards achieving all 17 SDGs.

The score can be interpreted as a percentage of SDG achievement. A score of 100 indicates that all SDGs have been achieved.

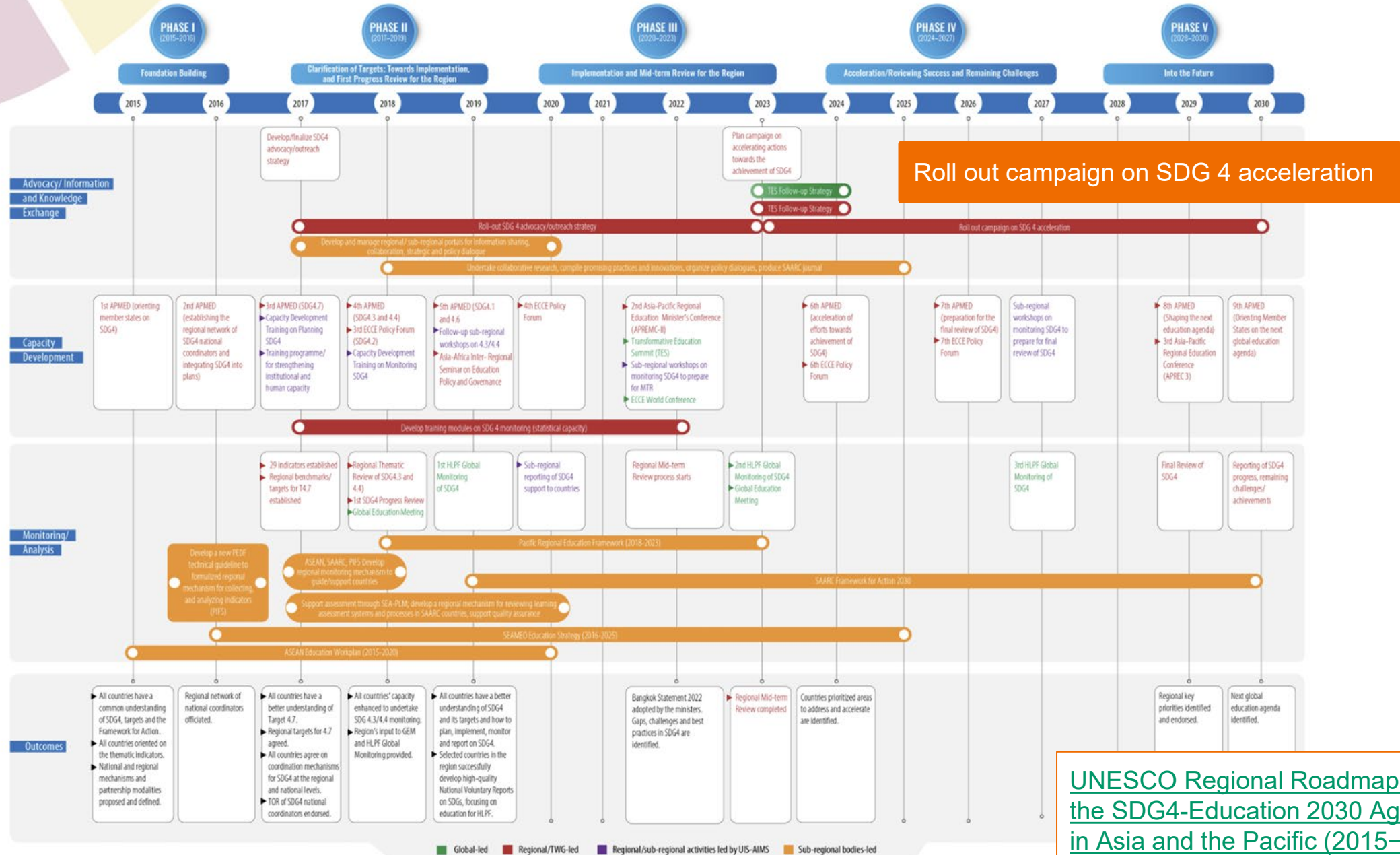


All data presented on this website are based on the publication Sachs, J.D., Lafortune, G., Fuller, G., Iablonski, G. (2025). Financing Sustainable Development to 2030 and Mid-Century. Sustainable Development Report 2025. Paris: SDSN, Dublin: Dublin University Press. DOI: <https://doi.org/10.25546/111909>

