



Asia Nano Forum

**Education Program  
Sustainability & Nanotechnology  
*Asia Perspective***

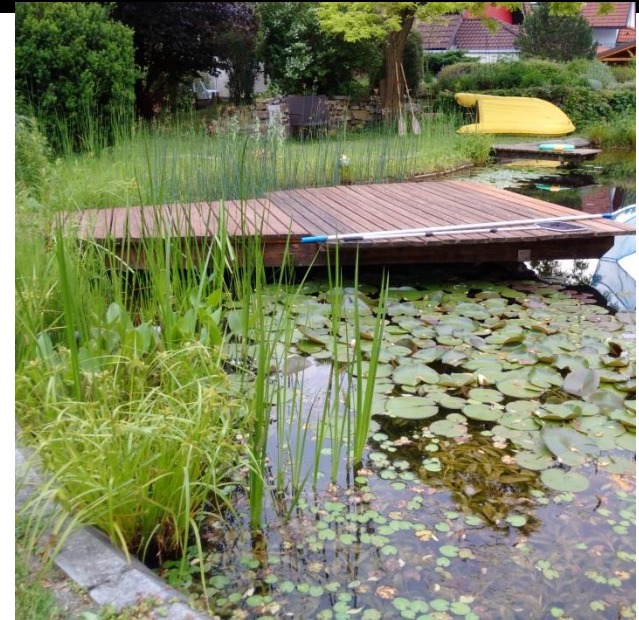
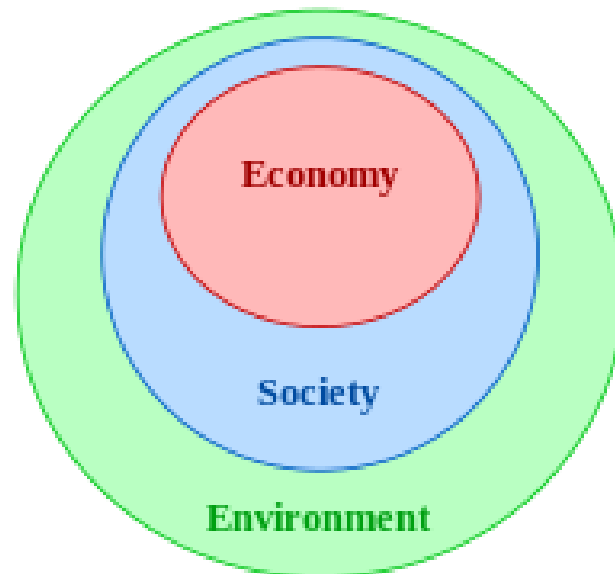
**Lerwen LIU (PhD in Physics)**

Founding Secretary of Asia Nano Forum

Adjunct Associate Professor, National University of Singapore

# Understanding of Sustainability

- Achieving sustainability will enable the Earth to continue supporting human life
- sustainability is the endurance of systems and processes
- 3 Pillars: Environment, Society & Economy



# United Nation's Sustainable Development Goals

- 17 Goals to Transform Our World
- Goal No. 12-Sustainable consumption and production
  - aims at “**doing more and better with less,**” involving **different stakeholders** (business, consumers, policy makers, researchers, scientists, retailers, media, and development cooperation agencies, among others)
  - requires a **systemic approach and cooperation among actors operating in the supply chain, from producer to final consumer.** It involves engaging consumers through awareness-raising and education on sustainable consumption and lifestyles, providing consumers with adequate information through **standards and labels** and engaging in sustainable public procurement, among others.

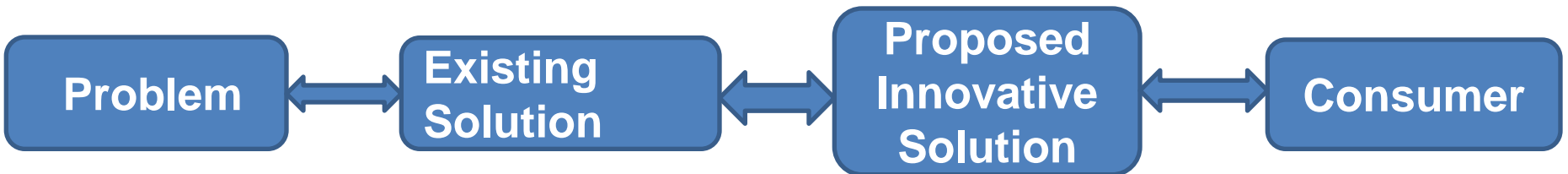
# Understanding the Economic Aspect

- ***Sustainability Compliance***
  - PWC: Global Sustainability and Climate Change (services from corporate strategy, supply chain to taxation)
  - World Bank: Sustainable Development, economic growth, environmental stewardship, and social inclusion – carry across all sectors of development, from cities facing rapid urbanization to agriculture, infrastructure, energy development and use, water availability, and transportation
  - Asia Development Bank: Sustainable Development Investments
  - Eco/Green Label
  - Bioplastics Compliance
- ***Green Economy Through Innovation- Disruption existing industries and creating new green industries & Improving Productivity of People***
- ***Interconnection with Social and Environmental Aspects***

