National University of Singapore

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on behalf of

Professor Shih Choon Fong, President of NUS

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University Vision
“Towards a Global Knowledge Enterprise”

• NUS will be
  – a globally-oriented university, in distinguished league of leading public universities in the world.
  – a key node in global network of knowledge communities at forefront of ideas.
  – a dynamic community, imbued with a “no walls” culture and a spirit of enterprise, which promotes
    • free flow of ideas &
    • builds synergies among processes of creating, imparting & exploiting knowledge.
NUS

- Founded in 1905
- Corporatized University as of April 2006
- University ranking (London Times Higher Education Supplement)
  - World: Top 20
  - Asia: Top 3
- Current capabilities
  - 23,469 Undergraduate students (12.3 / 1)
  - 9,075 Graduate students (4.7 / 1)
  - 1,913 Tenure-track Faculty & 1347 Research Staff
  - 14 Faculty academic units from medicine to architecture to engineering to music
FACULTIES / SCHOOLS

School of Business
- Banking Law
- Public International Law
- Law of Torts
- Intellectual Property Law
- Woodwinds
- Brass
- Percussion
- Strings
- Piano
- Orchestra Instruments
- Composition

Yong Siew Toh Conservatory of Music

Faculty of Law
- Transnational Communities and Globalizing Cities
- Religion, Music, and Constructions of ‘Nation’ and ‘Identity’ through Places and Landscapes
- Urban Planning and Public Housing Policy
- Emerging Consumer Society in Asia
- Personnel Selection, Research Methods and Data Analysis
- Adaptations to Changes at Work

School of Design & Environment
- Design Computing
- History Theory and Criticism
- Urban Studies
- Design Technologies
- Total Building Performance
- Construction Management and Economics
- Corporate & Securitised Real Estate
- Institutional and Spatial Analyses of Real Estate
- Housing Research

Faculty of Arts & Social Sciences
- Economic Globalisation and Transnational Corporations
- Asian Firms in the Global Economy
- Chinese Business Firms and Their Global Networks
- Gender and Migration
- Historical and Heritage Studies on the Urban Landscape

Areas of Excellence in the HUMANITIES
- Interior Point Optimization Methods

HUMANITIES: Faculty of Arts & Social Sciences; Faculty of Law; School of Business; School of Design & Environment; University Scholars Programme
STRATEGIC RESEARCH OBJECTIVES

- Identify Areas of Strategic Importance
- Grant Seed Funding
- Matching Grant Scheme
- Establish International Research Networks
- Spin-Off
- Facilitate Commercialisation of Research Outcomes
- Promote Multi-Disciplinary Research Programmes
- Review within NUS and relative to peer universities
- Promote NUS-Industry Exchange
- Attract & Retain Talent
- Increase Participation in International Conferences
- Establish International Research Networks
- Publicise Achievements

- High-Impact Research
  - Build solid base of research which is internationally competitive across broad range of disciplines
  - Establish Research Centres of Excellence & Build Peaks of International Research Excellence in selected areas
- Growing the Pie
- Strong Global Profile
- Research Benchmarking
- Match of Grant Scheme
- Research Spin-Off
- Recognition & Reward of Research Excellence
- IP Protection
- Prestigious Research Awards
- Publicise Achievements
NUS Environmental Research Institute - NERI

- A University-level Institute reporting to Office of President

  - NERI Mission: *Establish a sustainable research enterprise in “Environment, Health & Energy” at NUS*

  - NERI Focus Areas
    - Air, land and water systems
    - Human & environmental health
    - Energy systems

  - NERI activities
    - Expand, Enhance, Coordinate, Integrate & Facilitate research & education initiatives across campus in foci areas
    - Recruit eminent scholars, faculty, fellows, graduate students to expand capabilities
    - Pursue Excellence in cutting-edge research in high-impact areas from basic to applied areas, building for long-term excellence across the university
NERI – An Institute on a Comprehensive University Campus

University Town @ Warren

Coming: Green Campus at University Town @ Warren

NERI
- Computing
- Medicine
- Sciences
- Policy
- UnivHospital
- Engineering
- Design & Environment
- BIZ

Sciences
NERI Research Drivers

• Safe Waters for People & Countries
  – Potable water
  – Contaminant control/minimization
  – Pathogen control
  – Persistent organics
  – Hydraulic structures
  – Technology systems
    • membrane systems, sensors systems, bioprocess systems, natural-system wetlands …
  – Catchment protection
  – Runoff management
  – Sediment quality
  – Marina Bay and Singapore H₂O taps

• Energy Systems
  – Water-Land-Energy connectivity
  – Efficient machinery and industrial systems
  – Solar energy capture
  – Fuel cells – chemical, microbial
  – Wind
  – Biofuels
  – Hydrogen storage
  – Green Campus & Dorms

• Climate Change
  – Sea-level rise and mitigation
  – CO₂ & GHG control strategies
  – Alternative energy sources
  – CO₂ controls for mobile, point, areal, & residential sources
  – Acidification of oceans
  – Carbon sinks in ocean systems
  – Industrial production changes – success in a global Carbon-footprint marketplace

• Atmospheric particles - Aerosols
  – Human-health effects
  – Characterization as to source
  – Toxicology of particle surfaces
  – Atmospheric chemistry & physics
  – Particle exchange in lungs
  – Particle chemistry
  – Biogenic particulates (China, Indonesia …)
NERI Director