# Current SDG progress

<https://dashboards.sdgindex.org/map>

# ASIA-PACIFIC REGIONAL SUPPORT MILESTONE



Roll out campaign on SDG 4 acceleration

UNESCO Regional Roadmap for the SDG4-Education 2030 Agenda in Asia and the Pacific (2015–2030)

# SDG education in the Asia-Pacific region

Key recommendations for accelerating progress towards the SDG 4 Targets from UNESCO

- ◆ Strengthen monitoring and use of data on the levels of learning and conditions for learning (**Macroscopic: Curriculum analysis through data**)
- ◆ Strengthen and broaden partnerships across all actors in education from parents and caregivers, to international organizations and the private sector (**Microscopic: Game-based learning**)
- ◆ .....

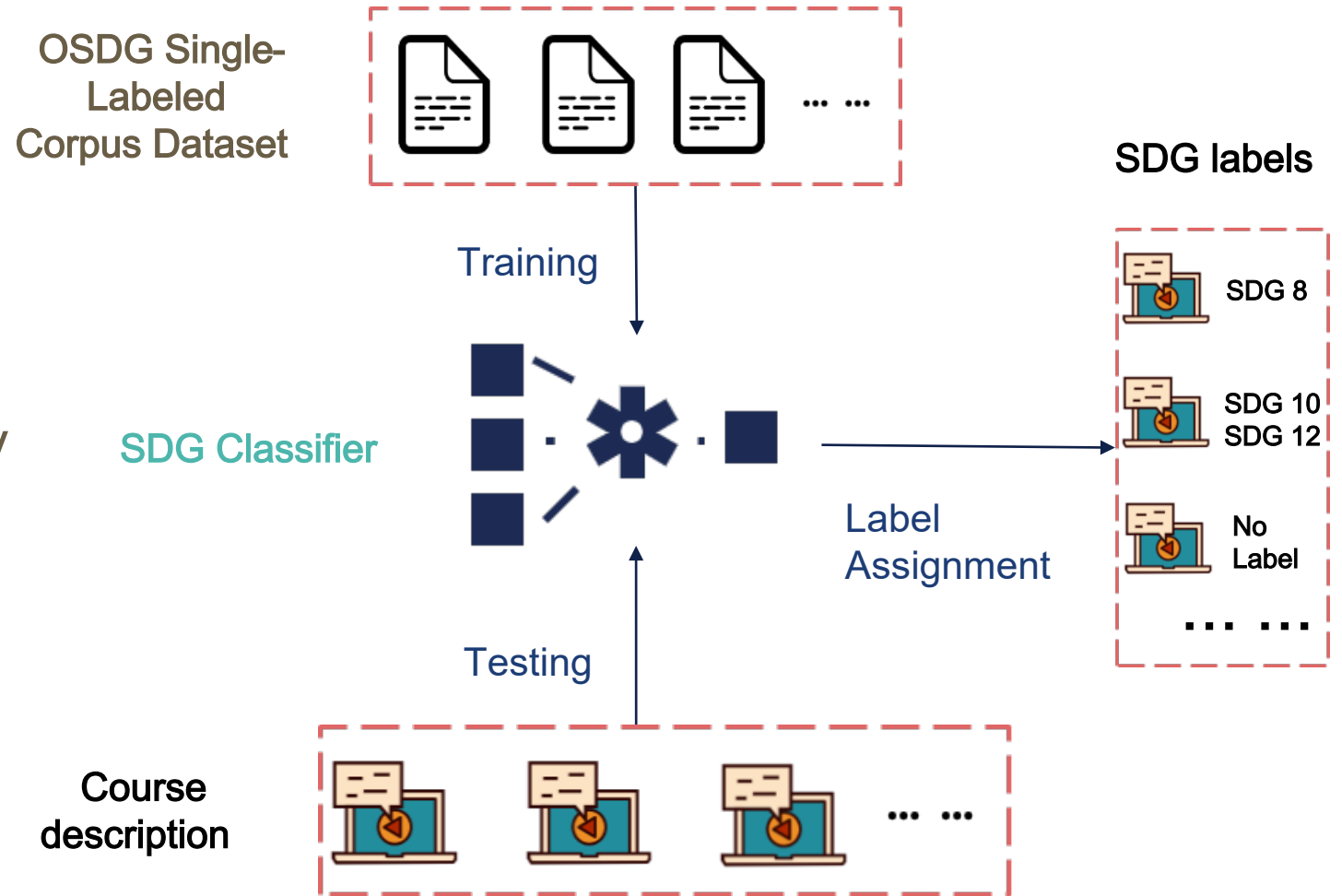
**Macroscopic: The integration of SDGs into educational curricula through open-source machine learning tools**

