International Institute of Peace and Sustainable Development:

A Microgrid Case Study

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Microgrid 2.0
Advancing Industry Growth
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Jennings Strouss
LAW FIRM

Introduction to IIPSD

- International Institute of Peace and Sustainable Development ("IIPSD")
  - Location(s) – Malaysia first, Costa Rica second, other locations to follow. Malaysia location just outside Kuala Lumpur in Melawati.
  - Mission – to build an institute that is a leader in the region for training in peace and sustainable development using project-based learning.
  - Scope – 386,000 square feet (Phase 1) on 10 acres, 10MW of load, 700 students initially, growing to 4,400 students within 5 years, carbon negative.
  - Attributes – Green building (will exceed LEED platinum), 100% renewable energy (including solar PV and battery storage), aggressive water and waste reclamation and reuse (or conversion), integrated wireless mesh microgrid.
  - Living Lesson – the curriculum of the university and the environmental attributes of the physical plant will intertwine, thus allowing the campus itself to be a key component of the coursework.
  - Fully-functioning microgrid – all energy, water, heat, cooling, and other environmental measures will be centrally controlled, managed and optimized.
  - Link to video -- https://www.dropbox.com/s/fao7ofm09y3lwh9/Project%20Study%20and%20Business%20Case%2008.02.2016.pdf?dl=0

IIPSD – Sustainable Attributes

- Energy conservation measures
- Renewable energy
- Water reclamation and reuse
- Waste reduction and conversion
- Passive lighting and daylighting
- Re-used materials
- Use of lightweight modular structures and stilt architecture to avoid excavation and slope cutting and maintain natural landform
- Design avoids most sun and heat penetration and allows free naturally ventilated spaces. Adjustable shading and ventilation.
- Carbon-negative
- All managed and optimized through integrated wireless mesh microgrid

IIPSD as Microgrid (cont'd)

- All energy generation, energy conservation, lighting, heating, cooling, water, waste and environmental attributes will be managed by a cloud-based, wireless networked web providing nodal pushed information to facility managers allowing them to control all of these attributes to maximize sustainability and maintain carbon negativity.

INTERNATIONAL INSTITUTE OF PEACE AND SUSTAINABLE DEVELOPMENT

Education with Purpose

Why a Microgrid?

- Control – Microgrid best way to meet mission of institute
  - Grid/resiliency
    - Microgrid controls 100% of energy needs; grid connection as backup
  - Cost Saving and cost management
    - Microgrid as tool to manage use and cost
  - Sustainability – 100% renewable energy and carbon negative

IIPSD as Microgrid

- Project development – PRiSM (project-integrating sustainable methods – a principles-based sustainable project management methodology incorporating a value maximization model focusing on total asset lifecycle).
- Project management – asset managed like an ESCO
- SMARTweb® – developer-based energy management software platform for energy reporting, analytics and carbon management. Dashboard M&V tool (ISO 9001).
- Comverge – Provider of integrated cloud-based demand response, energy efficiency and customer engagement solutions that enable electric utilities or other users to ensure grid reliability, lower energy costs, and enhance the customer experience. Combination of software, hardware and services, helps users optimize every aspect of a demand management program, from participant recruitment and device installation to call center support, control events and measurement and verification.

SMARTweb

- Cloud-based software solution that provides comprehensive monitoring, control, and automation functionality.
- Strategic assessment and reporting, plus improvement recommendations for energy, heating, cooling, water, waste, maintenance, usage, etc.
- Multi-dimensional asset management and control from a holistic sustainability perspective

SMARTweb – Inputs

Input data from meters and/or nodes covering all sustainability areas

- Energy management
- Water management
- Waste management (including production, usage, reduction, collection, landfilling, recycling, reuse, and/or conversion to energy or fuels)
- Transport management
- Workplace behavior (usage, maintenance, etc.)
- Shading and ventilation
- Measurement, verification and billing data
- Occupancy changes
- Integrated with external data, such as weather, competitors' usage and more, all with a goal of reducing consumption and GHG emissions and increasing sustainability, health, and well-being.

