


Skills Development For Green Jobs In Singapore

**International Forum on Skills for Inclusive &
Sustainable Growth in Developing Asia Pacific
10 – 12 Dec 12 ■ Manila, Philippines**

A photograph of a man and a woman in an office environment, both laughing heartily. The man is on the left, wearing a white shirt, and the woman is on the right, wearing a dark blazer over a red top. They are standing in front of a wall with several framed documents or charts. The image is partially obscured by a large blue curved shape on the left side of the slide.

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Brief Personal Profile

- Patrick Chan was headhunted to be Head of Industry Development at Institute of Certified Public Accountants of Singapore
- Leads industry efforts to develop accountancy as a financial and business services sector with the 2020 vision to develop Singapore into a leading accountancy services hub for Asia Pacific by 2020
- Prior to ICPAS, served as Director of Industry Development at Singapore Business Federation (SBF)
- Oversaw Singapore Sustainability Alliance and led industry efforts to develop cleantech, energy, environment and sustainability cluster in Singapore.
- Externally, represented Singapore at International Cleantech Network (ICN) and Global Cleantech Cluster Association (GCCA)
- Served as advisor to Centre of Innovation for Environmental and Water Technologies in Ngee Ann Polytechnic and founding exco member of Bioenergy Society of Singapore (BESS)
- Continues to represent Singapore in GCCA and serve on Business Sustainability Standards Committee of SPRING Singapore and as council member of Singapore High Technology Association (SHTA)
- Also, serve as advisor of China Greentech Initiative CEO Council
- Prior to SBF, served as Assistant General Manager at Corporate Brokers International, an investment and private equity company and co-chairman of Start-Up@Singapore and held various management positions across NUS Enterprise, KPMG Consulting's Banking & Finance and Web Enterprise Solutions Consultancy.
- Holds an MBA and a B. Eng (EE) (2nd Upper Hons) degree from National University of Singapore, where he studied under the SIA Undergraduate Scholarship

Clean Technology

– A New Pillar of the Singapore Economy

The Business Times, Tuesday, July 18, 2006

New body to boost environment and water industry

By **CHEN HUIFEN**

(SINGAPORE) A new council is to be set up to spearhead the growth of the environment and water industry in Singapore, the Ministry of Environment and Water Resources (MEWR) announced yesterday.

The new body, to be called the Environment and Water Industry Development Council (EWIDC), will help Singapore achieve its goals of doubling employment in the sector to 11,000 by 2015 and raising the value-added contribution to \$1.7 billion, from \$500 million in 2003.