# Goal: Classifying educational resources based on their relevance to SDGs, using open datasets

- To improve the accessibility of resources for SDG education
- To monitor and evaluate progress to ensure SDG 4.7 is being achieved by 2030
  - a. Classify courses
  - b. Identify gaps
  - c. Design missing modules
  - d. Scale and monitor

# ML-based SDG Classification: Overview

- OSDG (Link)
- Elsevier Data Repository



<https://zenodo.org/records/11441197>

<https://elsevier.digitalcommonsdata.com/datasets/p52c7d3hfs/1>

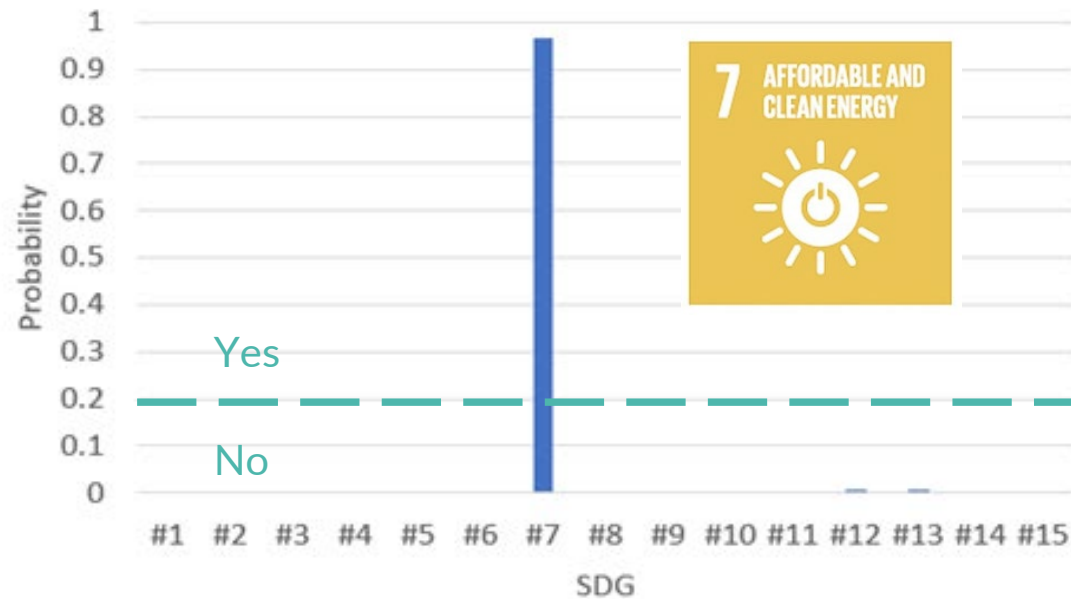
# Data: Course overviews, reading lists, and topic lists

*“Energy is essential to our daily lives. Electricity, fuel gas and fuel oil have brought us much convenience, luxury and prosperity. However, our present heavy reliance on fossil fuels has caused a serious energy crisis, air pollution and climate change problems. Active technological development is needed on both the supply and demand sides to enhance the energy industry to achieve sustainability. This course is designed to enable students to develop a broader perspective and critical understanding of energy issues that they are confronted with, to cultivate their appreciation of various viewpoints and responsibilities as global and local citizens, and to develop their problem-solving ability through lectures and discussion of the key energy and environmental issues. The course topics include: (i) world energy resources; (ii) fossil fuel-based, nuclear and hydro energy technologies; (iii) energy conservation and energy efficiency; (iv) clean and renewable energy technologies; (v) scheme of control and deregulation in electricity supply; (vi) environmental impacts of energy industry; (vii) social, economic and political issues; and (viii) remedial measures and policies.”*