SMARTweb – Outputs

Outputs

- Detailed recommendations and strategies for management for cost savings, energy savings, environmental impact improvement.
- Detailed reports across multiple levels (vertical and horizontal) using information from hundreds of nodes covering all electric, gas, water, waste, transport sources and sinks.
- Usage data from all devices (from solar panels to printers) can be measured against other users.
- Only known consolidated reporting framework across all sustainability categories.
- Closest adherent to UN sustainability initiatives
- GHG analysis consolidated across all components of building or portfolio
- Dashboard and controls with two-way connectivity for ease of management, control, and optimization (automated or manually).

IIPSD – Design, Development and Construction

- Design
  - Location – Melawati, Malaysia (15 minutes from KL)
  - Campus – design employs sustainability measures to tie into curriculum
  - Architectural design – focus on blending in with landscape and nature, sustainability, carbon negativity
  - Focus on pairing curriculum with practice
- Project Development
  - Linked to finance requirements
- Phased Construction
  - Phase 1 – retrofit of existing closed university
  - Phase 2 – expansion to more fully use landscape and microgrid
  - Guaranteed Maximum Price EPC to support financing

IIPSD.mp4

IIPSD – Financing

- Innovative finance platform developed by developers' counsel and bankers
  - Not traditional project finance
  - Why not? Unique challenges of revenue stream primarily derived from future tuition (as opposed to a firm single source, like a PPA).
  - Borrower affiliate formed to operate microgrid via an Energy Services Agreement (like an ESCO) – fixed fee services agreement
  - Credit-based financing provides 100% debt (no equity!)
  - Credit support from unique financial performance guarantee ("Surety Bond") to cover all risks of loan repayment.
  - Surety Bond acts as all-risks insurance policy guaranteeing repayment of debt regardless of matriculation numbers or project revenues.
  - Covers 100% of loan principal through term of loan.

A few legal issues…

- Finance structures rely on contracts to manage risk during construction and operation.
- Ultimate objective is to maximize non-recourse debt while providing adequate equity to protect debt providers.
- Must mitigate risk and optimize returns through contracts to show clear path to repayment through project revenues.
- Systematic approach required to achieve successful financial closing.
- Must assess market risk, supply risk, technology risk, operational performance risk, etc.

Legal Issues continued

EPC

- Fixed price (guaranteed maximum price), date certain completion, turnkey EPC contract with liquidated damages for delay.
  - EPC contractor must design, procure, construct, commission and start up facility to ensure facility meets performance specifications.
- Completion bond, performance bond or guarantee from rated or otherwise creditworthy surety.
- Insurance/warranties on parts, availability and general failure relating to technology.

Legal Issues (continued)

- Many of the project finance issues one might expect to see in an energy project are not present here. There is not traditional feedstock supply agreement or offtake agreement.
- The IIPSD is managed through an energy services agreement (like an ESCO contract) where a fixed price is contracted for a certain scope of services (PPA + O&M services together).
- The key to financing this project (and the key legal due diligence item) is insurance, primarily the Surety Bond.
- Surety Bond an all-purpose guarantee of debt service repayment – covers all risks in project.

Energy Services Agreement

- The Energy Services Agreement for the IIPSD governs all energy supply, energy conservation, energy management and management of the microgrid. This diverse scope of services made it clear that a PPA would not be sufficient. The main differences are these:
  - Fixed pricing for term of agreement
  - Power supply plus operation and maintenance services
  - Similar to ESCO agreement where energy services company provides customer with multiple services.

ENERGY SERVICES AGREEMENT

This Energy Services Agreement ("ESA") is made and entered into as of this ___ day of _____, 2014 between Company X, a XXX Corporation ("Provider") located at _____ and Company Y ("Customer"), a YYY located at _____ ("Customer"; and, together with Provider, each, a "Party" and together, the "Parties").

