GAUC

Global Alliance of
Universities on Climate

# CAMPUS DECARBONIZATION WORKSHOP 2021

## Report & Good Practice Book

hosted by

東京大学
THE UNIVERSITY OF TOKYO

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## About the Global Alliance of Universities on Climate (GAUC)

**The Global Alliance of Universities on Climate (GAUC)** is an alliance of universities launched in January 2019 with the aim of strengthening collaboration among universities and outreach to society on addressing climate issues. The mission of the Global Alliance of Universities on Climate is to advance climate change solutions through research, education, and public outreach, and to partner with industry, non-profit and government organizations to promote rapid implementation from local to global scales.

## About the Campus Action Working Group

The Campus Action Working Group is the one of the three working groups of GAUC, which member universities are: The University of Tokyo, Australian National University, London School of Economics and Political Science, and India Institute of Science. The group works on sharing experiences and best practices, and promoting the carbon-neutral transformation of the university.

Website of the Global Alliance of Universities on Climate (GAUC):
https://www.gauc.net/

# OVERVIEW

The Campus Decarbonization Workshop took place online on March 11, 2021. The workshop was co-organized by the University of Tokyo and Tsinghua University, and marked the start of the Campus Action Working Group of the Global Alliance of Universities on Climate (GAUC). The workshop was open to staff and students of GAUC member universities with pre-registration, and there were 167 participants in total.

The workshop focused on sharing challenges and good practices regarding campus decarbonization among GAUC member universities, with heightened awareness of campus management challenges in the post-COVID-19 world.

# WORKSHOP OUTLINE

The workshop consisted of opening remarks and the two main sessions. For the opening remarks, Professor Naoto Sekimura, Vice President of the University of Tokyo in charge of international affairs, and Professor Li Zheng, Executive Vice President and Professor at the Institute of Climate Change and Sustainable Development, Tsinghua University, each gave the audience an address representative of the host university and the Secretary-General of the GAUC.

The presentation session was chaired by Professor Mamoru Mitsuishi, Executive Director and Vice President of the University of Tokyo. Speakers from eight GAUC member institutions gave presentations on the current situation and focus of reducing carbon emission from their respective campuses, touching upon variety of topics including:

- *Measuring the carbon footprint,*
- *Setting reduction targets,*
- *Specific measures to reduce direct and indirect emissions, generating and purchasing renewable energy,*
- *Carbon offsetting, integrating sustainability efforts to research and education,*
- *Student engagement, and*
- *Working with the society.*

The eight universities and speakers were as follows;

- *Australian National University (Professor Mark Howden),*
- *Federal University of Rio de Janeiro (Professor Suzana Kahn),*
- *Indian Institutes of Science (Professor S.K. Satheesh),*
- *London School of Economics and Political Science (Mr. Charles Joly),*
- *The University of Tokyo (Professor Mamoru Mitsuishi),*
- *Tsinghua University (Mr. Huo Huibin),*
- *University of California, Berkeley (Ms. Kira Stoll), and*
- *University of Cambridge (Ms. Joanna Chamberlain)*

of which many were committed to achieving carbon neutrality by the middle of this century, while some had more ambitious target of achieving it earlier.

The second session was the discussion and Q&A session and was moderated by Professor Mamoru Mitsuishi, the University of Tokyo. 15 discussants joined the panelist of the presentation session for this session:

- *Professors Mamoru Mitsuishi and Yasunori Akashi, the University of Tokyo,*
- *Mr. HUO Huibin, Mr. ZHOU Jian and Dr. WANG Binbin, Tsinghua University,*
- *Professor Mark Howden and Ms. Clare de Castella, Australian National University,*
- *Professor S.K. Satheesh, Indian Institutes of Science,*
- *Mr. Charles Joly, London School of Economics and Political Science,*
- *Ms. Joanna Chamberlain and Dr. Amy Munro-Faure, University of Cambridge,*
- *Professor Suzana Kahn, Federal University of Rio de Janeiro,*
- *Ms. Kira Stoll, University of California, Berkeley,*
- *Dr. Charlotte Halpern, Sciences Po, and*
- *Professor Guy F Midgley, University of Stellenbosch.*

Wide variety of issues were discussed, including enhancement of research and education related to sustainability, engagement with the local community, landscape of the renewal energy market in each country, water usage for energy saving, decarbonizing methods of the heating systems, efforts to reduce scope 3 emissions and assessment of campus decarbonization. The discussion highlighted similarities and differences among each GAUC member institutions in terms of social, cultural, geographical and environmental context, and the experiences in regard to campus decarbonization. It also highlighted that this diversity of GAUC member institutions can provide great opportunities for each institutions to advance their own decarbonization strategies by learning from each other's experiences and generate new knowledge and activities that can impact the society.