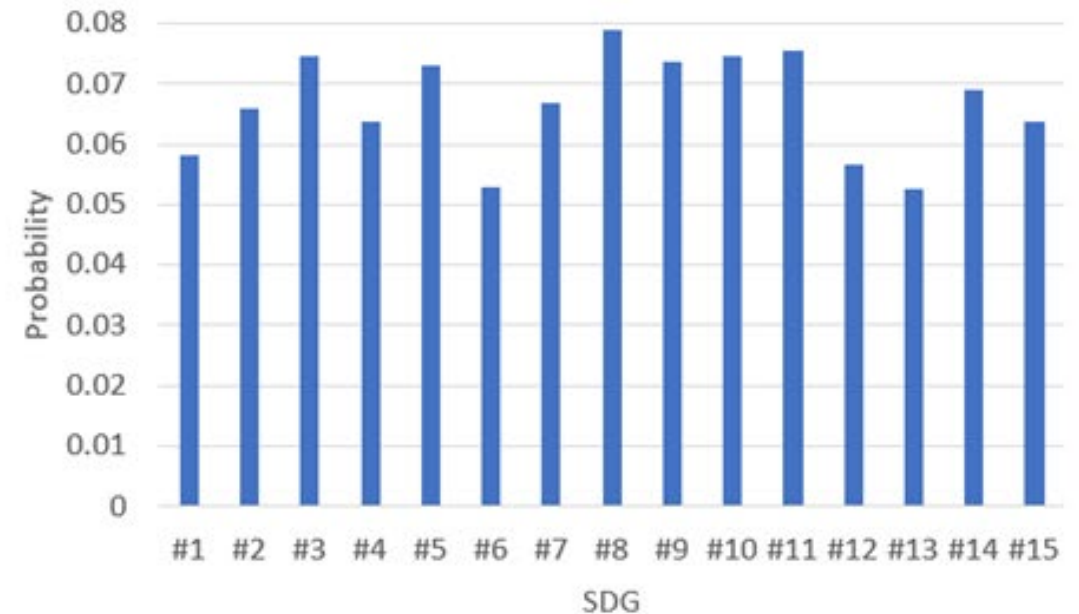
From <https://commoncore.hku.hk/ccst9016/> (Energy: Its Evolution and Environmental Impacts)

# “Scores” for each courses

Energy: Its Evolution and Environmental Impacts



Social Entrepreneurship for Social Impact



Value: “Probability of Course YYYY is related to SDG X”

# Study 1: Studying 170+ general education courses

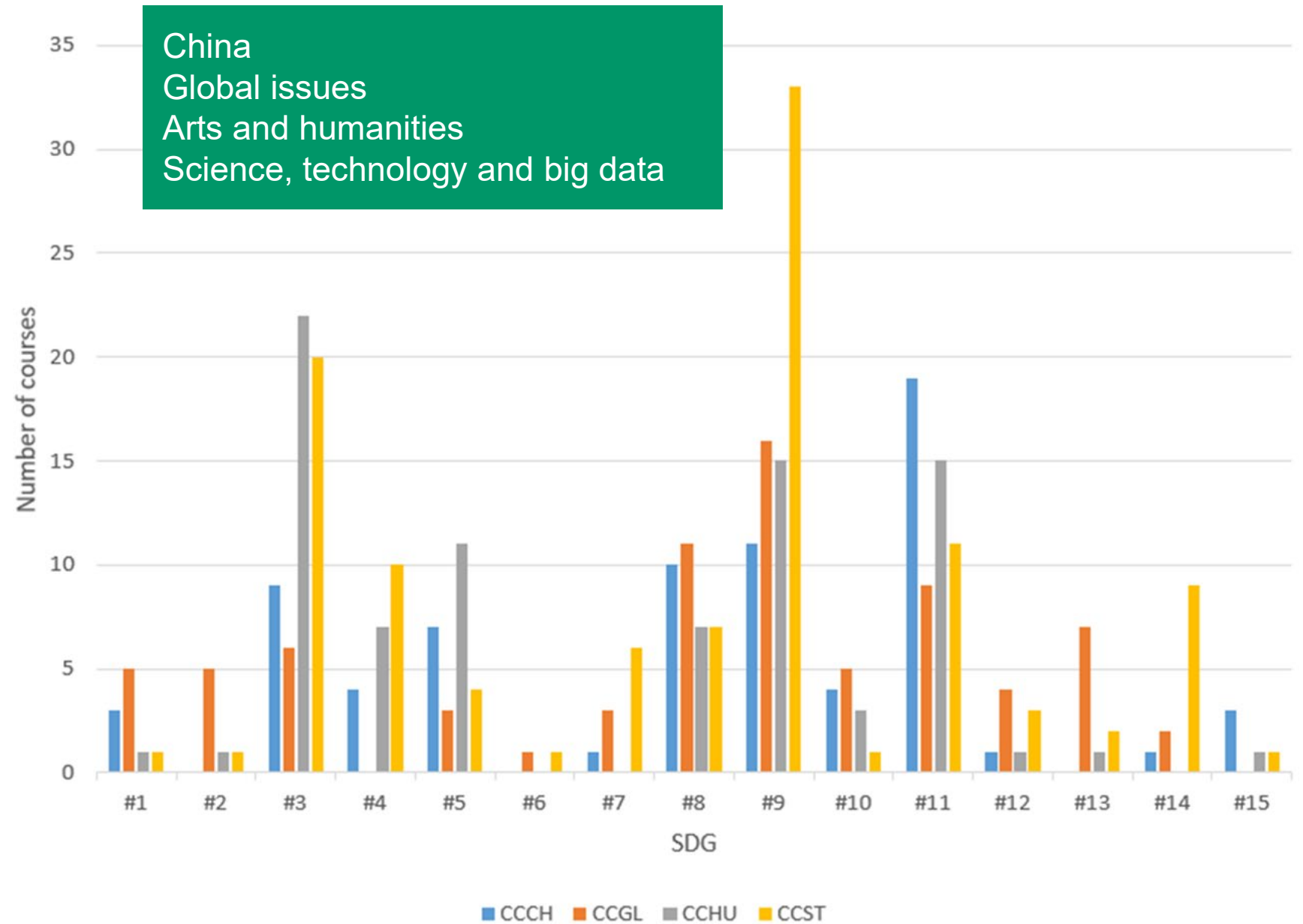
Interdisciplinary undergraduate curriculum offered by all 10 Faculties