# Innovation & Entrepreneurship for Sustainability Education Program

## Implementation Strategy:

- ✓ Biz Model (recycling)
- ✓ Revenue
- ✓ Marketing Strategy
- ✓ Milestones (5Y Plan)



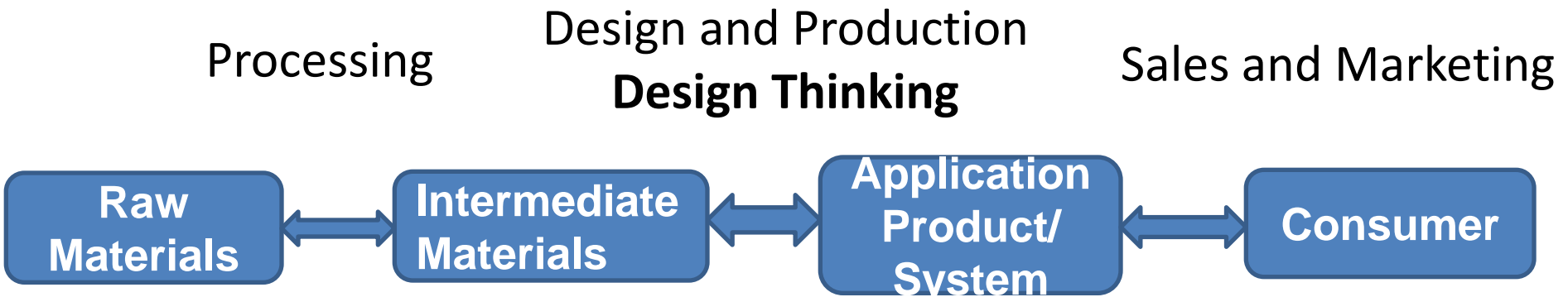
- Environmental
- Social
- Economic

- Comparative Analysis
- Supply Chain Analysis

- Systemic
- Innovation value Chain Analysis
- Addressing Sustainability (environmental, social and economic)

- Change Consumer Mindset towards Sustainable consumption
- Create Economic, Social and Environmental Transformation

# Innovation Value Chain



- Supply Chain Analysis
- Partner for sustainable production

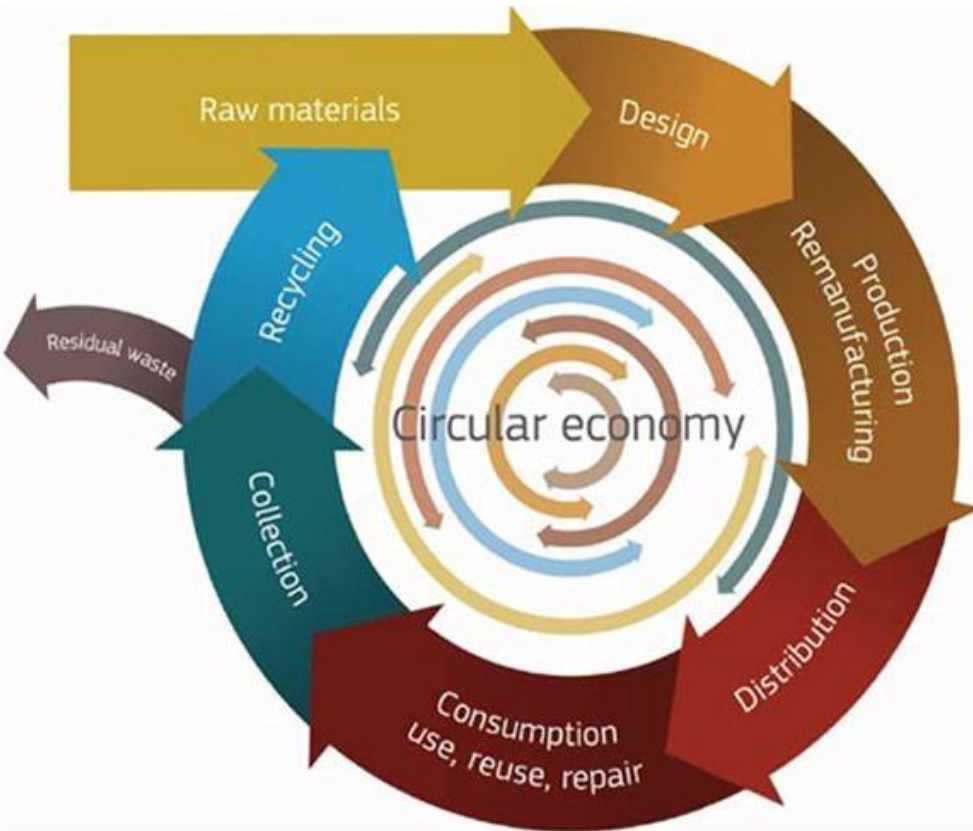
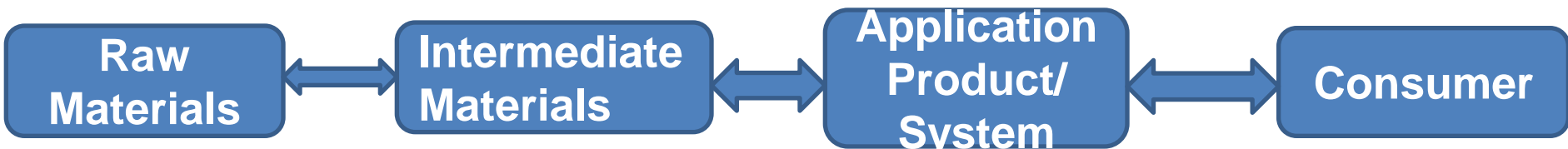
- Change Consumer Mindset towards Sustainable consumption
- Create Economic, Social and Environmental Transformation

