

# Sustainability Master Plan for Operations

Building on Our Progress



# Guidance from Leadership

“Setting scientific targets is one of the most important actions necessary for any sector, which as a whole contribute to Hong Kong’s long term decarbonization target and the COP 21 -1.5 degree target. I am glad to hear that we are determined to set ourselves more progressive targets and possibly a University Sector standard.”

- *Prof John CHAI Yat-Chui, HKUST Council Vice-Chairman*

“Hong Kong is committed to implementing the Hong Kong's Climate Action Plan 2030+ and exploring the long-term deep decarbonisation strategy. I look forward to seeing HKUST proactively take up the leading role of climate action and further demonstrate stronger support for clean energy, green building and energy saving, and waste reduction.”

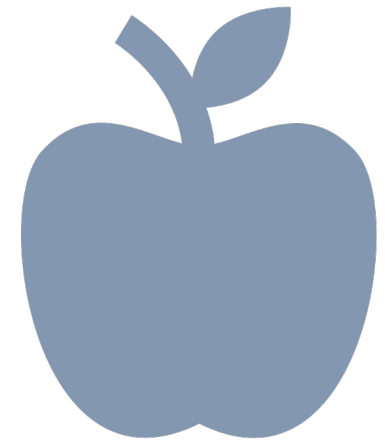
- *Mr. KS Wong, Secretary for the Environment, Hong Kong SAR*



Landscape and Biodiversity

# Progress and Performance

## 2028 Goals



Community Wellbeing



Water

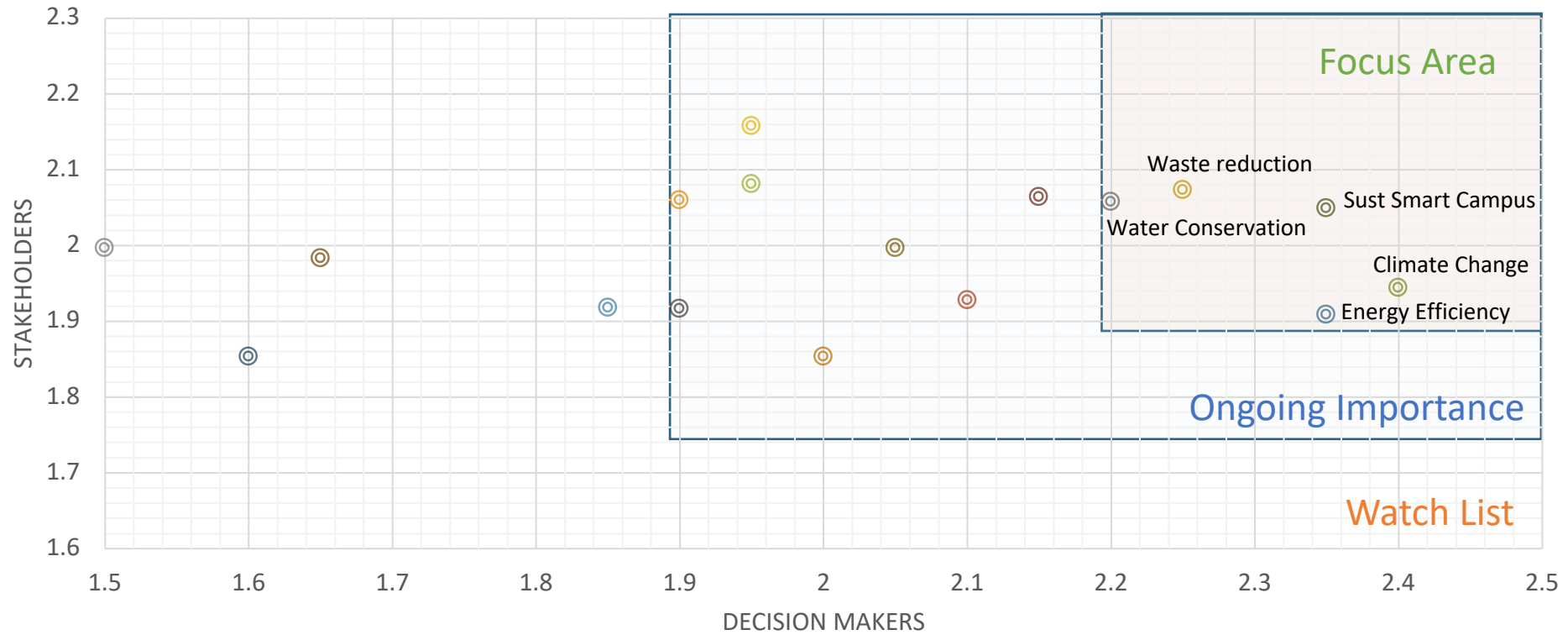


Energy and GHG



Waste to the Landfill

# In Context: Stakeholder Priorities



- ⦿ **Energy Efficiency & reduction**
- ⦿ **Water conservation**
- ⦿ Biodiversity of campus landscape
- ⦿ Diversity & equal opportunities
- ⦿ Data-driven management
- ⦿ Experiential and hands-on learning

- ⦿ **Climate change**
- ⦿ **Reduction of waste to landfill**
- ⦿ **Sustainable Smart Campus as a Living Lab**
- ⦿ Human values and integrity
- ⦿ Transparency & reporting
- ⦿ Academic freedom

- ⦿ Responsible purchasing
- ⦿ Sustainable food choices
- ⦿ Mutual respect & harmony
- ⦿ Sustainability leadership in Hong Kong
- ⦿ Quality teaching & education



# Progress & Performance Focus Areas



## PROGRESS AND PERFORMANCE

### Objective:

To pursue clear and measurable performance targets for efficiency, resource reductions, and campus improvements



Energy and GHG



Water



Waste to the Landfill



Landscape and Biodiversity



Community Well-Being

# Energy and GHG







## Energy and GHG

### Energy and GHG Linkage

- The energy needed to drive our operations and keep our building comfortable come with a price; greenhouse gas emissions. With over 95% of the energy used on campus coming in the form of electricity, our connection between energy and GHG emissions is directly tied to the fuels used by our electricity utility – which in 2020 still includes a high component of coal.
- The strategies for reducing GHG emissions are primarily focused on energy reductions.