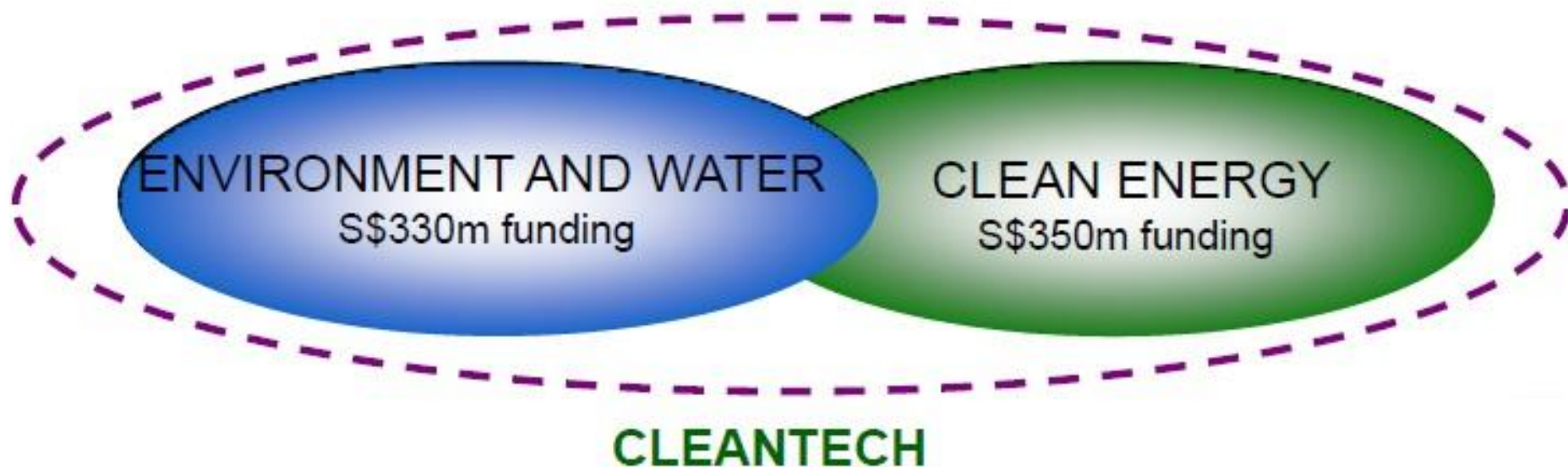
THE STRAITS TIMES

S'pore aims to be key player in green energy push

March 27 2007

\$350m blueprint encompasses R&D, nurturing firms and exporting products

By **ERICA TAY**



Singapore's Sustainable Development Targets

National Climate Change Targets

- **Up to 16%** emissions reduction below BAU levels by 2020 if there is global agreement
- If there is no agreement, **7-11%** emissions reduction