WITNESSETH:

WHEREAS, Customer owns or leases, directly or indirectly, the Premises (as hereafter defined);

WHEREAS, Provider is in the business of achieving energy cost reductions through a combination of services, software, building systems improvements and other energy efficiency and renewable energy products that reduce net energy cost and consumption in buildings (collectively, as further defined herein, the "EE System");

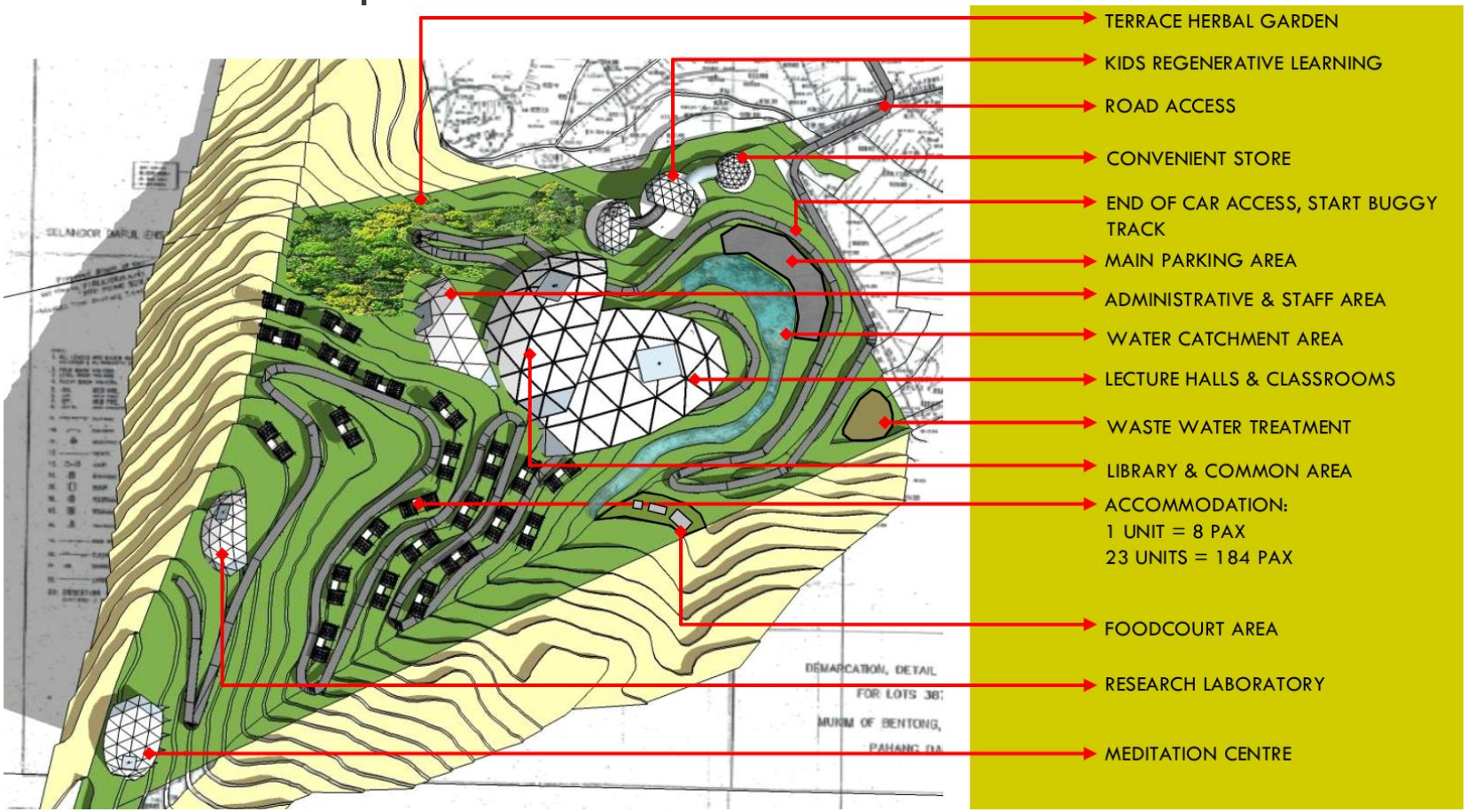
WHEREAS, Customer desires that Provider implement certain energy measures (as further defined herein, the "EMs") and provide energy efficiency, renewable energy, operation management services and other related services (as further defined herein, the "EE Services"), and Provider is willing to accept the EMs and the EE Services at its Premises;