# PRESENTATION SESSION

## Main Efforts for Campus Decarbonization

### The University of Tokyo: TSCP-UTokyo Sustainable Campus Project

- Monitoring electricity consumption
- Adopting electric heat source machines and improving efficiency
- Sharing the vision among professors, staff, and students

### Tsinghua University: Building green campus

- Strengthening sustainability-related education and promoting wide discussion on campus
- Improving energy management system by replacement with clean energy, reduction of losses in transmission and distribution and use fo new energy source
- Water-saving campus action

### Australian National University: ANU Below Zero Initiative

- On-campus emissions reduction and carbon sequestration
- World leading research and teaching on climate and energy
- Community engagement as a role of national university

### Indian Institute of Science

- Roof top and ground solar power; replacing diesel with PNG; zero-emission transportation
- Awareness programs for the benefit of research scholars and high school students

### London School of Economics and Political Science

- Measurement: improve the accuracy of carbon footprint measurement
- Reduction: energy performance contract and energy efficiency measures
- Mitigation: buying electricity from 100% renewable sources and fund carbon reduction projects
- Research: education and international collaboration

### University of Cambridge: Cambridge Zero

- Science Based Target approach
- Power Purchase Agreement and large scale onsite renewable electricity
- Resharping the estate for sustainability

### Federal University of Rio de Janeiro

- Establishing monitoring database
- Improving traffic system and energy system
- Urban living lab by intelligent constructive

### University of California, Berkeley

- Green building initiative for new and old ones
- Solar Powering California: Clean energy; energy efficiency
- Carbon neutrality strategies: biogas and carbon offsets
- Constructing new electrified energy strategy and becoming a renewable energy microgrid

# Decarbonization Targets for University Campuses

| | | | |
|---|---|---|---|
| The University of Tokyo | **2030:** 50% Reduction by FY 2030 compared to FY 2006 | **2050:** Achieve Carbon Neutral | |
| Tsinghua University | Green Campus 2.0 (Five-Year Action Plan) | | |
| Australian National University | **2025:** Net Zero Emissions for Direct On-Campus & Energy-Related Emissions (Scope 1 and 2) & Business Travel & Waste (Partial Scope 3) | **2030:** Below Zero Emissions | **Beyond 2030:** Progressively draw down emissions accumulated earlier |
| Indian Institute of Science | 36% reduction of emissions by 2025 | | |
| London School of Economics | **2020/21:** Carbon neutral for all the emisisons currently measured | **2030:** Net zero carbon (Scope 1 and 2) and by 2050 at the latest (Scope 3) | |
| University of Cambridge | Reduce scope 1 and 2 carbon emissions to absolute zero by 2048, with an aspiration to achieve this by 2038 | | |
| University of California, Berkeley | **2025:** Carbon neutral from building and fleet energy use | **2035:** Carbon-free energy use | **Beyond 2050:** Carbon neutral from all sources |

## The University of Tokyo

The University of Tokyo has primarily five main campuses in and around Tokyo and 51 facilities which are located across Japan. The University of Tokyo is the largest energy consumption institute among all national universities in Japan, and the Hongo Campus is the largest single energy consumption institutional area in Tokyo Metropolitan Area.

In order to realize a sustainable campus while utilizing its existing intellectual resources and revitalizing research and education, the University of Tokyo established the UTokyo Sustainable Campus Project (TSCP) in 2008.

The University of Tokyo reduced 145,000 t-$CO_2$ (138,271 t-$CO_2$ in FY2019) and saved USD 54M in total from FY2008 to FY2019. Further acceleration of the rate of reduction of $CO_2$ emission is necessary.

TSCP Activities

- PDCA cycle with cost payment system
- Every academic and administrative unit of the University of the University of Tokyo pays the TSCP a fee equivalent to 4% of its light and heat energy expenses. The fee is used to fund the budget for promoting TSCP.
- Measures for facilities update
- Energy consumption was reduced by adopting electric heat source machines and improving equipment efficiency
- Fostering energy conservation awareness
  TSCP has helped to build campus power visualization systems. TSCP has created and distributed energy-saving stickers and guidelines for experimental equipment.