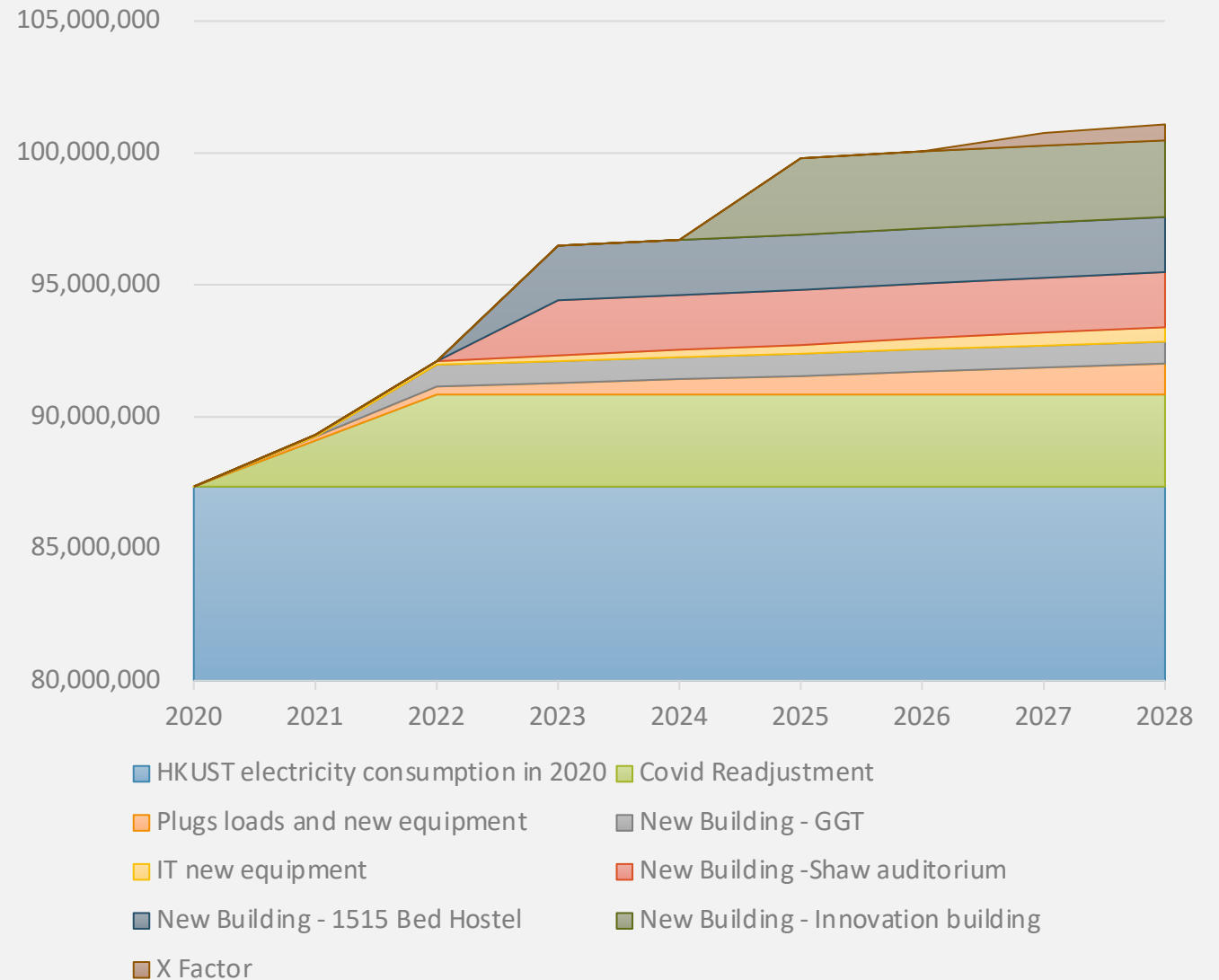


## Energy and GHG

### Energy Drivers: Looking Forward

- New buildings are the main drivers of energy growth.
- The Covid Readjustment assumes some of the current energy performance is the result of the work from home orders and online learning. Therefore, up to 4% of the consumption will return.
- IT and data center intensity is expected to continue its rise.
- Plug loads and new equipment is based on historical trends

### 2028 Energy Drivers



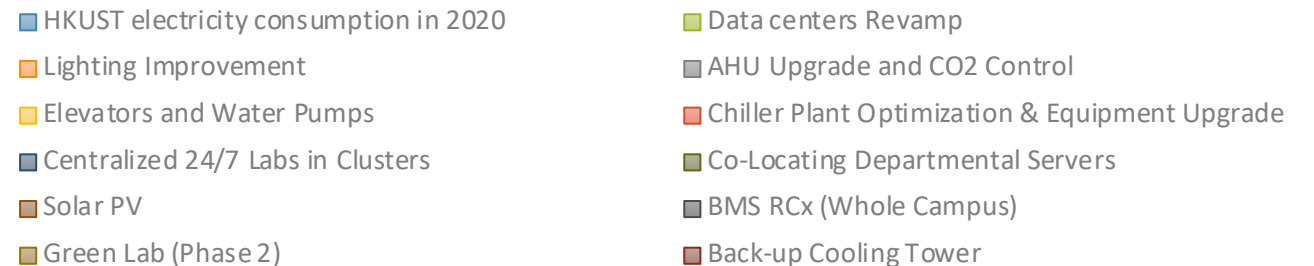
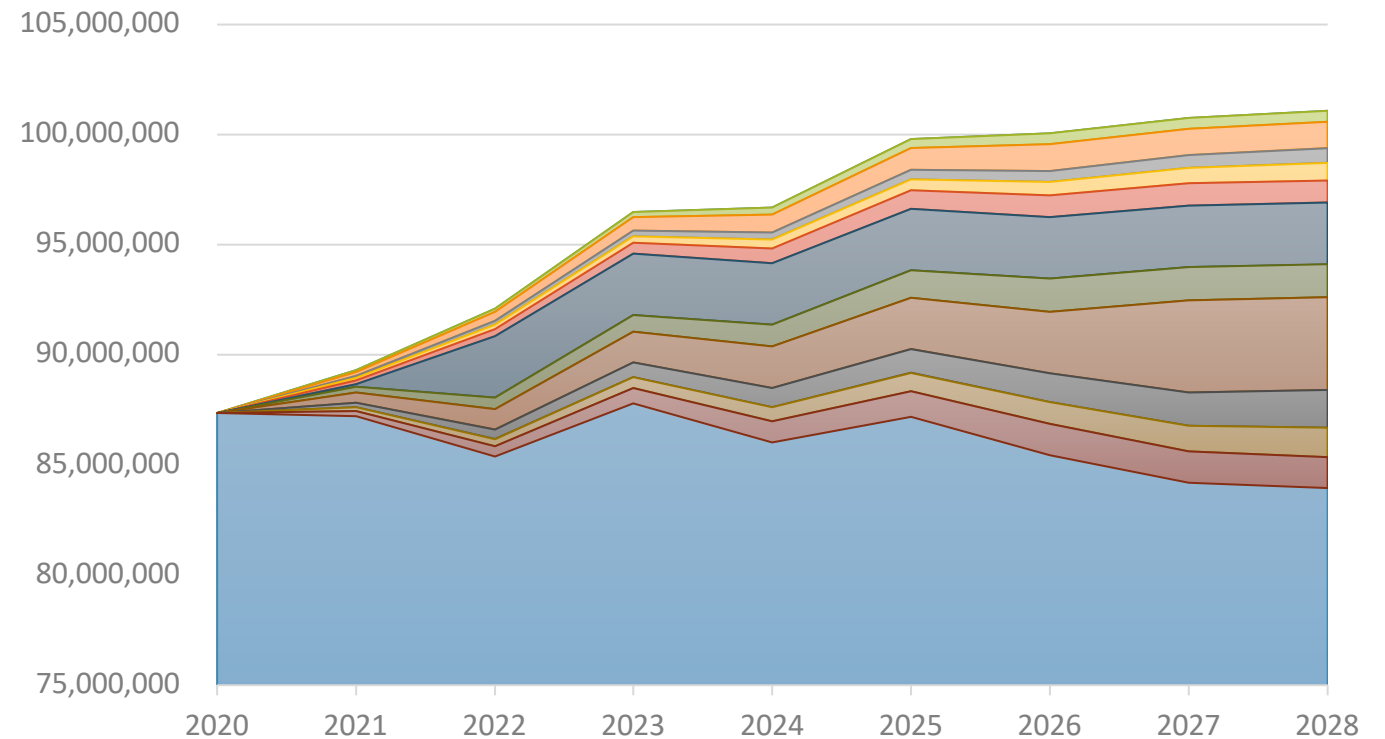


## Energy and GHG

### • Energy Savers

- While new buildings will drive up energy consumption, the performance of these “green” buildings will limit the rise compared to typical buildings.
- Some of these conservation measures were identified during the 2020 Challenge period and in process.
- The solar PV project does not save energy, but is listed as a “green energy” contribution because it reduces the dirtier power from the grid.

