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- Founder of Clean Tuesday Hong Kong, Charles d'Haussy: Clean Tuesday worldwide, and Latest in low-power LED lighting solutions

- GreenTech Outpost HK's CEO Steve Wong: Vertical Axis Wind Turbine Power Generation from Macau's Roof Tops

**- Macao's University of St Joseph Professor of Intelligent Systems and Technology, Richard Whitfield: University's new Green Campus**

6 Sep 2011

# USJ's Green Campus

Reporting on the environmental initiatives being undertaken for the University of Saint Joseph's new campus at Ilha Verde in Macau

Richard Whitfield PhD
Professor
School of Intelligent Systems and Technology

Presentation for
6 Sep 2011 Clean Tuesday Macao

# University of Saint Joseph

- Small university, affiliated with Catholic Church
- All degrees jointly awarded by the Catholic University of Portugal
- Mostly international staff, many visiting professors
- High quality courses, learning and teaching
- Opened as a graduate school, recently expanded to undergraduate
- Offers courses in Business, Design, Education, Government History, IT, Psychology, Social Work, Religion

# Project summary

- **Site Area** 12,622 $m^2$
- **GFA** 38,214 $m^2$
- **Coverage** 42%
- **Plot Ratio** 2.76

- **Accommodation** 60m
  - General purpose 3 flrs
  - Student dorm rooms 146
  - Staff apartments 16

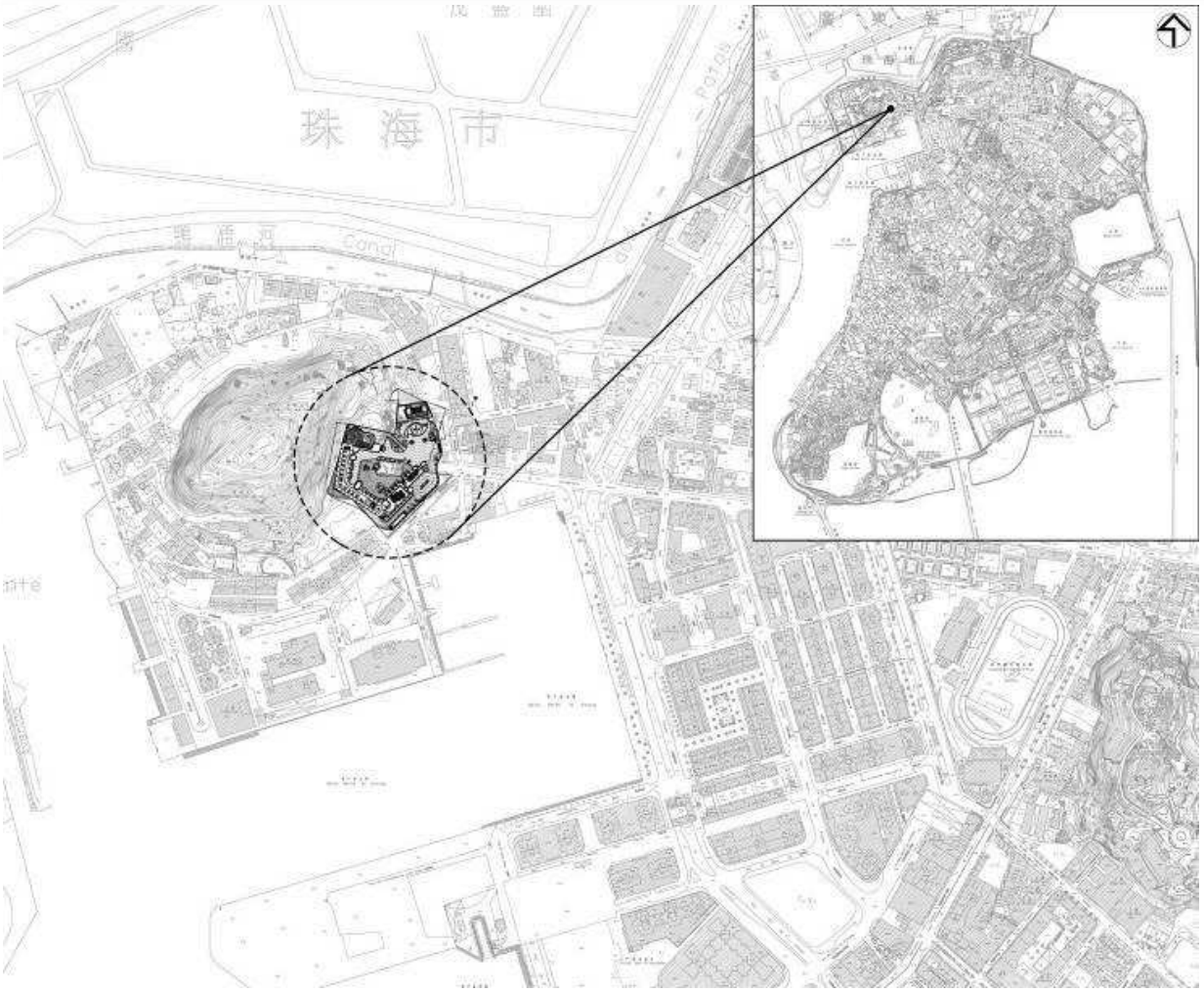
- **Academic** 27m
  - 96 seat lecture rooms 3
  - 40 seat classrooms 35
  - 20 seat classrooms 24
  - 10 seat study rooms 11
  - library
  - underground sports facilities
  - 540 seat theatre
  - 240 seat canteen