- Committed involvement in global learning through SDG education
- Some teachers have a basic understanding on SDGs
- Variety of courses covering a variety of SDGs, with well-design curricula

Test data: Course overview, suggested reading list, and weekly topics

- Neglected learning outcomes and assessment activities (Avoid misclassifications of SDG 4)

# S1: Classifications according to themes



# S1: Sharing insights to ALL teachers

- Share classified SDGs to teachers of all CC courses
  - Teachers with a diverse spectrum of SDG literacy and data literacy
  - We showed details of SDG and classification mechanisms
- Collect feedback from teachers (voluntary)
  - Whether the ML classification is correct
    - If not, tell us which SDGs were taught their courses
  - Whether they will revamp the course based on the insights (i.e., take actions)

# Study 2: Classifying courses across universities in HK

Analyzing 12K+ courses in seven public universities with the collaboration of the Hong Kong Sustainable Campus Consortium (and university registries)

- Need an agreement on the definitions of “sustainability education”
  - Environment-related SDGs? Climate-change-related SDGs? All SDGs? Others?
- Difficult to evaluate the performance of the classification results
  - No model answer in most situations (In progress)

Lei, C. U., & Tang, S. (2023). An Analysis of Hong Kong High School Curriculum with Implications for United Nations Sustainable Development Goals. *Smart Learning Environments*, 10, 47.  
 Lei, C. U. (2022). Analysis of the Connection of United Nations Sustainable Development Goals with the Hong Kong High School Technology Curriculum, in *APSCE International Conference on Computers in Education*, No. 2, 61-64.

# Study 3: Local K12 curriculum

Analysed 13 STEM and non-STEM high school subjects, in a module, subject and curriculum level.

Interviewed teachers for feedback on SDG education in Hong Kong

SDG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	#	^
DAT		2		4			1	1	19		2	8		3	1	27	90
HMSC	1	1	22	1	4	1		1	1						1	22	25
ICT			3						7							7	24
TL		7	4		2		1	1	2			4			1	14	28
BAFS				1	1		2	5	3		1	3		2		11	49
BIO		2	2			2			1					1	1	6	8

Geography (DSE)

Module	Related SDGs
Rational (Course Background)	SDG4, SDG11
Opportunities and Risks — Is it rational to live in hazard-prone areas?	SDG11, SDG13, SDG15
Managing River and Coastal Environments: A continuing challenge	SDG6, SDG14
Changing Industrial Location – How and why does it change over space and time?	SDG9

# Study 4: Vocational training

Vocational training plays a crucial role in supporting the achievement of SDGs (Targets 4.3, 4.4, and 4.5)

- Across all curricula, SDG 9 is the most prominently incorporated SDG.