### 2028 Electricity Savings Potential

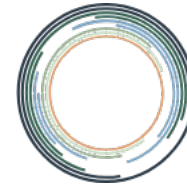




## Energy and GHG

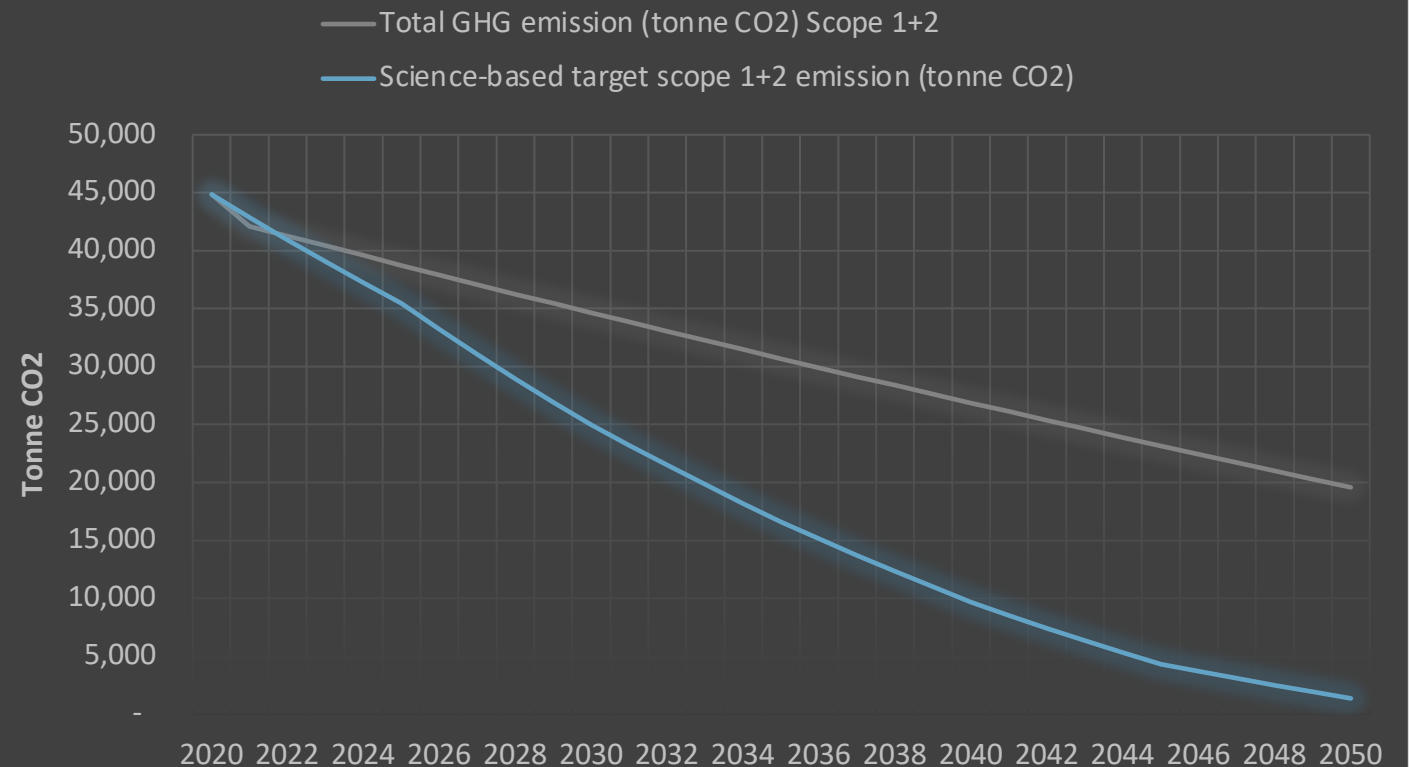
### Electricity and GHG Emissions

- Electricity is classified as a “Scope 2” emissions source, meaning that we have control over our consumption, but no control over the fuel used by the utility to produce the electricity. As such, the overall impact of our electricity consumption is tied directly to the environmental performance of our provider, CLP.
- Since the grid performance is unknown, we anticipate the GHG intensity of the grid will improve over the next 30 years.
- However, even with grid improvements, there is still a gap between where we would be and net-carbon zero. This is why an aggressive push to reduce electricity is so important.