UTokyo $CO_2$ Emission Targets

- TSCP2030: 50% reduction by FY2030 compared to FY2006
- Further target is to achieve Carbon Neutral by 2050

Future Challenges

- Implementation of high-density monitoring system for various campus activities
  Monitoring indoor temperature and air quality, air/water state inside an equipment, human mobility, etc.
- Further improvement of energy saving
  Data-driven optimization and fault detection/diagnosis system
- Further promotion of decarbonization
  Strategic purchase of green certificate and carbon free electricity, and installation of renewable energy
- Implementation of performance-based order/purchase
  For building new buildings, refurbishing and purchasing equipment
- Cultivating the next generation leaders
  Scaling up the activities of student groups working on environmental issues to be university-wide
- Share the vision among professors, staffs and students
  Further collaboration with the Institute for the Future Initiatives and the Center for Global Commons of UTokyo
- Scale up TSCP
  Staff resources and funding

## Tsinghua University

Brief Overview of Carbon Footprint and Decarbonization Ambitions

Carbon emissions are 189 kilotons in 2019. Scope 1 and Scope 2 emissions are 66 kilotons and 123 kilotons, respectively. Natural gas accounts for more than 98% of total Scope 1 emissions and heating takes up around 80% of total natural gas consumption. The construction area on campus has increased by 28.9% over the past decade, while carbon emissions have only risen by 8.7%. Tsinghua University will endeavor to reduce Scope 1 and Scope 2 emissions for a carbon neutral campus.

Examples of Measures Taken to Reduce Emissions, with a Particular Focus on Energy Use (Scope 1 and 2 Emissions)

Firstly, the energy mix has been adjusted. Coal has been replaced by natural gas as the fuel for heating supply, with all coal-fired boilers superseded by natural gas boilers. Secondly, we have improved the infrastructure and upgraded the heating pipes to reduce the loss in energy transmission. Thirdly, the use of new energy sources has been expanded. Currently, solar energy and geothermal energy are used for heating bathing water in student dormitories, reducing carbon emissions by more than 4,000 tons per year. In addition, we are implementing a project of great importance to install new electricity meters for 210 buildings. These meters feature remote data transmission, which can monitor the electricity consumption of electricity-using equipment in real time. The aggregation and analysis of collected data will enable us to further improve the capability of electricity consumption management, so as to avoid unreasonable electricity consumption.

Brief Outline of Future Plans and Key Areas of Focus

The comprehensive solutions are established to deal with gas and power related emissions and achieve net zero at Tsinghua University. Based on technical maturity and feasibility, five pillars are summarized: building energy efficiency, zero-carbon heating, zero-carbon power, electrification of transportation and cooking, management of campus carbon sink.

Zero-carbon heating: Currently, Tsinghua University adopts gas boilers to meet the campus heating demand in winter. Zero-carbon heating must replace natural gas with low-carbon energy. On the demand side and heating pipe network, the construction insulation system needs improving. The delicacy management and control are also indispensable to prevent excessive heating. On the supply side, we may use geotherm to replace gas boilers.

Zero-carbon power: On the grid side, with the process of carbon neutrality, the carbon intensity of electricity will decline rapidly. On the demand side, distributed PV (photovoltaics) is built on the roof, which could cooperate with charging piles, energy-saving buildings and energy-using equipment. It is estimated that 36 MWp of PV can be established. Besides, on the market side, purchasing green power certification will be a solution to offset remaining power emissions.

Building energy efficiency: The overall aim of buildings renovation is that the heating energy consumption of campus decreases from the current high level of 0.35 GJ/$m^2$ to the world first-class standard (< 0.1 GJ/$m^2$). The comprehensive energy management platform for buildings can play an important role in the process by intelligent scheduling and delicacy management. Electrification of transportation and cooking: Electrification of cooking and transportation is essential for zero emissions. All-electric cooking appliances and electric vehicles can be solutions respectively. Compare to fossil fuels, they have higher efficiency and lower emissions. Management of campus carbon sinks: Nature based solutions are adopted to improve campus carbon sinks and livability. For example, afforestation and wetland restoration on campus could be useful measures. The carbon sinks should also be detected and reported.

Key Challenges and Barriers Encountered

Firstly, technology is the key challenge for Tsinghua to achieve net zero. Plenty of technologie

related to carbon neural are not yet mature enough for large-scale application. Cost and efficiency will be barriers for these technologies. In order to solve this, the Institute for Carbon Neutrality was established in Tsinghua University in September 2021 to integrate our efforts to develop integrated and innovative technological solutions to achieve carbon neutrality.
Secondly, energy use is large in Tsinghua. Tsinghua University is located at about 40 degrees north latitude, with an average daily minimum temperature below 10 degrees Celsius for nearly six months in the year. Therefore, heating is supplied for more than four months every year. Two major growth points of energy consumption in the future will be energy use in additional floorage and electricity consumption in inventory floorage. In addition, the heating energy consumption of campus buildings is 0.35 GJ/$m^2$ because we have some old buildings. It is challenging to decrease from the current high level to the world first-class standard (< 0.1 GJ/$m^2$).

Key lessons Learned / Top Tips to Share

Research bases and demonstration projects will be built on the campus to develop and display key technologies of carbon neutrality. It can take advantage of technology innovation and promote the commercialization of research findings.