Surety Bond

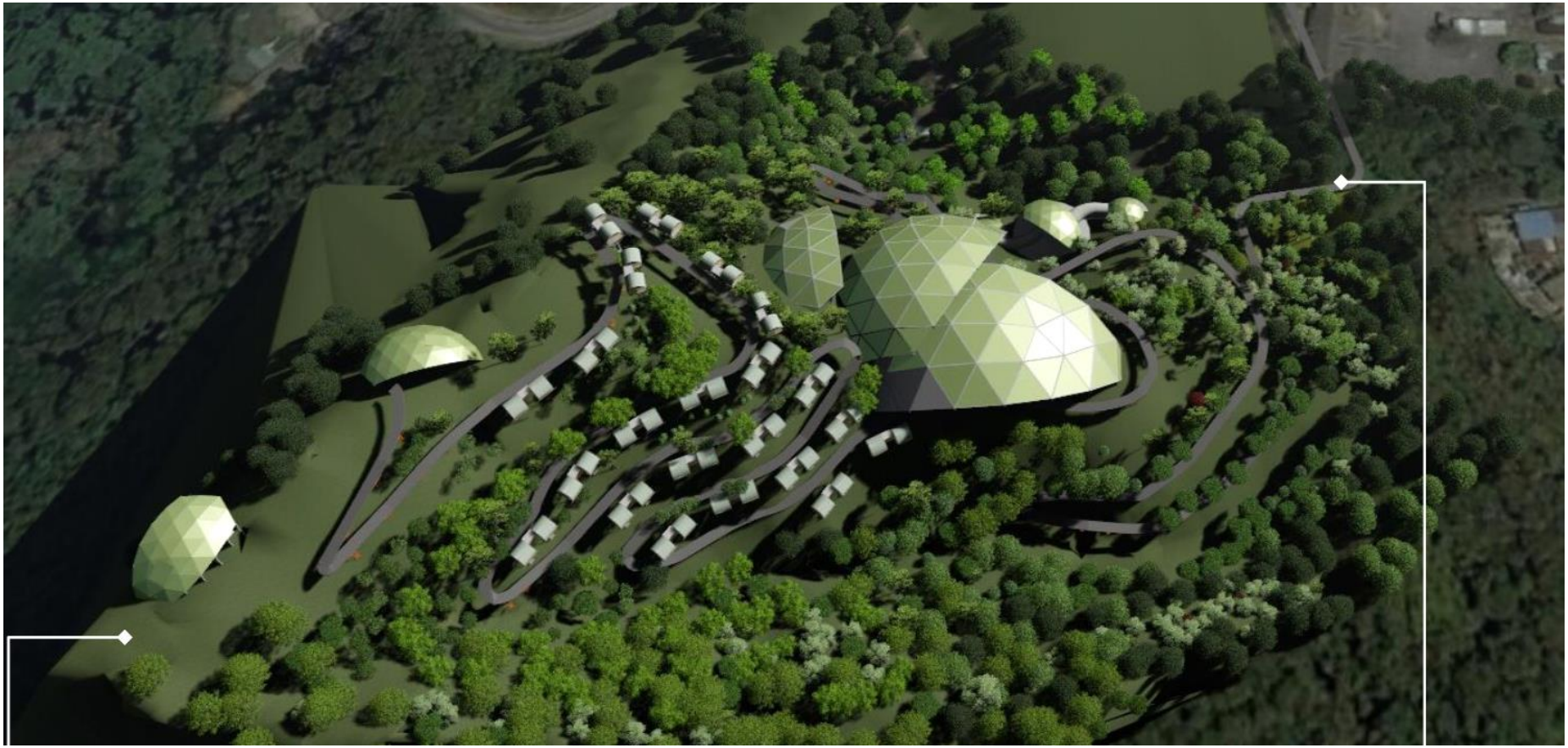
- A financial performance guarantee
- All-risks insurance policy
- Guarantees debt service payment for term of bond (7 years – 2 years of construction plus 5 years of operations.
- Bond is 100% cash-backed, and reinsured by Lloyds.
- Allows project to obtain investment-grade credit rating
- Covers Phase 1 of project only, but option to renew for Phase 2 financing.