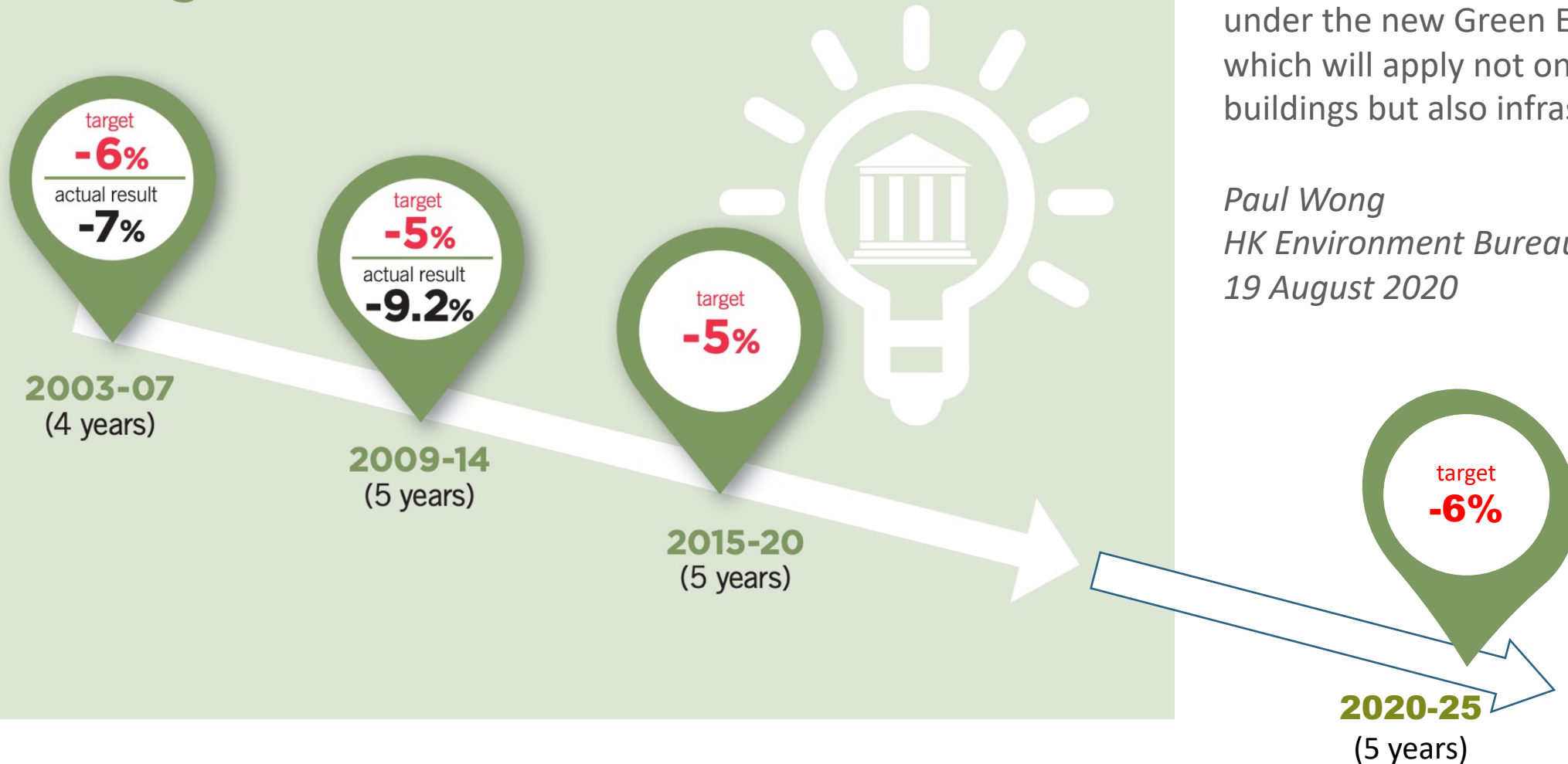
SCIENCE BASED TARGETS NETWORK  
GLOBAL COMMONS ALLIANCE

### CWB Campus Carbon Emission Projection Towards 2050



# Hong Kong Government Electricity Reduction Targets

## Reduction targets and actual reduction on electricity consumption for government buildings



“In the Policy Address of 2019, we rolled out a new Green Energy Saving Target. We aim to raise our energy performance by a further 6% under the new Green Energy Target, which will apply not only to government buildings but also infrastructure.”

*Paul Wong  
HK Environment Bureau  
19 August 2020*



## Energy and GHG

### Energy Reduction Target



## Energy and GHG Goals

Using the baseline year of 2014, exceed the Hong Kong government energy target by reaching a 15% reduction by 2028.

Using the baseline year of 2014, reduce GHG emissions by 40% by 2028.

## Strategies

- 1) Aggressively pursue energy reduction opportunities as identified through CMO and SSC initiative
- 2) Expand renewable energy in BIPV and wind
- 3) Reduce campus-related GHG emissions from tracer gases and refrigerants
- 4) Expand metering and data collection to improve analytics and predictive actions
- 5) Expand community-based behavior campaigns to incorporate individual contributions

## KPIs

Measurement and reporting of energy and GHG footprint





## Energy and GHG

# Tactics and Approaches

### Incremental Change Projects

1. Continue with incremental improvements in lighting, equipment, and air conditioning system upgrades.
2. Expand retro-commissioning efforts to all buildings.
3. Incorporate metering and sensor data for more accurate analytics and ability to make changes rapidly and predictively.
4. Develop high performance renovation strategies to increase performance for every new space retrofit, with an emphasis on windows and building envelope.

### Step Change Projects

1. Complete Solar project and develop a phase II renewable project that includes non-traditional locations and building-integrated technologies.
2. Review and revise policies to facilitate the centralization and sharing of equipment, and adopt LCC and LCA evaluation metrics as standard.
3. Fast-track Sustainable Smart Campus(SSC) projects as pilots for larger implementation opportunities.

### Green Labs Emphasis

1. Form a Green Lab Task Force to evaluate policies, procedures, space allocation, and current lab practices with the goal of identifying and removing roadblocks to aggressive changes within laboratories.
2. Evaluate energy charging schemes in labs to provide the right incentives for lab users to conserve energy.
3. Develop a comprehensive plan for refurbishing labs over the next 10 years with an emphasis on resource efficiency.