How Tsinghua University Engages with Students in its Decarbonization Efforts

Currently, 26 of the 59 departments have sustainability-related courses, with a total of over 240 courses (a 20% increase in the last five years). The university holds more than 200 academic forums on sustainable development every year, and those relating to climate change are attracting greater attention. As the concept of green development is becoming more widely accepted, an increasing number of teachers and students are taking actions. In order to help the young stay connect to the most cutting-edge climate research, Tsinghua University has organized 21 lectures on climate change to date, inviting policy makers and field experts around the world to share their insights, attracting more than two million students worldwide. In addition to classroom learning, students formed voluntary extracurricular project teams to conduct research on campus sustainability.
Tsinghua has also organized the previous two GAUC Graduate Forums, providing a platform for over 400 young scholars for an academic exchange on the most pressing issues in climate change. This year Tsinghua will co-organize the Climate x Global Youth Summit on Net-Zero Future, an upgrade from its predecessor - the GAUC Graduate Forum, which can help every youth find his/her place in contributing to achieving carbon neutrality.

## Australian National University

Consistent with what the IPCC says is needed to achieve the Paris Agreement goals, the Australian National University is implementing the new Below Zero Initiative which includes the following ambitious targets: 2025 – Net zero emissions for direct and energy related emissions (Scope 1 and 2) and business travel and waste (partial Scope 3), using verified Australian carbon offsets as a back-up. 2030 – Net below zero emissions for direct and energy related emissions (Scope 1 and 2) and business travel and waste (partial Scope 3) using only verified, Australia carbon offsets where necessary. ANU annual emissions would normally be about 140kt $CO_2$-e. Electricity is the largest single emission category but ANU now purchases 98% of this from renewable sources. Gas (mainly for heating) and travel are the next largest sources. The former is being addressed by electrification and potentially waste energy use, the latter is being addressed via revision of the ANU travel policy but will likely remain a stubbornly net source for the foreseeable future whilst the airline industry implements low-emissions flights. New buildings are being designed to reduce their lifetime GHG footprint and an integrated campus energy management strategy has been developed to provide systemic solutions. A comprehensive staff and student survey and consultation process have been implemented which has revealed widespread and deep concern about climate change, strong support for the Below Zero Initiative and a great set of ideas for reducing emissions. A series of task forces are addressing behavioural change, land

management and travel policy. As well as operational changes, ANU is integrating Below Zero into research and teaching across ANU and into a range of operational procedures.

Why Below Zero?

- Over 130 national governments and many sub-national governments, businesses and cities are now announcing net-zero greenhouse gas emissions targets, often by 2050
- The science is clear: to limit global warming to 1.5°C above pre-industrial levels we have to not only go to net-zero carbon dioxide emissions but actually go below-zero
- And because of delays in emission-reduction action we now have to do this well before 2050

What is the ANU Emissions Footprint?

- Total estimated 'normal year' emissions would be about 139,000 tonnes $CO_2$ equivalent - But 98% of ANU electricity is now renewable.
- Of remaining sources the largest is gas for heating (about 20,000t) and then business-related air travel (about 10,000t but this is highly uncertain and maybe substantially higher).
- The Acton campus in Canberra generates 96% of emissions.

Ambitious Scope & Targets

- 2025: Net zero emissions for direct on-campus & energy related emissions (Scope 1 and 2) & business travel & waste (partial Scope 3) with high quality Australian purchased carbon offsets as back-up
- 2030 – Below zero emissions (for scope outlined above) drawing down emissions on ANU land / using only carbon offsets with an ANU research connection.
- Beyond 2030: Progressively draw down emissions accumulated earlier (starting with those over ANU Below Zero lifetime).
- All other indirect emissions from procurement of goods and services & commuter travel (Scope 3) – Reduce as rapidly as possible, based on international best practice for university sector.

## Indian Institute of Science (IISc)

Brief Overview of Carbon Footprint and Decarbonization Ambitions

Per Capita carbon footprint of IISc is around 4.5 tonnes of $CO_2$ in 2020. The institute plans to deploy solar panels in available roof top areas of buildings, which is around 13,560 square meters and expected to reduce 8% of our emissions. We have plan to replace diesel with piped natural gas with an objective to reduce 21% of emissions and deploy solar panels on the ground covering 1 hectare of land to reduce emissions by 7%. Thus, total reduction in $CO_2$ emissions being planned by 2025 is 36%.

Examples of Measures Taken to Reduce Emissions, with a Particular Focus on Energy Use (Scope 1 and 2 Emissions)

- Zero-emission transportation: Zero emission transportation for small, 4-seater EV vehicles, bikes etc. Students are encouraged to use bicycles instead of motorized vehicles. Faculty/ staff encouraged to utilize EV vehicle services for commuting within the campus.
- Replacement of old air conditioners with new energy efficient models.
- Deployment of rooftop solar panels.