NERI Faculty
NUS Faculty, Research Institutes, & Global-Partner Universities

[Research Clusters]_i & [Thrust Areas]_ij

NERI Research-area, Faculty-driven Institute
Providing Global focus to Singapore Research and Education

Research Council

Administration & Support
[Research Clusters]\_i Approach

- **Cross-disciplinary Research Areas**
  - Research areas driven by pursuit of excellence and directed to
    - NUS *niche* areas & capabilities
    - Singapore needs and sponsored R&D opportunities
  - Faculty-developed and faculty-managed units with focus on
    - enhancing research,
    - identification of “gaps” and infrastructure needs,
    - enhancing development of long-term base for continued research success in Singapore, regional and international marketplace
  - [Thrust Areas]\_ij
    - Subsets of a Cluster - allows for enhanced collaboration in a targeted area within an integrated cluster
Research Cluster
Human & Environmental Health

• Thrust Areas
  – Monitoring systems
  – Biomarkers
  – Toxicity of environmental agents
  – Chemo-intervention
  – Disease assessments

• Faculty > 25 in:
  – School of Medicine
  – Faculty of Engineering
  – Faculty of Science
  – Life Sciences
  – National University Hospital
Singapore-Delft Water Alliance

- SDWA – Started in April 2007 with $65 million over 5yr
  - Partners in Research, Education & Support
    - EWI - National Research Foundation (NRF)
    - Delft Hydraulics - DH
    - Public Utility Board – PUB
    - TU Delft
    - NUS
  - Scope
    - Analysis of aquatic systems
      - In depth scientific questions
    - Smart sensing
      - Sensing, monitoring, data-model integration
    - Holistic/systemic approach
      - Integration and interdisciplinary (hydrology, hydraulics, environmental and social sciences, human health
    - Information cycle in respect of water cycle
      - Acquisition, analysis, modelling, decision support
Singapore-Delft Water Alliance

- **Singapore Water Catchments**
  (An example project)
  - Marina Bay, Marina Channel, Catchments & Contributing Rivers & Canals
  - Integration of Model Components
    - Rainfall Forecasting
    - Catchment Runoff
    - Optimal Reservoir Operation
  - Advanced Forecasting Model
    - Rainfall-runoff models
    - River models
    - Reservoir model (gate operation)
    - Oceanographic models
  - Water Quality Assessments

- **Global Commercialization Opportunities**
Additional Research Clusters

• Sensor systems
• Atmospheric aerosols
• Membrane systems
  – Surface fouling
  – BioMimicry membranes
  – Nano and metal-based membranes
  – Membrane-sensor systems
• Persistent organics & human health
• Energy Systems
  – Solar
  – Fuel cell
  – BioFuels
  – Hydrogen storage systems
• Green Campus and Low-energy Dormitory
Education Cluster
Environment, Health & Energy

Opportunities available in a variety of cross-campus academic degree programs at BS, BA, MA, MSc, MEng & PhD levels

- Environmental Engineering
- Environmental Management
- Health & Environmental Technology
- Bioengineering
- Civil Engineering
- Chemical Engineering
- Computational Engineering
- Logistics & Supply Chain Management
- Industrial & Systems Engineering
- Material Science & Engineering
- Mechanical Engineering
- Law
- Public Policy
- Chemistry
- Industrial Chemistry
- Infectious Diseases
- Microbiology
- Biochemistry
- Computational Biology
- Public Health Medicine
- Architecture
- Urban Design
- Building Science
- Industrial Design
- Geography
Education Cluster
Environment, Health & Energy

• University commitment to global education for its Undergraduates enhances the focus on *Global Environment, Health & Energy* with Overseas Colleges

• NUS Overseas Colleges
  – NUS College in Silicon Valley (NCSV), CA w/ Stanford University
  – NUS College in Bio Valley, Philadelphia PA w/ Penn University
  – NUS College in Stockholm w/ Royal Institute of Technology (Kungliga Tekniska Högskolan, KTH)
  – NUS College in Bangalore, India w/ Indian Institute of Science (IISc)
  – NUS College in Shanghai, one of China's leading entrepreneurial and academic hubs, w/ Fudan University
Campus for Research Excellence And Technology Enterprise

• CREATE
  – Location
    • NUS “University Campus @ Warren”
  – Integrated research-campus community with global partners of Singapore
    • Singapore MIT Alliance
      – Initial University team recruited to Singapore for CREATE
        » Areas to potentially include Infectious Diseases, Sensor systems, Environmental monitoring …
  • Additional Universities in process in Asia, Europe, UK, USA …
NUS & NERI Global Initiatives

- **International Association of Research Universities (IARU)**
  - (ANU, Cambridge, Copenhagen, ETHZ, NUS, Oxford, PKU, Tokyo U, UCal-Berkeley, & Yale)
    - Energy, Resources & Environment Initiative
      - Zurich ‘06, Tokyo ‘07 & Canberra ‘07 Meetings set agenda for action
      - “Transformation Towards Sustainability” research program
        - *Land use and ecosystem functions*
          » Urban and rural development interaction, synergies and conflicts
          » Land use changes in a spatially explicit framework
        - *Food systems and water resources*
          » Appropriate water usage
          » Sustainable consumption and production
          » Nutrient conservation and soil conservation
        - *Energy and environment*
          » Energy and material flows
          » Anthropogenic effects on natural cycles
          » Food and bioenergy
Questions & Discussion

NUS Environmental Research Institute