Classification Performance between Models (“Agriculture”)

- All of the coders have a consensus on the coverage of SDG 2 in the course.
- Different classifications are relevant to the impact of agriculture on sustainable development, from various perspectives.

TABLE I. COMPARISON OF CLASSIFIED SDGs BETWEEN CODERS ON THE CLASSIFICATION: RESULTS

	<b>Human 1</b>	<b>Human 2</b>	<b>LR</b>	<b>GPT</b>
Overview	2	2	2	2
Farm case study	9	9	2	12
Plant production	15	15	0	2
Animal production	15	15	0	2
Plant/Animal production	15	15	6	15
Farm product study	12	8	2	8
Agri-food, Fibre and Fuel Technologies	9	12	9	9
Climate Challenge	13	13	13	13
Farming for the 21st Century	9	9	9	11

Liu, R., Xie, Z., Lei, C.U., & Chiu, D.K.W. (2024) Revealing the United Nations Sustainable Development Goals in International MOOC Course. International Journal of Sustainability in Higher Education.

Wang, Y., Li, Y., Hu, X., Xu, Y., Liang, X., & Lei, C. U. (2022, September). Massive Open Online Courses Role in Promoting United Nations Sustainable Development Goals. In *2022 IEEE Learning with MOOCS* (pp. 126-130). IEEE.

# Study 5: Identifying MOOC Resources for reskilling

Analysed 13394 MOOCs and MOOC-based micro-credentials on edX, Coursera, and FutureLearn

Identified SDGs that requires more public attentions

SDG Label	Number of Related Courses	Number of Related Participants
SDG_1	113	1,484,001
SDG_2	75	947,890
SDG_3	709	17,923,770
SDG_4	2,047	230,913,677
SDG_5	75	846,850
SDG_6	70	498,573
SDG_7	186	3,453,421
SDG_8	627	14,071,601
SDG_9	720	43,356,408
SDG_10	83	1,026,249
SDG_11	403	3,676,379
SDG_12	84	1,212,510
SDG_13	184	1,928,766
SDG_14	27	136,382
SDG_15	30	109,480
SDG_16	519	10,025,075

# Impact and future work

## Impact

- Supporting stakeholders to take actions
- Building awareness of SDG education
- Scalability of classification through open-source data

## Future work

- Cross-nation analysis in the Asia-Pacific region
- Cross-nation respiratory in the Asia-Pacific region

# Microscopic: Engage new learners through game-based learning



# Game-based learning for SDG education

- Enhances understanding and retention of SDG concepts
- Increases learner engagement and motivation
- Fosters collaboration, communication and social competencies
- Cultivates systems thinking and problem-solving skills
- Creates a safe environment for experimentation

# Game introduction

Objective: Deploy adequate policies for achieving SDGs and taking action against climate change by 2030

Video: [https://youtu.be/\\_5LhHILNFDw](https://youtu.be/_5LhHILNFDw)