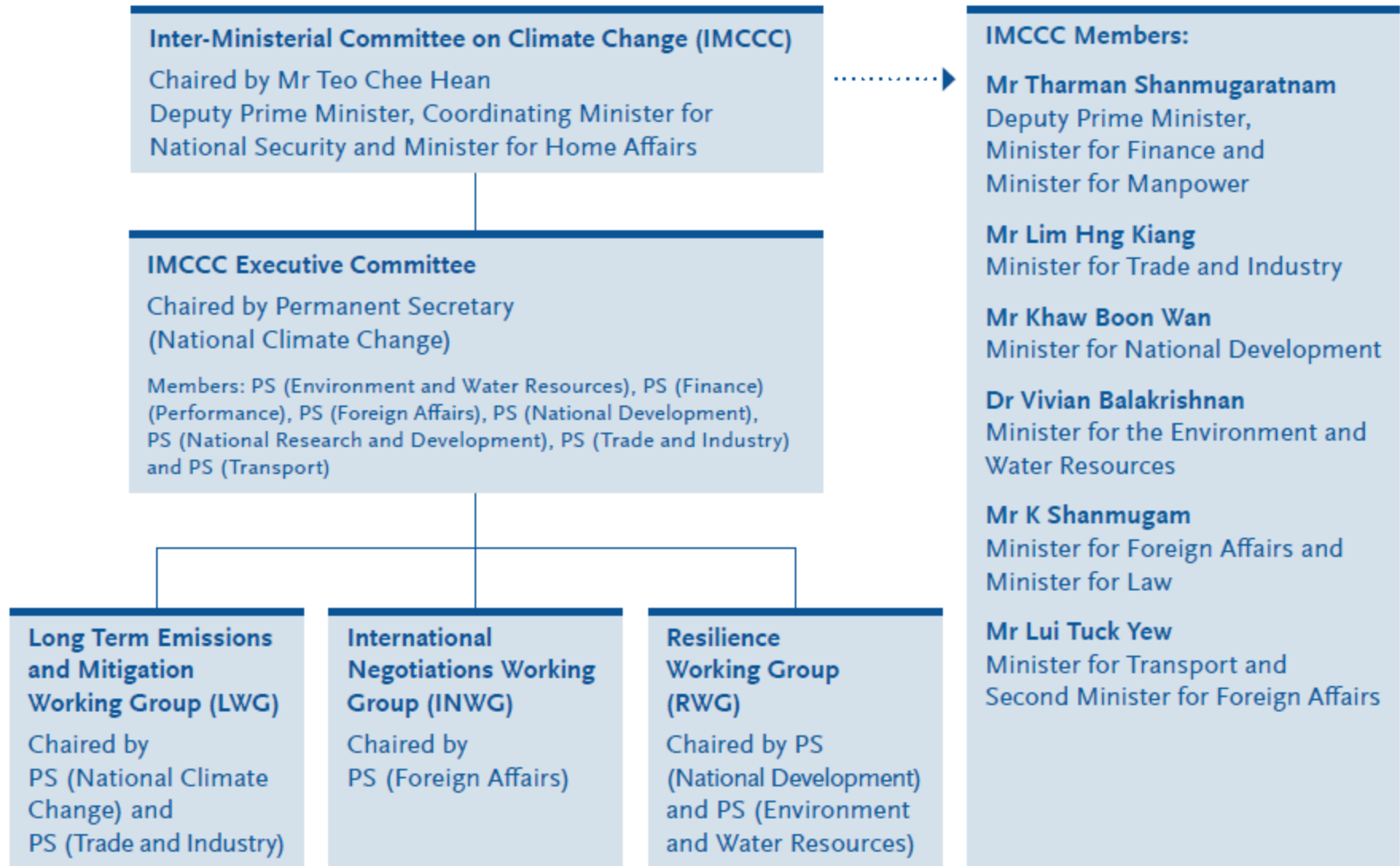


- **35%** improvement in energy efficiency from 2005 levels
- **80%** of all buildings green by 2030

- **5%** of peak electricity demand from renewable energy sources by 2020
- Step up **Energy Efficiency**



Roles of Government Agencies in Green Growth



Source: National Climate Change Strategy 2012 Report

Singapore Cleantech and Sustainability Community

Clean Energy (Solar, wind, fuel cell, etc.)	Engineering/Energy Efficiency	Chemical/Oil/Petrochemical/Utilities	Bioenergy (Biofuels & Biomass)	Environmental Mgmt/Waste-to-Energy
          	        	         	  	
Water & Waste Water Treatment	Green IT/Computing	Green Manufacturing & Logistics	Green Building & Facilities Mgmt	Consultancy + Project Devt + Accreditation
    	       	      	      	      
Carbon Trading + Exchanges	Investment, Funding + Financial Svcs	Legal, Audit, Risk Mgmt, Insurance	Government Agencies	R&D + IHLs
    	       	         	    	    

Singapore Energy Sector Manpower Landscape Study

AREAS OF RESEARCH					
1. Industry Overview & Mapping	2. Current manpower sizing and profiling	3. Demand side analysis and forecasting	4. Supply side analysis and forecasting	5. Gap Analysis	6. Recommendations
<ul style="list-style-type: none"> • Industry trends analysis, by sector • Sizing of players for current, short 1-5 years and medium term 5-10 years 	<ul style="list-style-type: none"> • Core jobs in sectors • Key responsibilities, skills & competencies – technical & behavioural • Mapping of various roles, sizing of energy sectors and segmentation by roles/value chain • Profiling of demographics 	<ul style="list-style-type: none"> • Core jobs in future manpower profile • Key responsibilities, required skills & competencies • Correlation analysis bet target energy supply mix, headcount per GW benchmark, manpower demand till 2020 with clear alignment with industry size forecast 	<ul style="list-style-type: none"> • Key supply side segments / sources • Forecasting of supply pool, profiling of expected curricula of IHLs • Assessment of interaction and cooperation between IHL and industry • Assessment of relevant foreign manpower sources 	<ul style="list-style-type: none"> • Analysis of quantitative gaps between current and projected demand / supply • Existing qualitative gaps, evaluation and ranking of issues by severity, trend and scenarios forecasting, e.g. variations in scale of energy supply, retirement age 	<ul style="list-style-type: none"> • Summary of key manpower issues and gaps • Analysis of key identified reasons behind gaps • Recommendations on possible solutions for manpower solution • Proposed scope and approach for development of national energy training framework

Environmental Education in Singapore













Formal Education

- Lead Agency: Ministry of Education
- Made environmental education part of school curriculum.
- Schools play vital role in educating the young.
- A criteria in School Excellence Model.
- Incorporated recycling, energy and water conservation into formal curriculum of subjects like geography, social studies & science.
- Review and update curriculum to generate more academic interest e.g. in clean energy and water technology.