Brief Outline of Future Plans and Key Areas of Focus

- Green Buildings: "GRIHA" stands for Green Rating for Integrated Habitat Assessment. "GRIHA" guidelines attempts to minimize a building's resource consumption, waste generation, and overall ecological impact to within certain acceptable limits/benchmarks. The upcoming infrastructure projects at IISc will follow "GRIHA" specifications (as much as possible).

- Gas Authority of India Limited (GAIL) will provide piped natural gas (PNG) connections to various buildings/facilities such as residences, hostels, restaurants, departments/centres, guest houses and other amenities on IISc campus. Existing DG sets will be converted to

make these PNG compatible. Future generators will be PNG compatible. Chillers will be madecompatible with PNG. PNG will be used for construction related activities. For example, DG sets in construction sites will be PNG compatible.

Key Challenges and Barriers Encountered

Initial investment required to deploy energy efficient systems or replace with old systems with energy efficient systems is high. Cost versus benefit of various steps taken needs to be analysed before implementation.

Key Lessons Learned / Top Tips to Share

Awareness about the consequences of climate change is important. Translating knowledge and communicating to the campus community is helpful to all to get involved in decarbonisation efforts of the institute.

How IISc Engages with Students in its Decarbonization Efforts

IISc conducts climate change awareness programs for students consisting of lectures by eminent faculty, demonstration of measurements, quiz contests and so on for the benefit of research. Students are encouraged to participate in decarbonisation efforts of the institute.

## London School of Economics

LSE's Carbon Footprint

For the academic year 2019/20 our measured carbon footprint was mainly made of emissions from:

- Scope 1 - Gas and other fuels used to heat and operate buildings: 3,519 $tCO_2e$.
- Scope 2 - Electricity used for lighting, ventilation, IT equipment: 3,550 $tCO_2e$ (or 0 $tCO_2e$. when considering our electricity is purchased from 100% renewable sources such as wind and solar).
- Scope 3 - Water consumer: 160 $tCO_2e$ / Business travel (air and rail): 2,453 $tCO_2e$.

LSE's Carbon Targets

- Become Carbon Neutral from 2020/21 for all the emissions we currently measure (scope 1 and 2 for our energy use, and scope 3 for water, waste and business travel), using high-quality carbon reduction offsets to mitigate the emissions we have not yet reduced or avoided.

- Achieve Net Zero Carbon emissions by 2030 for our energy use (scope 1 and 2), and by 2050 at the latest for other emissions, adopting a challenging carbon reduction pathway aligned to climate science and only using carbon removal offsets for our residual emissions.

Examples of Measures Taken to Reduce Emissions, with a Particular Focus on Energy Use (Scope 1 and 2 Emissions)

- LSE has invested £4.8 million since 2015 in a range of energy efficiency measures for its campus buildings, including upgrading its Building Management Systems, installing LED lights and advanced lighting controls, fitting solar panels, insulating pipes, or replacing boilers and chillers.
- The carbon emissions linked to our energy use (scope 1 and 2) have reduced by 46% since 2005 despite an increase in campus size and the number of staff and students.

Brief Outline of Future Plans and Key Areas of Focus

The UK electricity grid is projected to decarbonise rapidly over the next 10 years whilst innovations to decarbonise the gas network (eg through use of hydrogen) are not expected to become mainstream until a much later date. Thus our area of focus to meet our net-zero carbon target is the electrification of our currently gas-fed heat systems. This approach will involve targeting buildings for electrification of heat, through most likely the replacement of gas-fed boilers with electric air source heat pumps. Multiple factors and constraints willneed to be assessed next, such as physical space in plant

rooms, impact on building electrical supplies, impacts on service and users, costs, etc.

Key Challenges and Lessons Learned

- Financial and time resources to drive planning and delivery of carbon reduction projects.
- Reconciling decarbonization efforts with other competing priorities for the university.
- Project delivery impacts (eg boiler replacement) on building users and space availability.
- Lesson learned: The teams responsible for buildings and plants operations and maintenance have a critical role to play and need to be involved at all stages of the decarbonization agenda.

How LSE Engages with Students in its Decarbonization Efforts

- Student representatives are included in all Sustainability working groups and committees at LSE.
- We work closely with the LSE Students' Union and its sustainability societies.
- The LSE Sustainable Project Fund provides an opportunity for student to bid for funding to finance small scale projects and initiatives to advance sustainability on campus.