# Water





Water



# SUSTAINABLE DEVELOPMENT GOALS



*By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater*

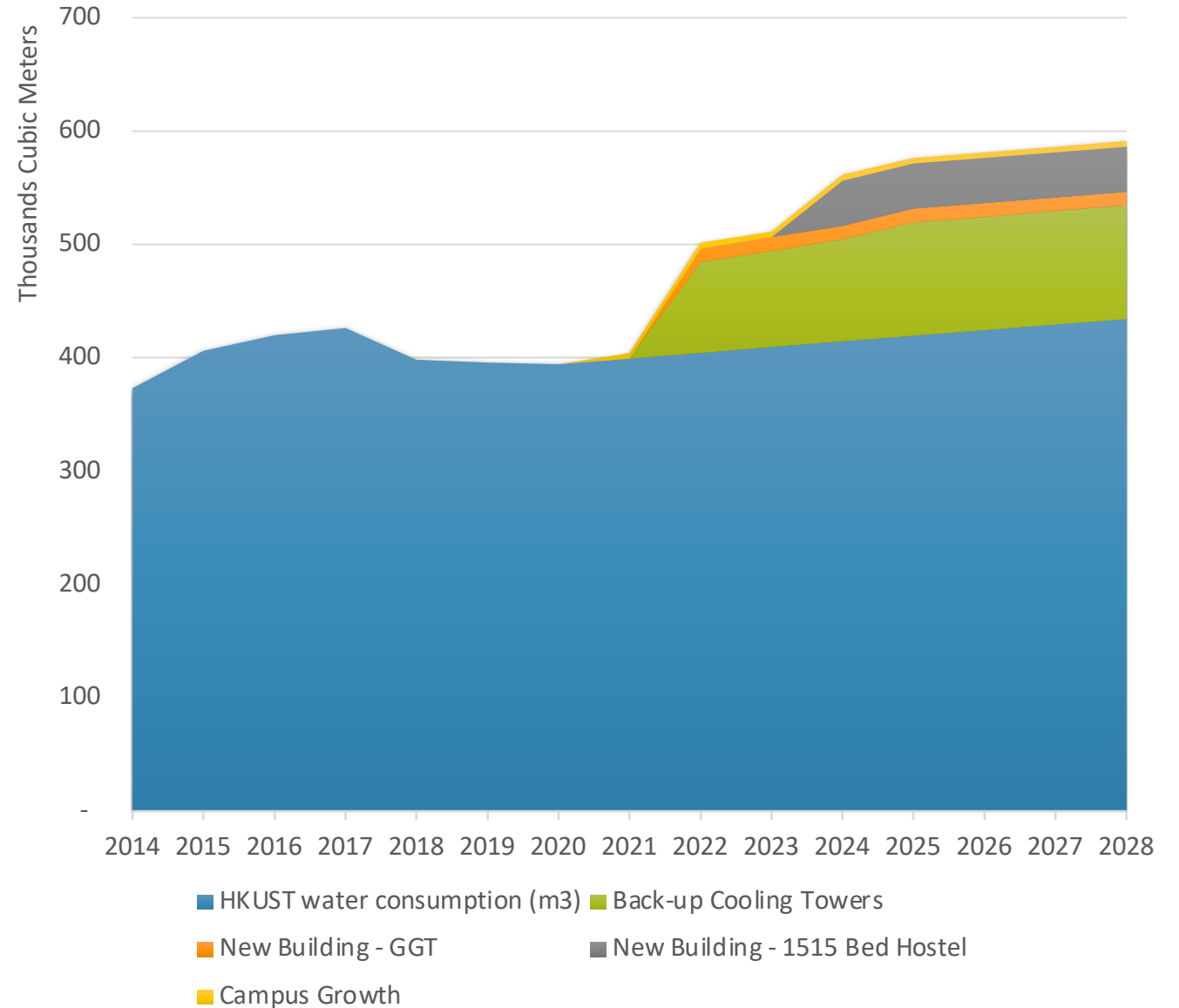


## Water

### Water Consumption Drivers

- Similar to electricity, the main drivers of new water consumption will be the addition of two new student residential buildings.
- The largest driver, however, is the installation of a new back-up cooling tower for the central air conditioning system. While saving significant energy, this new cooling tower will increase water consumption considerably.

### 2028 Estimated Water Consumption



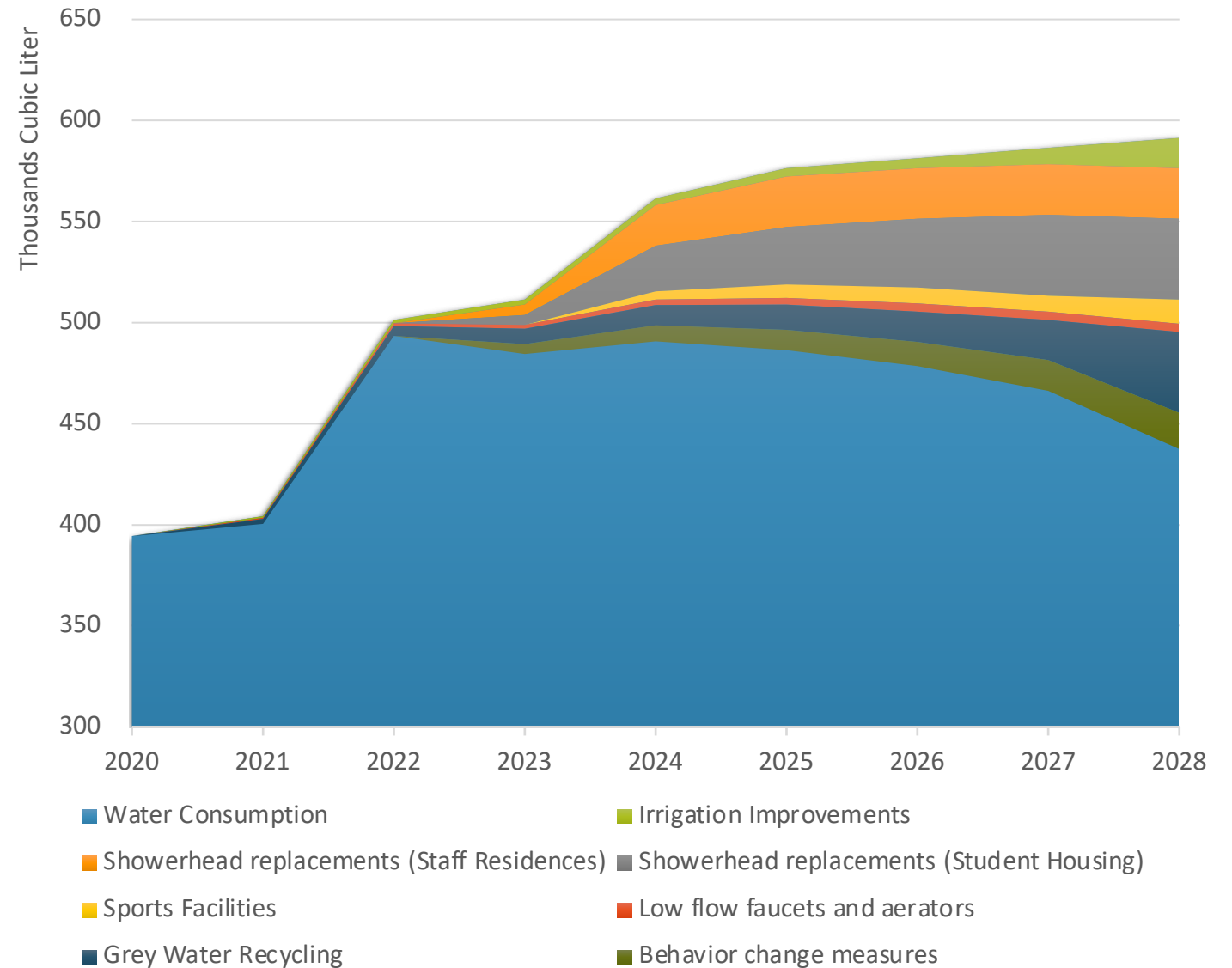


## Water

### Water Savings Opportunities

- The most effective water conservation measure will be in replacing showerheads with water savings models.
- A measure with great potential is based on two Sustainable Smart Campus (SSC) projects where grey water (from washing) is captured and recycled. In this performance period, we anticipate several pilot projects to establish the proof of concept for greater benefits to come later.

### 2028 Water Saving Measures







## Water



## Water Goal

Make substantial progress towards UN Sustainable Development goal #6 Clean Water and Sanitation by limiting potable water consumption to less than 500,000 cubic meters by 2028

## Strategies

- 1) Aggressively pursue water reduction opportunities in student and staff residences
- 2) Identify and implement grey water recycling projects
- 3) Identify and implement rainwater capture and recycling projects
- 4) Develop an irrigation reduction infrastructure using sensors and drip irrigation methods

## KPIs

Measurement and reporting of freshwater and seawater consumption



## Water

# Tactics and Approaches

### Residence Focus

1. Retrofit all showerheads in staff quarters and residence halls with low flow models. Install low flow faucets in all restrooms.
2. Implement behavior change strategies that nudge residents towards more water savings actions.
3. Encourage the use of dish washing machines in staff quarters to use water more efficiently.

### Incorporation of Technology

1. Incorporate greywater collection and filtration for water recycling. Focus on water from washing machines, showers, sinks, and other lightly contaminated water sources for easier treatment.
2. Develop rain water capture and treatment tanks to make better use of the free water falling onto the campus.
3. Recommission the underground water tanks to offset as much as the new cooling tower consumption.
4. Install drip irrigation pipes and water sensors where most likely to improve plant watering needs.