Informal Education

- Lead Agency: National Environment Agency
- Rolls out various education programs, supported by 3P inter-agency partner.
- Encourage & train teachers & students to develop own environmental initiatives (Environmental Education Advisors).
- Train youths to conceptualize & implement projects through the Youth Environment Envoy (YEE) program.
- Conduct “Learning Journeys” to incineration plants, Semakau landfill and meteorological stations.

Specialist Manpower Development for Green Jobs in Singapore

Programme	Supply	Educational Institutes
<u>Postgraduate</u> <ul style="list-style-type: none"> NRF Postgraduate Scholarships NRF Company Scholarships 	40 60	     
<u>Universities</u> <ul style="list-style-type: none"> Specialist Manpower Programme (SMP) in Clean Energy 	100 / yr	 
<u>Polytechnics</u> <ul style="list-style-type: none"> Clean Energy Diploma Specialised electives 	200 / yr	   

Source: Singapore Economic Development Board (EDB)

From Education to R&D to Technology Commercialization



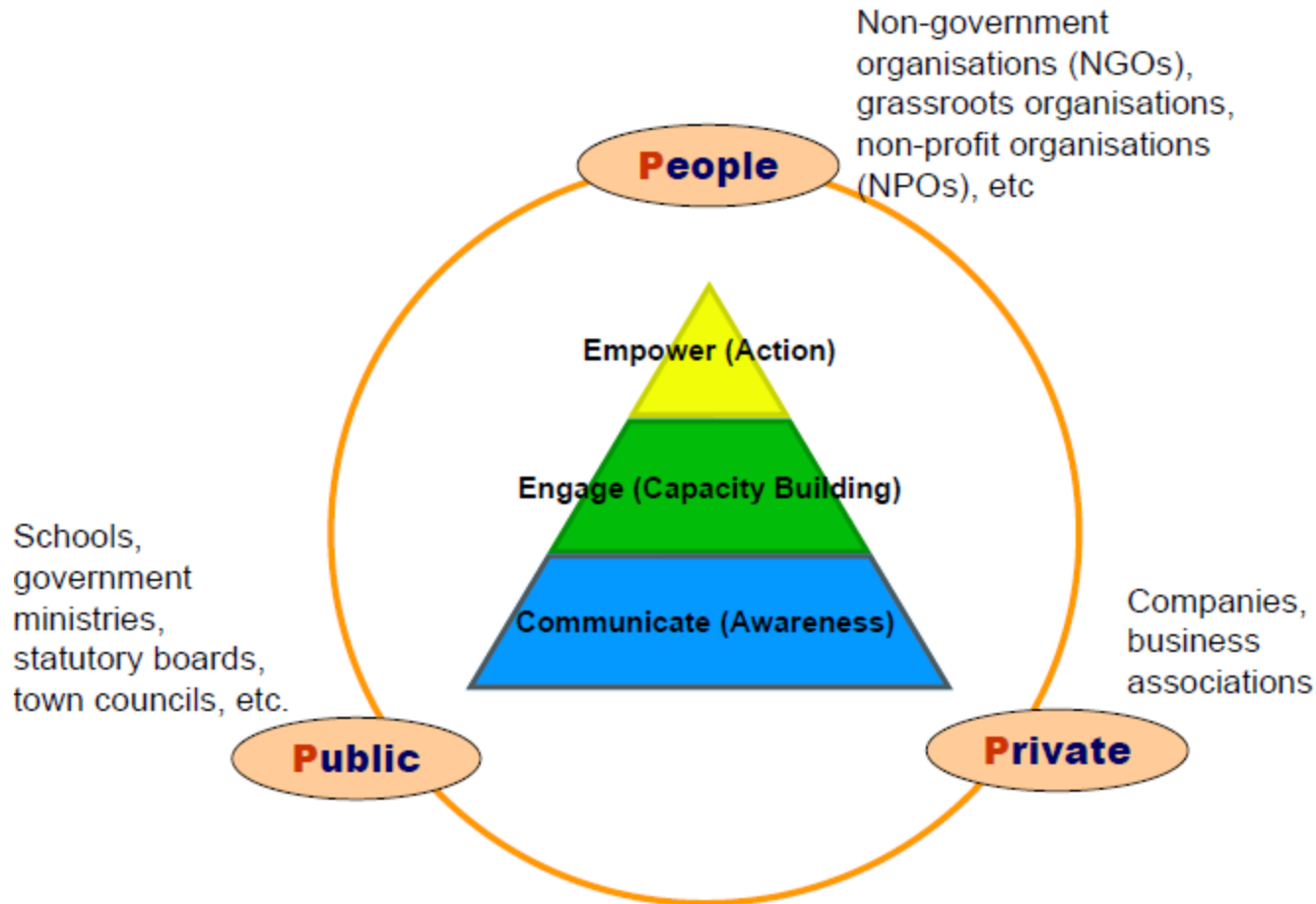
	Universities/CREATE	Research Centres	Test Beds
	NUS MIT ETH Zurich Shanghai Jiaotong University NTU Berkeley Cambridge TUM Ben-Gurion University Hebrew University of Jerusalem	Within NUS NERI TMSI SERIS NUSDeltares Within NTU ERI@N NEWRI Within A*STAR SMC EPGC	CleanTech Park Intelligent Energy System Punggol Eco-Town Pulau Ubin Micro-Grid Zero Energy Building EV Test Bed Solar PV Systems
Government/ Collaborating Agencies	NRF	NRF A*STAR EIPO	NRF A*STAR EMA EIPO EDB BCA HDB