Further information at www.lse.ac.uk/sustainableLSE

## University of Cambridge

In 2019, Cambridge became the first university in the world to adopt a Science Based Target (SBT) for carbon reduction. The target applies to the University's operational estate, and commits the University to reducing its energy-related (scope 1 and 2) carbon emissions to absolute zero by 2048. Furthermore, it has expressed an aspiration to become zero carbon at least ten years ahead of its target date (by 2038). This is so the University can provide an example of what is achievable in terms of carbon reduction, and opportunities for others to learn from its approach, including both its successes and areas that are found to be challenging.

Scope 1 and 2 carbon emissions: 53,931 $tCO_2e$ with total carbon emissions including Scope 3 circa 454,000 $tCO_2e$

Some key initiatives to achieve this aspiration include:

- Power Purchase Agreement for zero carbon electricity – 20%
- Large scale onsite renewables
- Removing gas from the estate
- Incorporating carbon into the capital programme decision making process
- Energy efficiency retrofit projects
- The Electricity Devolution Programme to get department to benefit from reducing consumption
- Electrification of the transport fleet
- Independent assurance of sustainability data

Key barriers include costs and return on investment of installing new technologies into a wide and varied building portfolio whilst being aware of the impact on other neighbouring buildings and the wider city. Scope three data collection is improving but this is an ongoing process.

Green Impact is the University's environmental accreditation scheme. It encourages departments and colleges across the University in reducing their environmental impacts and

has proven to be an excellent way of engaging staff members and students. The scheme provides students with opportunities to join teams across the University's departments, for insights and the ability to make tangible changes. The Living Lab organises and advertises summer internships within the Environment and Energy Section and offers students the opportunity to use the University estate as a case study for academic projects, dissertations or thesis.

What's next:

- Measuring our fugitive emissions and including in our SBT
- Setting a baseline for scope 3 emissions – improving data capture
- Setting a SBT for scope 3 emissions
- Completing work to develop SBTs for the Collegiate University
- Developing an internal offsetting scheme

## Federal University of Rio de Janeiro

UFRJ's history dates back to the beginning of the 19th century and is filled with remarkable scientific, cultural, and artistic accomplishments. It is currently the 3rd best university in Brazil and the 7th best university in Latin America (QS Rankings – 2018).

With many campuses and faculties scattered around the State of Rio de Janeiro, it comprises institutes, schools, and other facilities, including museums, hospitals, and the third largest ocean basin in the world for research on offshore oil exploitation. It also houses the Alberto Luiz Coimbra Institute for Graduate Studies and Engineering Research (Coppe), the largest engineering teaching and research center in Latin America.

Coppe – is Latin America's largest center for research and education in engineering. It was founded in 1963 by the engineer Alberto Luiz Coimbra. With Coppe, Coimbra contributed to the introduction of graduate studies in Brazil. The institution has awarded more than 13 thousand Master's and doctorate degrees from its 13 departments. Based on three pillars, academic excellence; full-time faculty and students, and commitment to society, Coppe has distinguished itself by producing knowledge, highly qualified professionals, and innovative teaching methods. With all that, Coppe has become a model for other universities and research institutes across the country. One of the lading projects of UFRJ is named as "Sustainable Campus", which focuses on the diffusion of new disruptive sustainable technologies and improvement of environmental indicators. It contributes to building of a sustainable society through education, research, collaborating with the society and campus development.

Actions Already Taken

- Build a database to know our own characteristics and also allow us to monitor
- Bicycle and electric car sharing system
- COPPE/UFRJ Hybrid Electric-Hydrogen Fuel Cell Bus and Electric-Ethanol Bus
- Retrofit from energy systems
- Photovoltaic systems
- Urban Living Lab - Intelligent Constructive

Future Plans

- Living Lab – The consuming number of University City campus can be compared to small cities in Brazil. This fact opens the opportunity to make the campus a living lab for sustainable projects.
- Mobility – Boat and train systems to the campus

Students' Engagement

- Contest for students apply sustainable ideas for the campus;
- Implement project and/or their technologies, make us stay close to the students;
- Open access to all data from sustainable projects to be used in their class and/or research

Challenges and Barriers

- Lack and dependence of private and public investment;
- Necessity to better integrate the different sphere in the university to plan and integrate the sustainable actions.
- Promote active participation of all parts of the society

Lessons Learned

- Need to establish private partnership to be closer to the market place;
- Need to establish "cities" partnership to implement local and urban innovative solutions;
- Need to establish international partnership to technology transfer and scale up the solutions

## University of California, Berkeley

In 2013 the University of California system pledged to be carbon neutral by 2025 from scope 1 (campus-generated energy, campus fleet) and scope 2 (purchased electricity) carbon emission sources.

For Berkeley to get to carbon neutrality, or zero-net carbon emissions, from building and fleet energy use, the campus is aiming to reduce emissions as much as feasible and use carbon offsets to achieve neutrality from 150,000 tons of emissions. This reduction represents 80% of Berkeley's carbon emissions. The remaining 20% of Berkeley's emissions outside of the 2025 goal are associated with the campus commute, business air travel, waste, and water. A neutrality date for these other scope 3 emissions is currently 2050.