### Conservation in Buildings

1. Incorporate water saving and water recycling measures in campus canteens, with focus on cleaning and washing.
2. Capture condensation from the air conditioning systems in the main buildings and recycle for use in the buildings.
3. Identify ways to get recycled water into the new back-up cooling tower equipment to reduce its large water demands.





# Waste to the Landfill



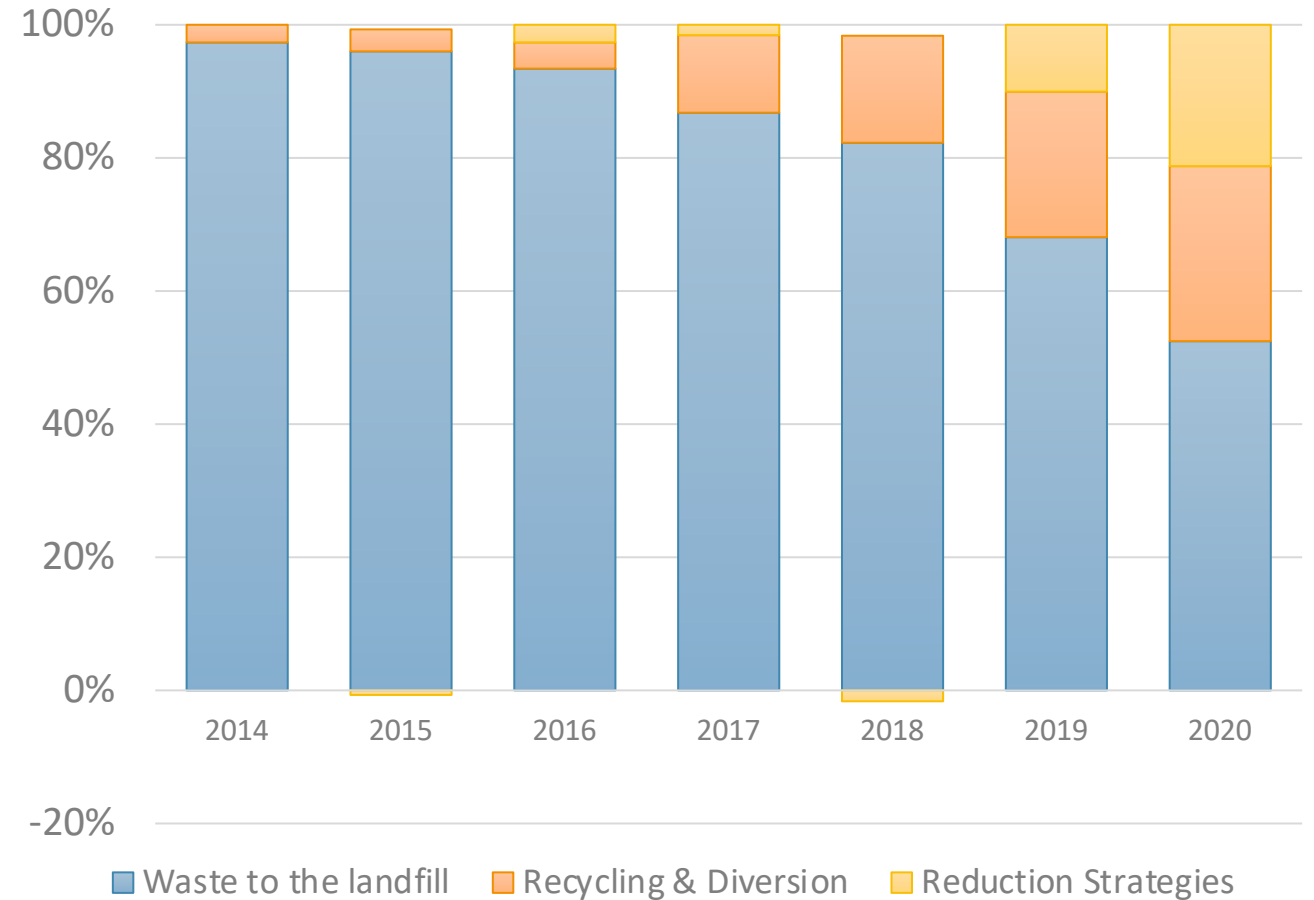


## Waste to the Landfill

### Waste to Landfill Drivers

- The growing population of the campus has the largest influence on the amount of waste generated. The population is expected to increase with the addition of the new PG and UG residence halls.
- In the next five years we anticipate the Hong Kong government instituting a waste charging scheme that will reward HKUST for its aggressive action in waste reductions.