Lead Adoption

Source: National Climate Change Strategy 2012 Report

Working in Partnership

3P Partnership Strategy



Bringing Together Partners from Singapore Cleantech Community

Industry Associations & Professional Bodies

- Business Council for Sustainable Development (Singapore)
- Institute of Engineers Singapore (IES)
- Singapore Compact for CSR
- Singapore Contractors Association (SCAL)
- Singapore Environment Council (SEC)
- Singapore Green Building Council (SGBC)
- Singapore Manufacturing Federation (SMF)
- Singapore Water Association (SWA)
- Sustainable Energy Association of Singapore (SEAS)
- Singapore High Technology Association (SHTA)
- The Economics of Environment & Biodiversity (TEEB) Singapore
- Waste Management & Recycling Association of Singapore (WMRAS)

Government Agencies



Academic & Vocational Institutes & Research Centres

- Agency for Science & Technology Research (A*Star)
- Exploit Technologies
- Institute of Systems Science (ISS)
- Institute of Technical Education (ITE)
- The Logistic Institute Asia Pacific (TLIAP)
- Ngee Ann Polytechnic (NP)
- National University of Singapore (NUS)
- Nanyang Technological University (NTU)
- Republic Polytechnic (RP)
- Singapore-Delft Water Alliance (SDWA)
- Singapore Institute of Management (SIM)
- Singapore Institute of Manufacturing Technology (SIMTech)
- Sustainable Supply Chain Centre of Asia Pacific
- Singapore Polytechnic (SP)
- Singapore Water Technology Centre (SWTC)
- Solar Energy Research Institute of Singapore (SERIS)
- Temasek Polytechnic (TP)

Business Community

600+ Foreign & Local Companies in Cleantech & Sustainability Sector

Triple-Helix Model in Action – Education & Training for Green Sector

Clean Energy

- EDB, SEAS, Polys
- Executive Cert in Clean Energy
- Diploma in Clean Energy
- Diploma in Chemical & Green Technology
- WSQ modules for Renewable Energy