Berkeley's carbon neutrality strategy for scopes 1 and 2:

UC Berkeley has taken the first steps toward neutrality by reducing emissions to levels lower than they were 30 years ago. Strategies include:

- Expanding the use of low and non-carbon energy supply for power and thermal needs. including directed biogas, green power options from utilities, and on-site solar photovoltaics .
- Reducing energy use through building level energy efficiency projects.
- Curbing growth-related emissions through electrification, green building practices and improved space utilization.
- Increasing the efficiency and using less carbon intensive fuel in the vehicle fleet.
- Utilizing carbon offset mechanisms to get to neutrality in the near term.

Getting to Zero-Emissions in Building Energy Use - Berkeley's Clean Energy Campus Initiative

Within eight years, Berkeley plans to switch to a new clean and resilient energy system that will phase out fossil fuels and demonstrate cutting-edge technologies and creative financing. Through this initiative 80% to 90% of Berkeley's carbon emissions will be eliminated. Planning includes:

- Replacing the campus' natural gas-fired cogeneration plant with electric heat pumps, as part of a centralized system or via a distributed network.
- Providing the campus microgrid with power from on-site and utility clean electricity.
- Additional renewable energy will be produced through solar photovoltaic panels, fuel cells, geothermal and hydrogen resources to bolster resiliency.
- New battery and thermal storage supporting peak energy demand and resiliency.
- Activating living lab opportunities.

- Serving as a model for other colleges, universities, and public institutions.

Berkeley is looking to spend $400 million on new energy infrastructure and another $30 million on annual operation costs. Funding strategies to consider will be debt, public-private partnerships, gifts, grants, state and federal funding, and impact investment.

More information:
http://sustainability.berkeley.edu and http://cleanenergycampus.berkeley.edu

# DISCUSSION TOPICS

1. **Importance of engagement of faculties and students through research and education programs**
2. **Campus decarbonization in relationship with local authority and community**
3. **Water usage influence on energy saving**
4. **Choice of renewable energy provider**
   - National situation and regulation
   - Available amount and price in market
   - University motivation and policy: long-term contract
5. **Energy consumption of heating system**
   - High thermal efficient countermeasure for old buildings
   - Shift from gas system to renewable electronic system
   - New buildings with air tightness (to mitigate leakage) and so on
   - Divide campus into many regions to manage peak adjustment and reduce heat loss
6. **Hierarchy of policies on the international, domestic, and regional level and the role of universities**
7. **Linking student activities to campus decarbonization efforts**
8. **Issues on travel-related emissions**
9. **Assessment of campus decarbonization**
10. **Sustainable mechanism to share knowledge among the GAUC community**
    - Proposal of annual workshop to share knowledge
    - Australian National University will host the next workshop in 2022

# FUTURE ACTIONS

It was agreed that the Campus Decarbonization workshop will be held annually, and Australian National University will host the next workshop in 2022.

# APPENDIX

## 2021 Workshop Speakers

### MITSUISHI Mamoru

Executive Director and Vice President (Environmental Safety)
Professor of the Department of Mechanical Engineering,
School of Engineering, The University of Tokyo

Presentation Title:
*UTokyo Sustainable Campus Project*

### HUO Huibin

Deputy Director, Office of General Affairs / Office of Green University Project,
Tsinghua University

Presentation Title:
*Building a Green Campus in the Era of Ecological Civilization*

### Mark HOWDEN

Professor and Director, ANU Climate Change Institute, Australian National University

Presentation Title:
*ANU Below Zero Initiative*

### S.K. SATHEESH

Professor, Dean (Planning and Infrastructure) and Chair,
Divecha Centre for Climate Change, Indian Institute of Science

Presentation Title:
*Campus Decarbonisation at the Indian Institute of Science (IISc)*

### Charles JOLY

Head of Sustainability, London School of Economics and Political Science

Presentation Title:
*#SustainableLSE: Our Journey to net zero*

### Joanna CHAMBERLAIN

Head of Sustainability, Estates Division, University of Cambridge

Presentation Title:
*Decarbonising a University Using a Science Based Target Approach*