IIPSD Campus Site Plan

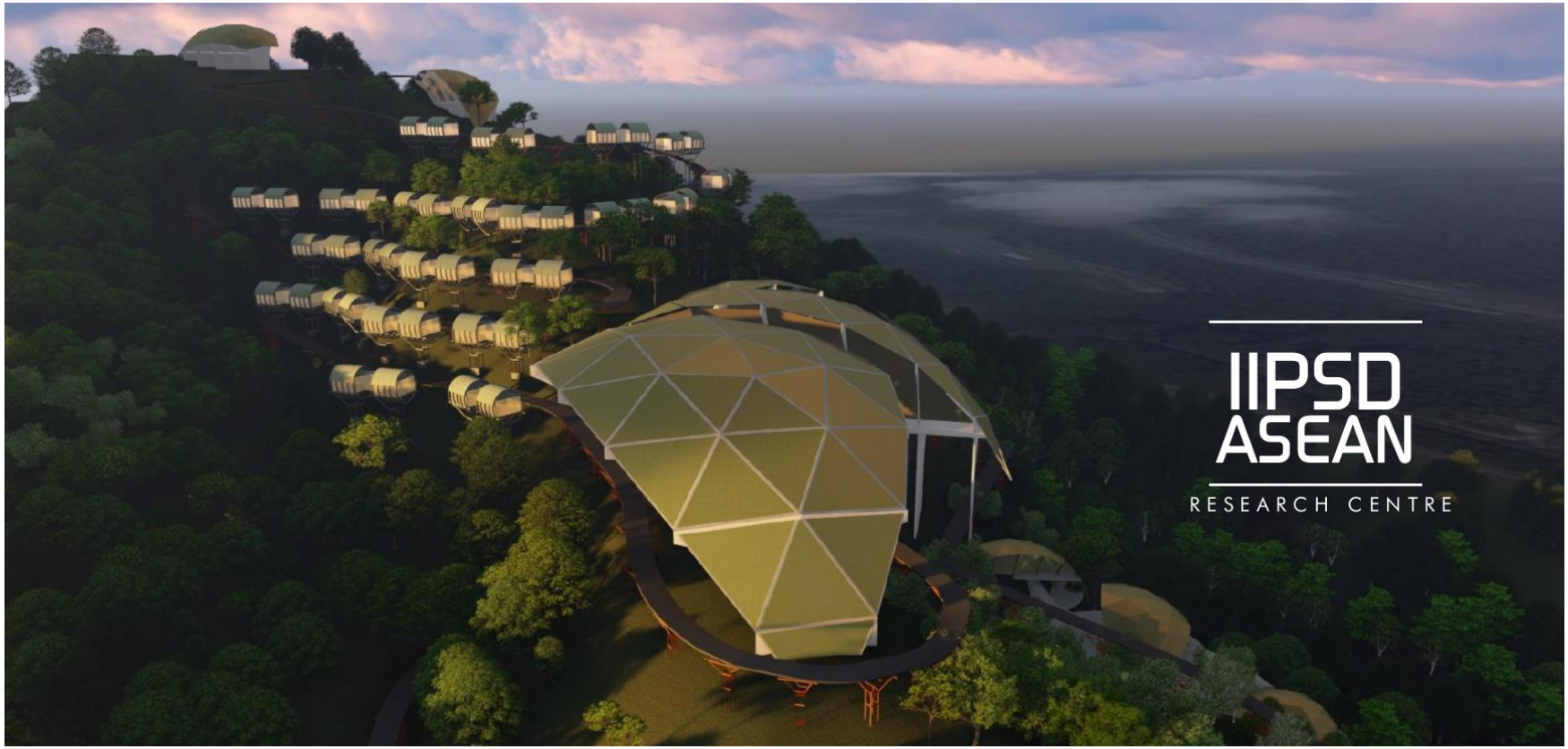
- IIPSD Campus



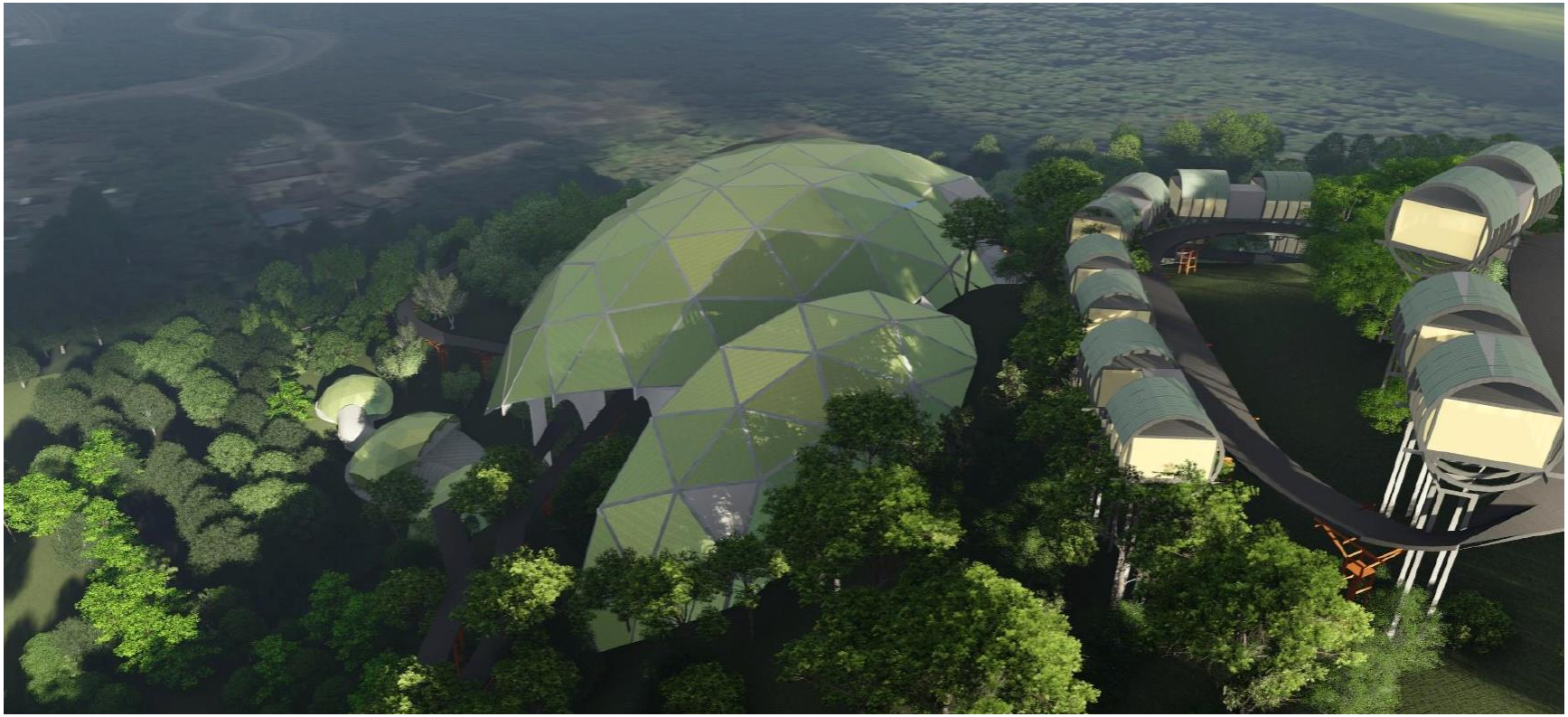