Energy Efficiency & Management

- EEPO, NEA, WDA SEAS, IES, Polys, Siemens
- Singapore Certified Energy Manager Program (SCEM)
- WSQ modules for Energy Efficiency & Mgmt

Waste Management & Recycling

- NEA, WMRAS. Polys, WDA
- WSQ Certified Waste Mgmt Crew

EnviroTech

- EDB, NEA, SEI, WDA, SEAS, NUS, NTU, SP
- WSQ Modules for Environmental Technology

Green Building

- BCA, SGBC, NUS
- Green Mark Cert
- Diploma in ME (Green Bldg Tech)
- Diploma in EE & Clean Energy
- Specialist Diploma in Energy & Facility Mgmt
- Specialist Diploma in BIM

Green IT

- IDA, SiTF, NUS, ISS
- Green IT Certification
- Singapore Certified Green IT Professional (SCGP)
- Foundation Certificate in Green IT

Sustainable Manufacturing & Supply Chain

- SPRING, WDA, SMF, SEC, SIMTech
- WSQ Graduate Diploma in Sustainable Mfg
- WSQ Modules for Environmental Technology

Sustainable Water Solutions

- EWI, PUB, SDWA, GE, SWTC, Polys
- Diploma in Environment Mgmt & Water Technology
- WSQ Certified Used Water Treatment Operator/ Technician