## Landfill Reductions, 2014-20



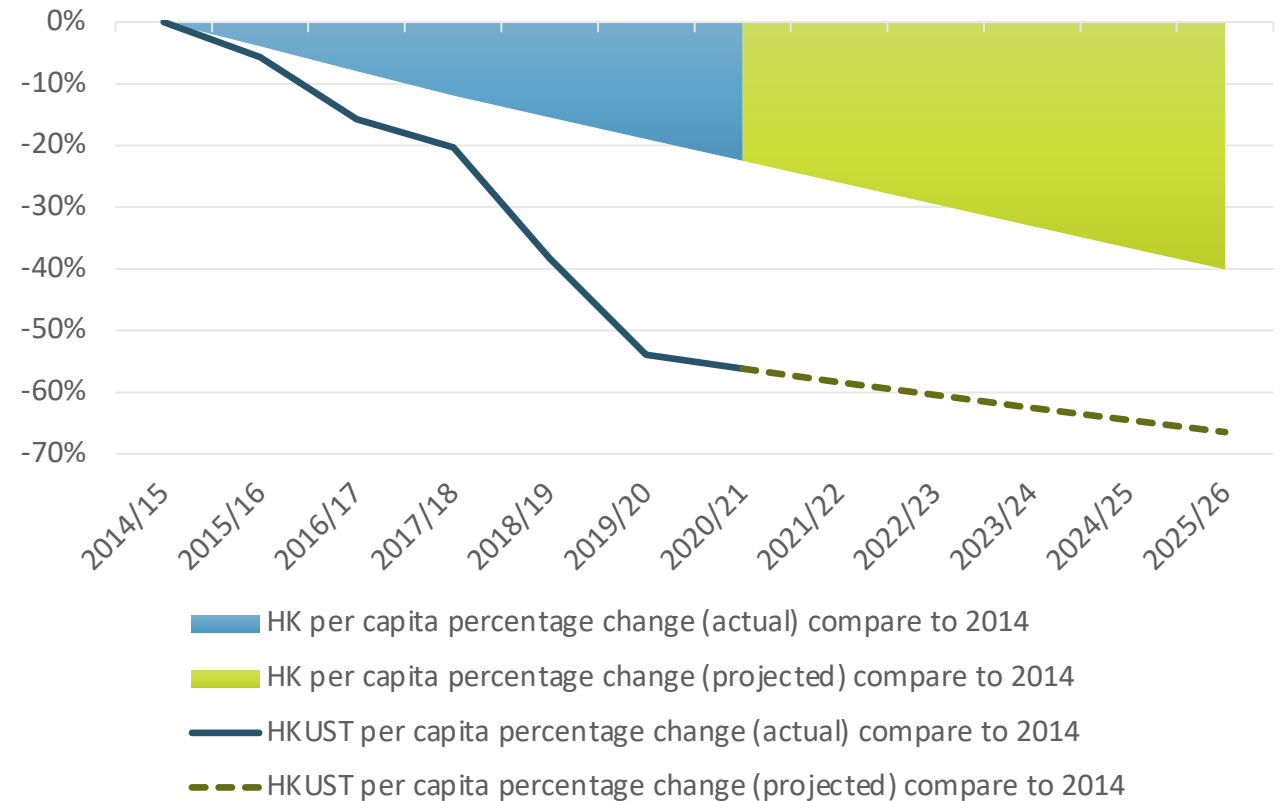


## Waste to the Landfill

### Compared to the Hong Kong Government

- In 2011 the Environment Bureau released the [\*Hong Kong Blueprint for Sustainable Use of resources: 2013-2022\*](#) which set a target of 30% waste reduction per capita.
- In 2020, HKUST had already exceeded this target with a 54% reduction per capita.
- In the next five years, our waste reduction targets will continue to outperform the ENB goals.

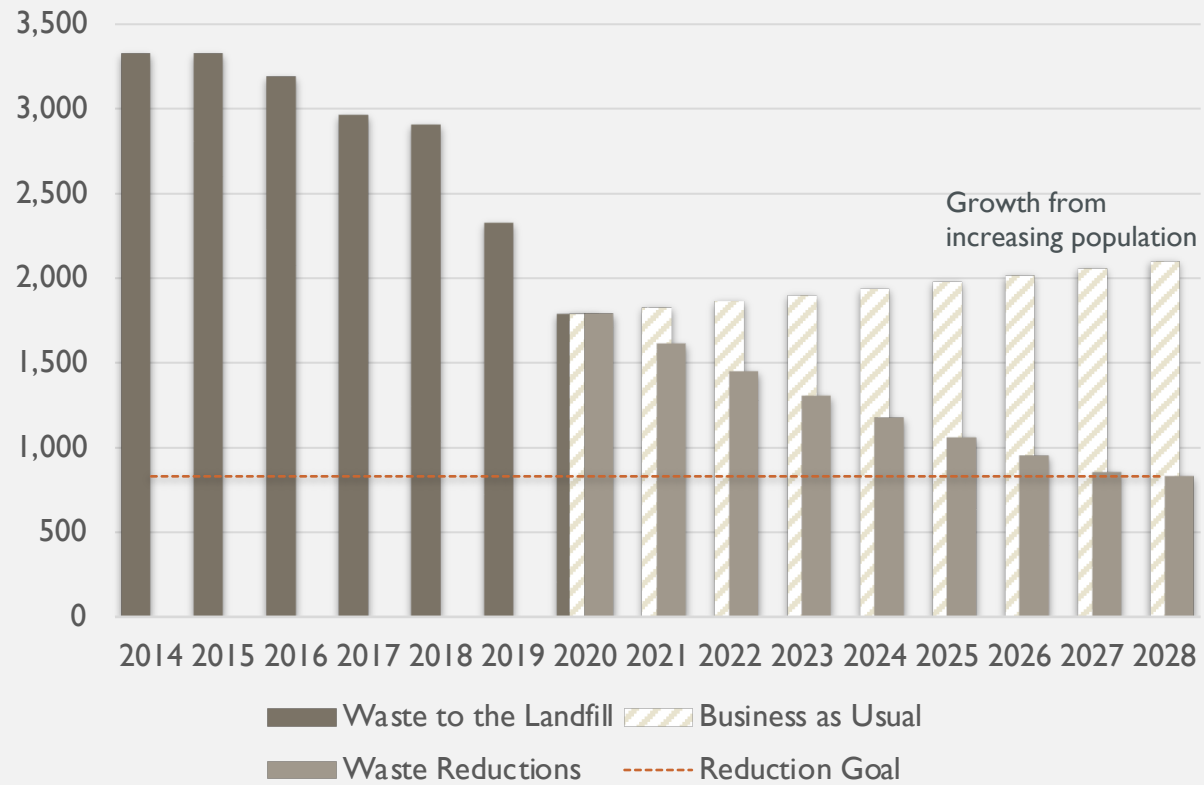
### Waste Per Capita Compared to HK Government Targets





# Waste to the Landfill

## Waste Reduction Target



## Waste Goal

By 2028 reduce waste to the landfill by 75% compared to the 2014 baseline year

## Strategies

- 1) Develop and implement an on-campus composting program for biodegradable materials
- 2) Institute strategies to eliminate disposables from campus restaurants and coffee shops
- 3) Institute new measures for monitoring and auditing waste streams for efficiency
- 4) Utilize the university's purchasing power to motivate vendors to reduce packaging materials
- 5) Establish a space for repairing, trading, and loaning materials to extend their lives and delay new purchases

## KPIs

Measurement and reporting of waste to landfill, food waste, avoidance, and recycling data.



## Waste to the Landfill

# Tactics and Approaches

### Disposables

1. Eliminate one-time use plastics and non-biodegradable disposables cannot be recycled; Increase separation and processing for materials that can be recycled or composted.
2. Reducing the need for these materials is the priority. Developing reusable container programs, lunchbox borrowing schemes, and financial disincentives are options.
3. Where disposables are compostable, develop a collection strategy for on-site processing.

### Extending Life of Materials

1. Avoid items that are designed to be used and replaced quickly, such as fast fashion and cheap electronics. Develop more “sharing economy” opportunities with more durable goods that can be used over a longer period of time.
2. Emphasize repairing and reuse, and support activities like “Repair Parities” where equipment can be brought back to life.
3. Institute an equipment and material sharing program among offices and departments.

### New Approaches

1. Develop new on-site composting systems to allow many other options for waste reduction. Emphasis should be on paper towels for mixing with food waste to produce high quality compost for use on campus.
2. Generate more opportunities to use smart technologies to help reduce food waste. Take advantage of SSC projects that use AI and image recognition algorithms to identify specific food choices that are more likely to be wasted. Expand use of RFID tags and sensors to streamline processes.





# Landscape and Biodiversity





## Landscape and Biodiversity

### Landscape Priorities

- Water conservation – particularly in irrigation – is one of the key areas of focus. Tactics include capturing rainwater, using drip irrigation techniques, and the use of mulch for water retention.
- Another priority is to add new ways to utilize the landscape for the learning and enrichment of our campus community. Tactics include increasing the amount of space for community gardens, orchards, and providing campus eco-tours.







## Landscape and Biodiversity

### Biodiversity Priorities

- A healthy and biodiverse campus starts from the ground up, literally. Tactics will be to improve soils by reducing chemical fertilizers and replacing them with natural amendments like compost and biochar.
- To better understand campus biodiversity, an effort will focus on developing an inventory of flora and fauna.
- Specific zones can be identified for special treatment as butterfly gardens or other diversity hotspots.







## Landscape and Biodiversity



### Landscape Goal

Utilize the campus landscape as an active resource for research, sustainability experimentation, and community engagement.