IIPSD Campus



IIPSD Campus

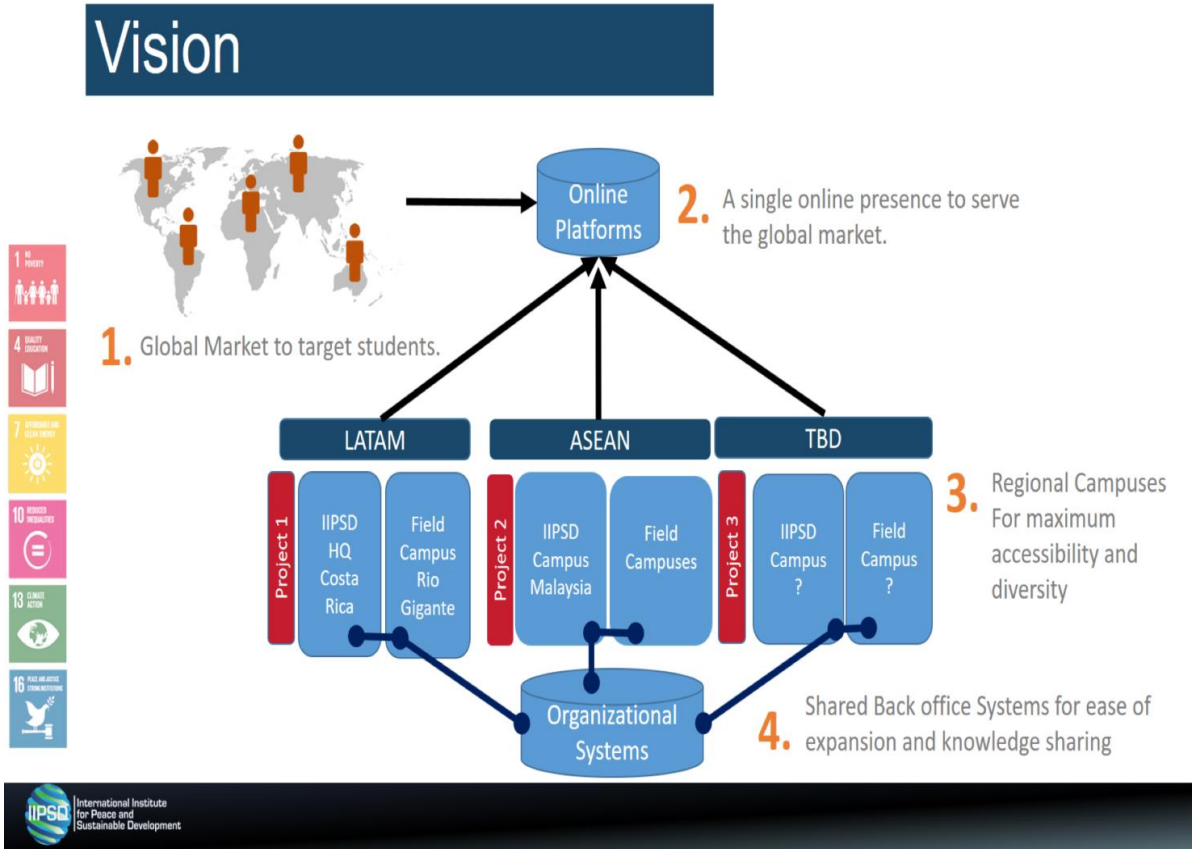


IIPSD Campus



IIPSD Vision

- IIPSD Vision – global market, regional campuses



Contact Details

- Thank you!

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