Research & Innovation

Integrating Solar Power and Fire Protection for Sustainable Buildings

Fire safety and energy efficiency are critical concerns in modern high-rise buildings, as combustible external wall insulation has caused tragic incidents in cities such as London, Shanghai, and Tianjin. The Department of Building Environment and Energy Engineering has thus created the Fireproof Solar PV Vacuum-Glazing (FSVG) wall panel to address these challenges by combining non-combustible construction with superior thermal insulation, soundproofing, and integrated solar power generation.

Designed as a multifunctional external wall solution, the FSVG panel reduces building cooling loads by 57%, generates 170 kWh/m² of electricity annually, and mitigates fire risks, replacing traditional curtain walls while contributing to sustainable energy use. This innovative material is particularly suitable for colder climates where external insulation is essential, providing energy efficiency without posing any fire hazard.

The invention has been recognised with the **Gold Medal at the 49th International Exhibition of Inventions Geneva** for its contribution to safer, low-carbon building design. By integrating energy generation and fireproofing, this solution advances sustainable infrastructure and building technology while promoting Affordable and Clean Energy (SDG7) and supporting Climate Action (SDG13).

Optimising Sustainable Development with GeoAI Models

The Research Centre for Artificial Intelligence in Geomatics (RCAIG), a cross-disciplinary hub that aims to develop original AI-driven technologies in geomatics, was established to provide innovative solutions to pressing environmental and societal challenges while positioning itself as a global research and development leader in GeoAI. By leveraging the potential of the Jockey Club STEM Lab of Earth Observations, RCAIG fosters interdisciplinary collaboration, knowledge transfer, and talent development to support Hong Kong, the Greater Bay Area, and beyond.

RCAIG focuses on advancing sustainable urban development by exploring human–environment interactions, applying geospatial analytics and big data, and creating Earth observation-based urban data services, while GeoAI plays a crucial role in enhancing urban resilience, improving public health and strengthening urban safety and security by transforming building monitoring with thousands of learnable parameters. This allows for the detection of disaster-damaged buildings, identification of structural changes, estimation of energy consumption, and rapid response to environmental threats such as extreme heatwaves, poor air quality, or natural disasters.

RCAIG has also developed an impervious surface area-based urban cellular automata model that uses satellite imagery to simulate the impact of changes in urban development. By characterising historical urban growth at different levels and pathways, this model captures the dynamics of urban sprawl with greater detail than traditional binary approaches, generating insights that support long-term conservation, land management, and sustainable planning at both regional and global scales.

Teaching & Learning

Developing Cultural Appreciation through Experiential Learning

To deepen appreciation of Chinese cultural heritage and promote its preservation, the Department of Chinese History and Culture has launched a range of initiatives aimed at nurturing students' cultural awareness. Since the 2022/23 academic year, the department has offered a selection of Chinese history and culture courses such as "Discovering Chinese History in Hong Kong" as part of the graduation requirements for undergraduate students. These courses enable students to explore the unique cultural fabric of the city through field studies and visits to historical sites, enabling them to connect national heritage with local narratives and broaden their perspective on the evolution of Chinese culture in a modern urban context.

Furthermore, a workshop was organised to introduce Hakka unicorn dance, an intangible cultural heritage with over 200 years of history in Hong Kong, through virtual reality. By blending historical rituals with digital innovation, the workshop demonstrated how modern tools can inspire the next generation to help preserve and promote traditional customs to wider audiences.

External Engagement

Building Age-Inclusive Communities through Innovation in the Greater Bay Area

The Social Innovation Regional Forum was hosted by the PolyU Jockey Club Design Institute for Social Innovation (DISI) to promote age-inclusive communities through social and technological innovation across the Greater Bay Area. With the theme "Social and Technology Innovation to Shape Community Integration for All Ages", the Forum featured four thematic sessions and a main forum, attracting **around 890 in-person and over 53,000 online viewers**.