**Total Expenditure US$40-50 million**
**2010 – 2012 construction period**
**Maximum practical "green" features**

# Project team

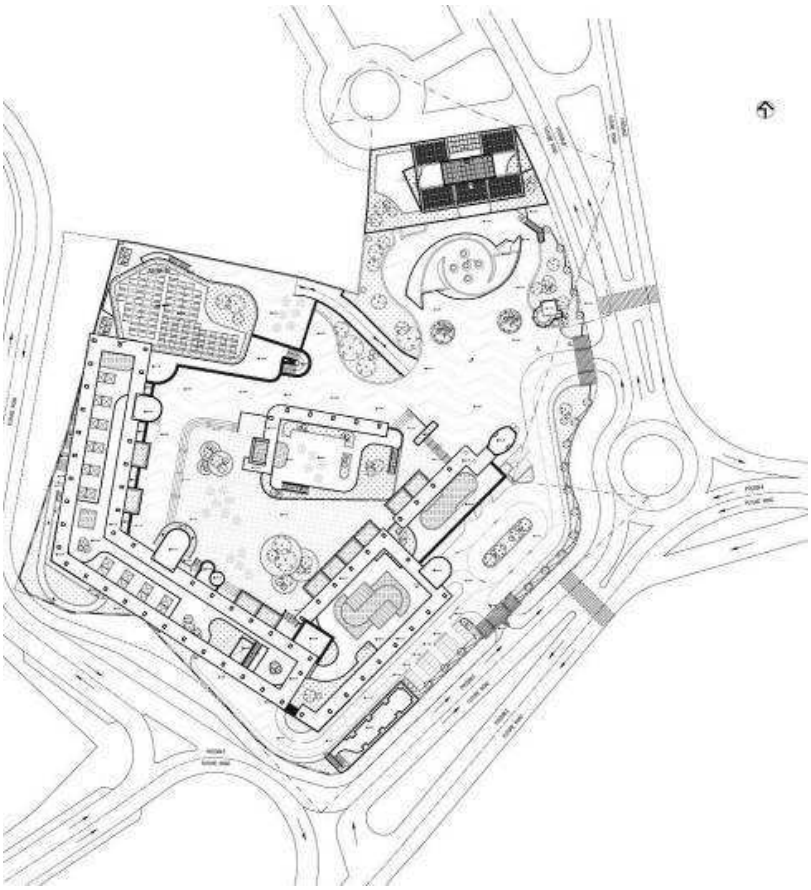
- **Client/Owner**
  USJ/ Diocese de Macau
- **Concept Design**
  Prof. K. Yagi (TIT+DS) / MPS
- **Architecture**
  MPS, Macau Professional Services
- **Quantity Surveyor**
  Widnell, Ltd.
- **Project Management**
  MPS
- **Civil and Structural Engineer**
  MPS
- **MEP Engineer**
  MPS

# Campus Location



# General plan

- Minimized direct sunlight into interiors
- Shaded central open space
- Rooftop gardens and water features to minimize building heat absorption
- Wall ledges and greenery to block direct sunlight
- Narrow buildings with light deflection louvers to maximize daylighting
- Through building cavities to maximize wind cross-flows
- Underground water storage cistern



# Maximized garden areas

- Extensive underground facilities
  - •Swimming pool
  - •Basketball court
  - •Gymnasium
  - •Aerobics/dance rooms
  - •Music practice rooms
  - •Car parking
- Surface and rooftop parklands
  - •Outdoor dining/recreation plaza
  - •Academic building rooftop gardens
  - •Accommodation building podium, mid-level and rooftop gardens

# Underground water storage

- All rainwater collected and stored in underground cistern
  - Natural aquifer used for back-up storage
- Water pumped to rooftop water features
- Gravity distribution to drip irrigated rooftop gardens and building ledge gardens
- Analysis shows annual rainfall covers annual consumption
- On campus photovoltaic electricity generation provides all pumping power

- Financial savings not large, but is a powerful positioning statement

# Reduced electricity consumption

- Solar (thermal) hot water heating for whole campus
- Underground heat exchanger for air-conditioning (swimming pool heating/cooling)
- Thermal chimneys for improved campus airflows
- Shade ledges and light pipes for maximum natural lighting with minimal thermal penetration
- Central plaza water feature for natural air-conditioning
- On campus photovoltaic electricity generation provides general lighting (and pumping)
- All lighting is CFD or LED
- Extensive use of task lighting

# Telecommunications

- All wireless campus
- All students MUST have laptops
  - Problem of electricity in classroms
- VOIP telephone system
- Computer + multimedia project + speakers in classrooms (nothing else)
- Extensive online, Internet accessible learning resources
  - Ebook focused library
  - Virtual learning environment
  - “Paperless” electronic distribution/collection of all written materials

# Goals

**HK BEAM “gold” Standard**
**< 50% traditional building energy consumption**
**< 20% traditional building water consumption**

# Major difficulties faced

- Unable to buy/sell electricity to grid – rules out a lot of cost-effective on-site electricity generation options
- No local technical capability to evaluate underground aquifer
- Minimal local capability for non-traditional air-conditioning, eg in slab cooling and underground heat sinks
- Minimal local capability for daylight piping and thermal chimneys

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# Thank you

# and

# enjoy the rest of the night!

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