### Strategies

- 1) Focus on improving soil content through eco-friendly techniques such as the use of compost, biochar, and reduction of chemical fertilizers
- 2) Establish a metering system for measuring water used for irrigation and implement water efficiency measures to reduce consumption
- 3) Make more areas of the campus available for engagement and research from campus community
- 4) Create biodiversity zones on campus that can serve as ways to create inventories of bio-activity

### KPIs

Measurement and reporting of fertilizer use, compost created and used, irrigation water, and number of campus-related projects





## Landscape and Biodiversity

# Tactics and Approaches

### Healthy Soils

1. Allocate spaces on campus for utilizing “green” landscape wastes and storage of site-developed compost.
2. Prioritize the use of compost in flower beds as a way to provide natural nutrients a groundcover that can retain moisture.
3. Experiment with “compost tea” as a way to add natural nutrients to the turf and grassy areas.

### Water and Irrigation

1. Test different drip irrigation technologies to see which options are most robust and durable, and under what conditions.
2. Build a rainwater capture system for use in irrigation.
3. Test new water sources (e.g., waste water from washing machines) to see how well they can be utilized for irrigation.

### Engagement and Research

1. Expand the number of community garden plots on campus.
2. Collect flora and fauna information from SSC projects to build a public and visible inventory of the natural capital of the campus.
3. Add specific landscape areas and features in the campus tours for incoming students and visitors.
4. Make more spaces available for research on moods, behaviors, and ability to reduce stress levels.

# Community Well-Being



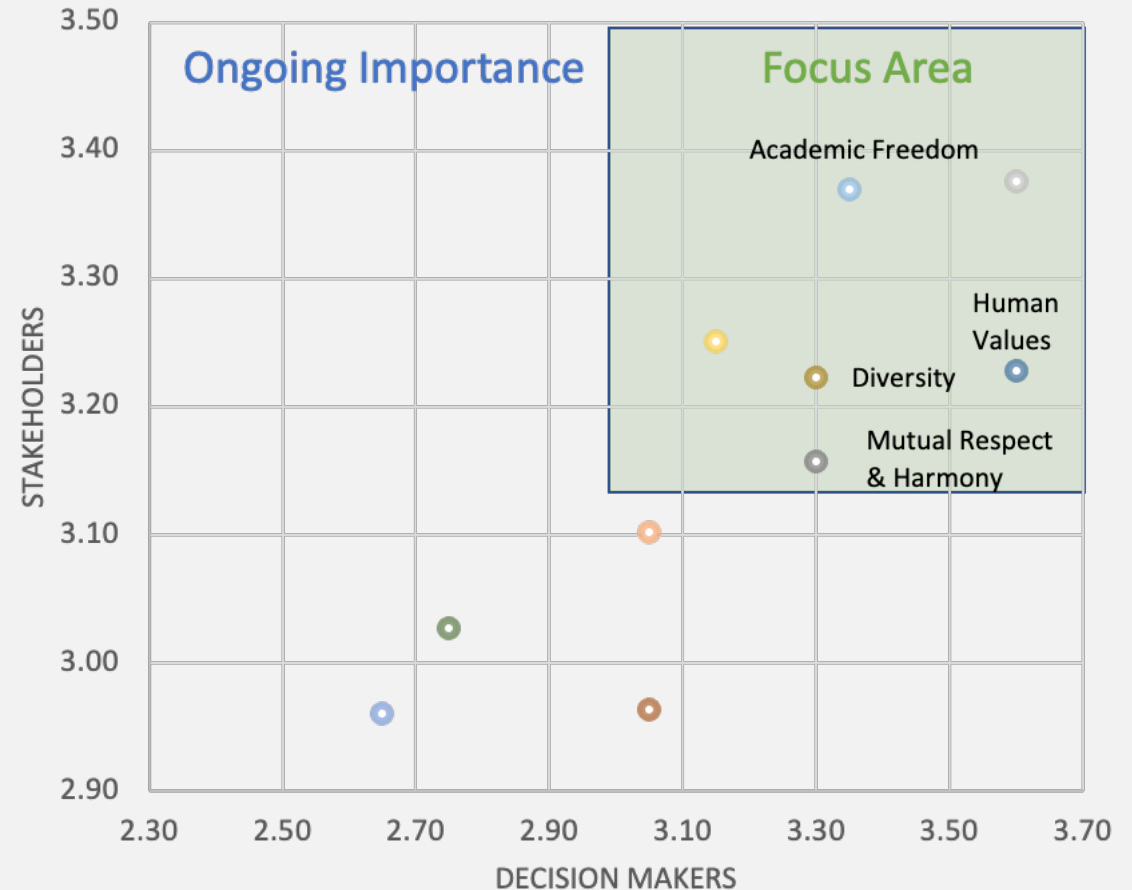


## Community Well-being

Building a vibrant community requires an effective support structure that emphasizes healthy lifestyles, facilitates positive work experiences, and empathy towards a good work-life balance.

From recent surveys, we recognize that key elements for recruiting and retaining talent – such as valuing diversity and creating an environment of respect and harmony – overlap well with creating a healthy and engaged campus community.

## Recruitment and Retention of Talent







## Community Well-being

### Continuous Improvement in food

- Healthy and environmentally-preferable food choices are key sustainability priorities for the campus because they represent the most direct connection to our campus community.
- In addition to meal choices, the actions of the campus caterers can contribute to our waste reduction goals, energy and water goals, and our ability to facilitate good social conditions for all our staff members (including contract staff).









## Community Well-Being



## Well-Being Goal

Establish a framework for measuring progress for the well-being of the campus community in relation to food, lifestyles, and workplace environments.

## Strategies

- 1) Develop a measurement and evaluation framework for assessing community well-being
- 2) Identify campus improvements focused on stress reduction and community happiness
- 3) Utilize Food Made Good Index as benchmark for continual improvement in canteens
- 4) Include well-being measures in new construction and renovation of spaces
- 5) Monitor air quality, lighting, and other comfort indicators for improving campus conditions for staff and students.

## KPIs

- 1) Measurement and reporting of number of betterment projects, staff and student surveys, and quantitative improvements in food and nutrition



## Community Well-Being

# Tactics and Approaches

### Healthy Food Choices

1. Develop a campus-wide mobile phone app for ordering that includes calorie counts, GHG footprint impacts, and purchasing data to help customers make more informed decisions.
2. Annually assess the items in the Food Made Good sustainable restaurant rating index to find new areas of opportunity for improvement.
3. Implement vegetarian food tasting events to drive interest in eco-friendly food choices

### Healthy Work/Live Balance

1. Develop a university-wide inventory of student-related surveys, well-being measures, and activities that can become a benchmark for evaluation and progress
2. Adopt flexible modes of working by devising policies to cater to different needs of our staff. Include evaluation of software or technologies necessary to support flexible work arrangements. Include evaluation of schedules and adapted work
3. Redesign of spaces and areas to encourage more healthy lifestyles

### Healthy and Productive Workplaces

1. Monitor air quality indoors and outdoors and make the readings available and transparent
2. Establish renovation standards to provide more natural lighting for staff work areas and increase comfort levels relating to temperature and humidity
3. Develop a set of indicators that can be used to benchmark happiness and well-being for faculty and staff