For the first thematic session, DISI participated in the China Charity Fair in Shenzhen and showcased case studies through the "participatory design" approach, inspiring educators and social workers to promote age-inclusivity through community engagement. Meanwhile, the second session, "All Age Inclusive: Exploration Trip to Redefine Ages", invited participants on a guided exploration of child-friendly urban spaces in Shenzhen that combined innovative service models and design approaches for intergenerational needs.

The third session, "Sparkling Insights: Age-Inclusive Ideas Exchange in Hong Kong/Shenzhen", fostered dialogue between Hong Kong and Shenzhen professionals through presentations and roundtable discussions focused on planning communities that are inclusive for both the young and elderly. Finally, the fourth session, "Making Changes: Social Impact Jamming on Stage", celebrated youth-led innovation. It highlighted environmental, social and governance (ESG) principles and SDG-oriented projects, offering a platform for start-ups and young innovators to present impactful solutions, including assistive technologies and age-inclusive spatial designs.

The main forum, "Tech for Social: Community Integration for All Ages in the Greater Bay Area", convened experts from Hong Kong and Shenzhen to share actionable insights and strategies on inclusive urban development, from housing policy and sustainable transportation design to intergenerational public spaces and smart mobility solutions. Overall, cross-border dialogue was fostered and new partnerships catalysed to co-create a more inclusive future for the Greater Bay Area.

Sparking Creative Solutions for Future Public Housing

The Research Institute for Land and Space co-organised the HKBIM Future Public Housing Design Competition to inspire innovative interdisciplinary solutions for affordable housing in Hong Kong. **Over 250 secondary school students and around 80 public participants** used the HKBIM software platform, developed by PolyU's Smart Construction Laboratory, to design sustainable, practical housing proposals.

At the opening ceremony, participants were introduced to the HKBIM platform, which, as a building information modelling tool, enables 3D digital representations that support project management, construction efficiency, stakeholder engagement, and risk control, capabilities that are especially valuable in addressing the complex planning and land-use challenges associated with public housing development.

The Competition encouraged the young participants and professional designers to apply their knowledge of science, technology, engineering, the arts, and mathematics in their next-generation design proposals, promoting cross-disciplinary collaboration and creativity. It also aligned with the pushes of the Government of the HKSAR to accelerate housing supply, including transitional and modular housing, amidst growing demand and lengthy waiting times. In order to create an impact on public housing planning and development, the winning affordable homes designs may be applied to real-world public housing projects in the future, offering fresh perspectives on improving and reshaping the living environments in Hong Kong.

Governance & Operations

Enhancing Campus Environment with Clean Air

Demonstrating its ongoing commitment to health and environmental standards, PolyU received the **"10 Highest Participation Award"** from the Environmental Protection Department of the Government of the HKSAR for achieving one of the largest certified floor areas in the **Indoor Air Quality (IAQ) Certification Scheme**. All PolyU buildings have been awarded the **"Good Class" IAQ Certificate**, with the PolyU Library attaining the prestigious **"Excellent Class"** status. These achievements not only contribute to campus well-being but also support wider sustainability and health goals in institutional planning and facilities management.

Prioritising Low-Carbon Commuting

To help de-carbonise campus operations and promote sustainable transportation, the University has now equipped over ten on-campus parking spaces with semi-fast AC chargers and around 50 others with 13A socket EV chargers. These facilities are available free of charge for PolyU staff and students with valid parking permits, who can conveniently check charger availability via an online platform.

At the same time, pedestrians are given priority access at the podium level of the campus, reinforcing a safe and environmentally conscious environment for all. To further support low-carbon commuting, a network of walkways and bridges has been constructed, including direct links between Block Z and the main campus. This integrated design significantly enhances connectivity and mobility, making it easier and more pleasant for users to navigate the campus on foot, of which sustainable urban planning ensures that daily campus movement aligns with long-term environmental goals.