# Tokens and Cards (I)

Resource for  
deploying policies



Finance



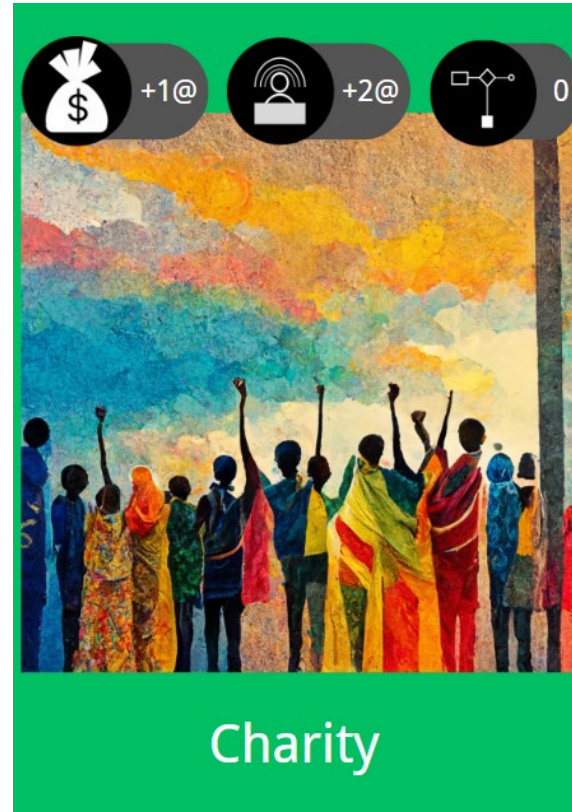
Influence



Technology

## Tokens

Gain one finance token & two  
influence tokens **each round**



## Stakeholders/Roles

Implement 3 policy projects on  
SDG 7 by the end of Round 7



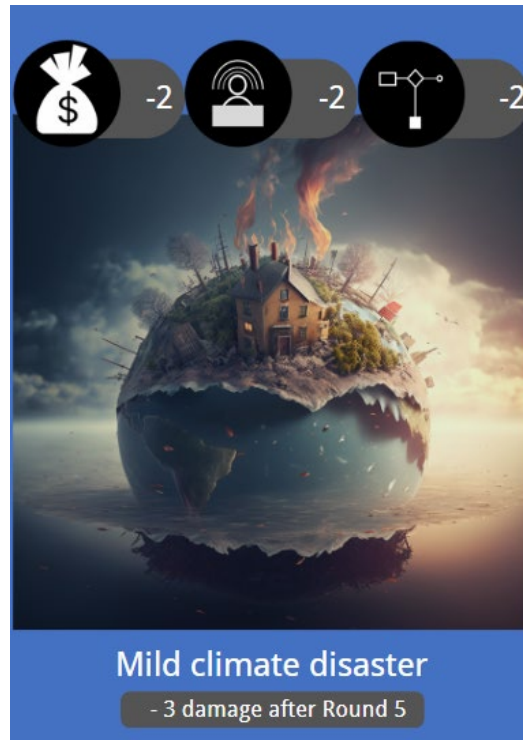
## Goal

# Cards (II)

Exchange resources and policy cards through negotiations



Pay the resource for the recovery; Otherwise, skip one round

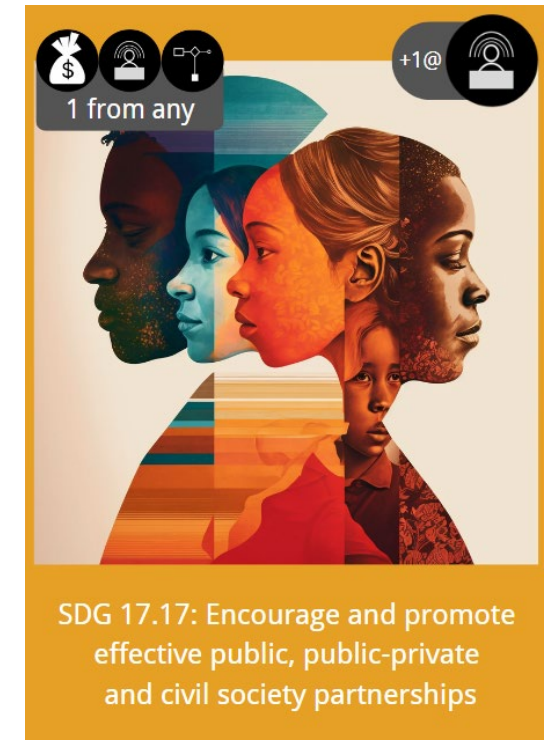


Events

Pay the required cost for deploying the policy



Pay the required cost for deploying the policy; Gain one resource per round



Policies

# Game play in each round

1. All players get new resources and draw a new policy card based on their stakeholder role and deployed SDG 17 policies. (@: per round)
2. Negotiate and trade with peers for policy cards and tokens that you want
3. Deploy SDG policies by playing the policy card with the resource cost mentioned on the card.
  - a. SDG 17 policies can help players obtain additional resources in future rounds.
  - b. Players can establish multiple policies in the same round.