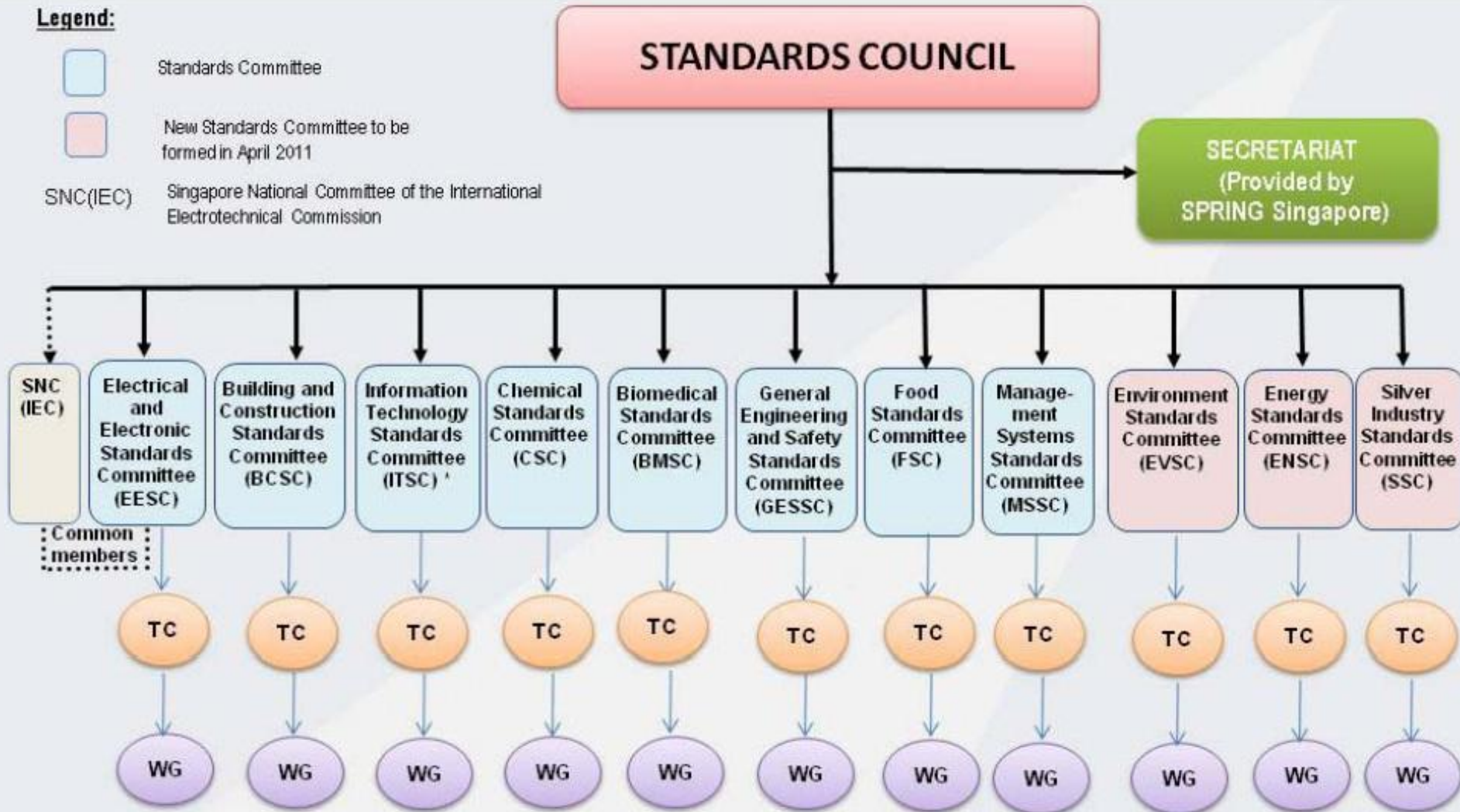
Environmental Management

- NEA, SEC, Polys
- Environmental Protection Management Programmes
- Environmental Public Health Programmes

Sustainability - General

- SBF, NUS, ITE
- Certified sustainability professional trng
- Green collar worker training

Green Standards Development – One for Green Skills?



Industry Competence Framework Development – One for Green Sector?

Sub-Sector		EMERGING TECHNOLOGIES								
Functional Group		Green ICT Involves the design, management and maintenance of the energy usage in the IT environment					Cloud Computing Involves the designing of the cloud network, development of cloud solutions, maintenance of cloud services and development of cloud service offerings to clients			
Job Family		Data Centre Design and Implementation	Data Centre Operations, Maintenance and Monitoring	IT Management	Green Advisory	Requirements Gathering and Process Redesign	Cloud Architecture	Cloud Engineering	Cloud Operations	Cloud Services
Career Progression Pathways based on Job Roles	Senior Management		•Data Centre Director – Green ICT ΔXΘ	•Chief Information Officer – Green ICT ΣΔXΘ			•Chief Architect - Cloud ΔXΘ		•Cloud Operations Director ΔXΘ	
	Expert / Management	•Data Centre Architect– Green ICT ΔXΘ	•Data Centre Operations Manager– Green ICT ΔXΘ		•Energy Manager •Energy Auditor ΔXΘ		•Information / Database Architect – Cloud •Integration Architect – Cloud •Infrastructure Architect - Cloud ◊ΔXΘ	•Cloud Development Manager •Application Support Manager – Cloud ΔXΘ	•Cloud Operations Manager ΔXΘ	•Cloud Services Product Manager ΔX
	Specialist (Tech) (Mgt)		•Data Centre Operations Engineer – Green ICT ΔXΘ			•Business Analyst– Green ICT ΔXΘ		•Cloud Software Engineer (Solution / Database) •Cloud Infrastructure Engineer ◊ΣΔXΘ	•Senior Cloud Operations Engineer ΣΔXΘ	•Cloud Services Product Analyst ΔX
	Entrant								•Cloud Operations Engineer ΔXΘ	

Source: Part of National Infocomm Industry Competency Framework (NICF) jointly developed by Infocomm Development Authority of Singapore (IDA) and Singapore Workforce Development Agency (WDA)
(<http://www.nicf.sg>)

An aerial photograph of a vast, frozen body of water, likely a lake or sea, under a clear blue sky. The ice is broken up into numerous small, irregular floes and larger chunks, creating a textured, mosaic-like appearance. A faint rainbow is visible in the upper right portion of the sky, arching over the horizon. The overall scene is serene and expansive.

Thank You

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