## Suzana KAHN

Professor and Vice Director, COPPE, Federal University of Rio de Janeiro

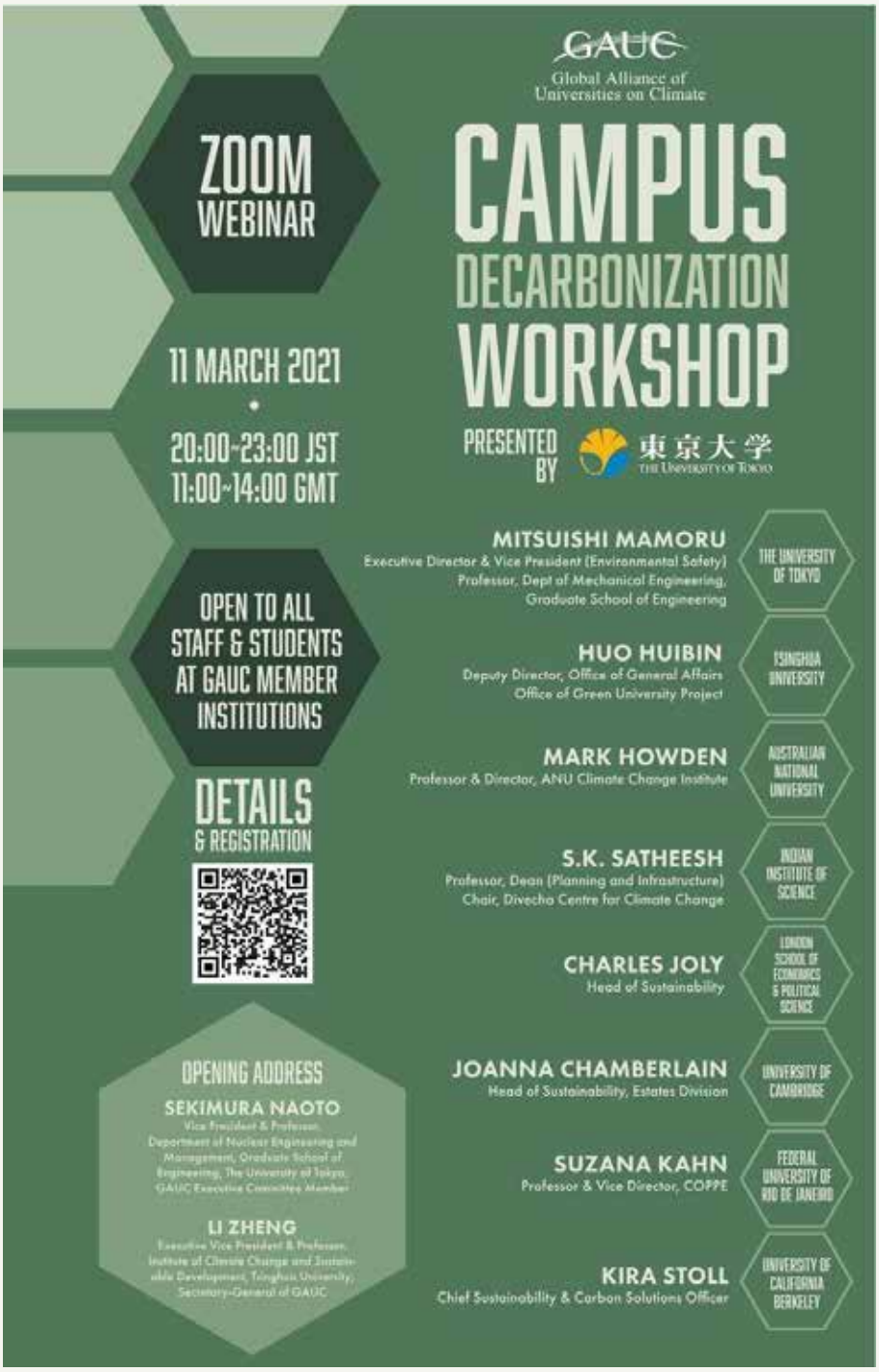
Presentation Title:
*Federal University of Rio de Janeiro: challenges and opportunities to reduce and mitigate the campus GHG emissions*

## Kira STOLL

Chief Sustainability and Carbon Solutions Office, University of California, Berkeley

Presentation Title:
*Path to Zero Carbon*

# 2021 Workshop Flyer



## About the Global Alliance of Universities on Climate (GAUC)

**The Global Alliance of Universities on Climate (GAUC)** is an alliance of universities launched in January 2019 with the aim of strengthening collaboration among universities and outreach to society on addressing climate issues. The mission of the Global Alliance of Universities on Climate is to advance climate change solutions through research, education, and public outreach, and to partner with industry, non-profit and government organizations to promote rapid implementation from local to global scales.

## About the Campus Action Working Group

The Campus Action Working Group is the one of the three working groups of GAUC, which member universities are: The University of Tokyo, Australian National University, London School of Economics and Political Science, and India Institute of Science. The group works on sharing experiences and best practices, and promoting the carbon-neutral transformation of the university.

Website of the Global Alliance of Universities on Climate (GAUC):
https://www.gauc.net/