**Practices on communications and negotiations**

# Reflection after playing the game

# Read your card deck again

- Rounds: Halfway point in the implementation of SDGs
  - 2015 □ 2023 □ 2030
- Tokens: Three major resources for achieving SDGs
  - e.g., Measuring research related to SDGs, COP28, SDG Financing
- Policy cards: Targets under each SDGs
  - 17 SDGs with 169 targets

# Read your card deck again

- Event cards: Opportunities and threats in achieving SDGs
  - There is always uncertainty
- Stakeholder cards: Different stakeholders involved
  - Any other stakeholders for achieving SDGs?
- SDG 7: Affordable and clean energy
- SDG 12: Responsible consumption and production
- SDG 13: Climate action
- SDG 17: Collaboration is the key to achieving SDGs



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**Pick a card, and tell others how the card is related to your own experience.**

# Follow up activities

Explore, discover, inspire and share about solar energy

- <https://tryengineering.org/engineering-fields/power-energy-nuclear-engineering/tryengineering-tuesday-solar-power/>

IEEE TryEngineering activities on solar energy

- <https://tryengineering.org/teacher/lesson-plans/solar-power/>
- <https://tryengineering.org/teacher/lesson-plans/solar-structures/>
- <https://tryengineering.org/teacher/lesson-plans/here-comes-sun/>

IEEE Technology for a Sustainable Climate

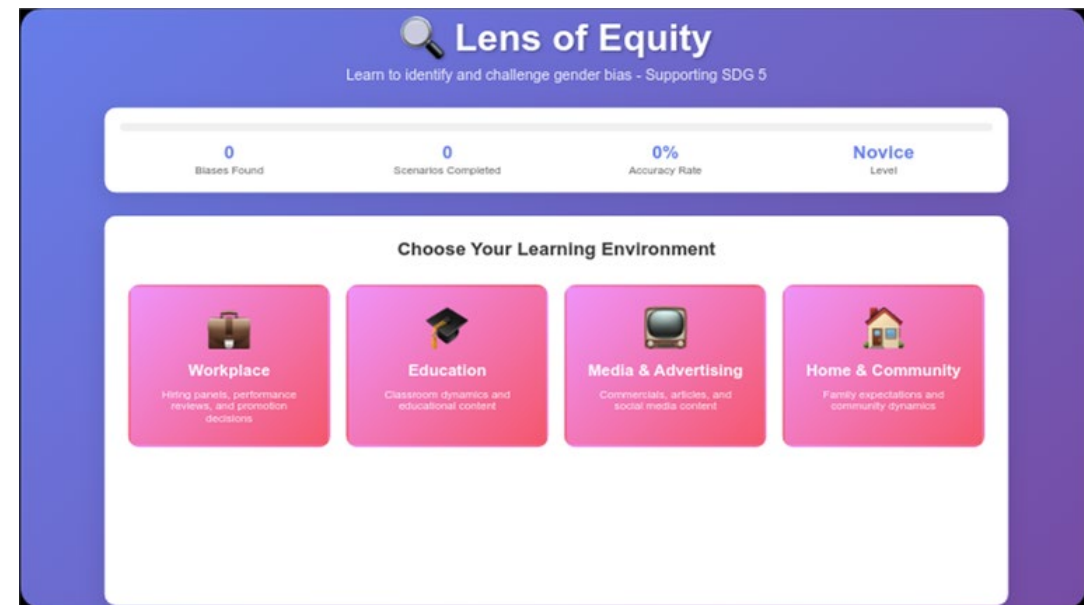
- <https://sustainable-climate.ieee.org/>

# Ask learners design SDG games

YouWare: Make coding intuitive

- Prompt-to-website/app generation
- Built-In design enhancements

Learners can turn ideas into digital tools, games, or visualizations that raise awareness on specific SDGs.



<https://www.youware.com/project/energy-puzzle-euce5srw37>

<https://www.youware.com/project/lensofequity-0jxmx8p3zs>

# Impact and future work

## Impact

- Leverage stakeholders' resource for further development
- Game as a Metaphor for Policy: Negotiation for Stakeholder engagement in policy design

## Future work

- SDG x AI x Fun: Experiential learning on SDG actions

A landscape of rolling hills with green and golden fields under a dramatic, cloudy sky at sunset or sunrise. The foreground is dominated by tall, green grasses. The middle ground shows a series of golden fields, possibly corn or wheat, with distinct rows. The background features rolling hills and a few scattered trees. The sky is filled with large, dark clouds, with a bright, golden light breaking through near the horizon, creating a dramatic and atmospheric scene.

**How to make your  
neighborhood  
to be resilient to climate  
change?**

# Your next step

## Food-for-thought

- The importance of sustainability and sustainability education
- We need more green talents ([Link](#))
- What is the future of SDG after 2030? Extending to 2050? ([Link](#))

## Call for actions

- SDG education policy
- Game-based SDG education
- Connect stakeholders for SDG/sustainability education