UN SGD 12th

**ANE** Sustainable consumption & Production

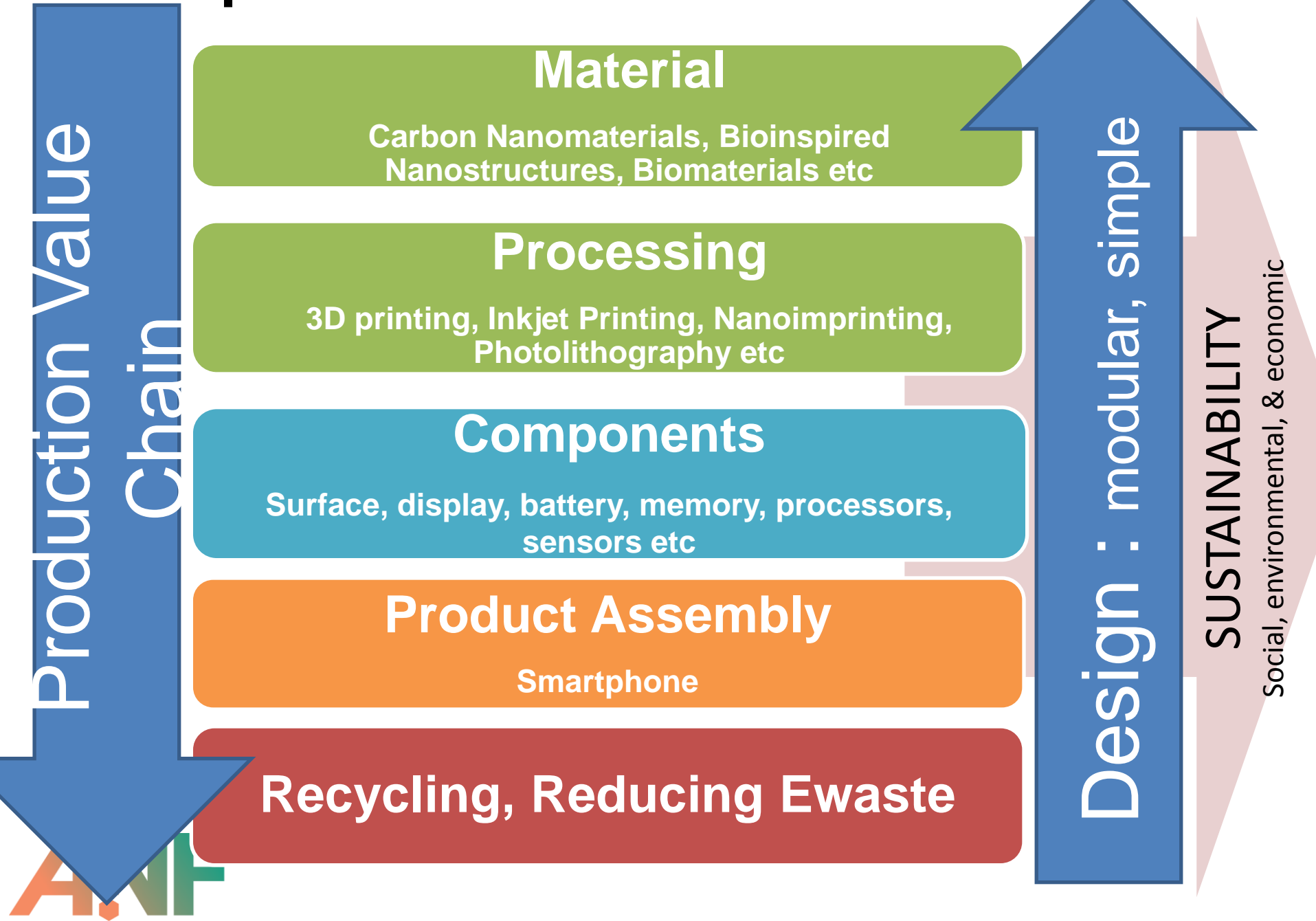
# Implementation of Innovation

## Lean Launchpad



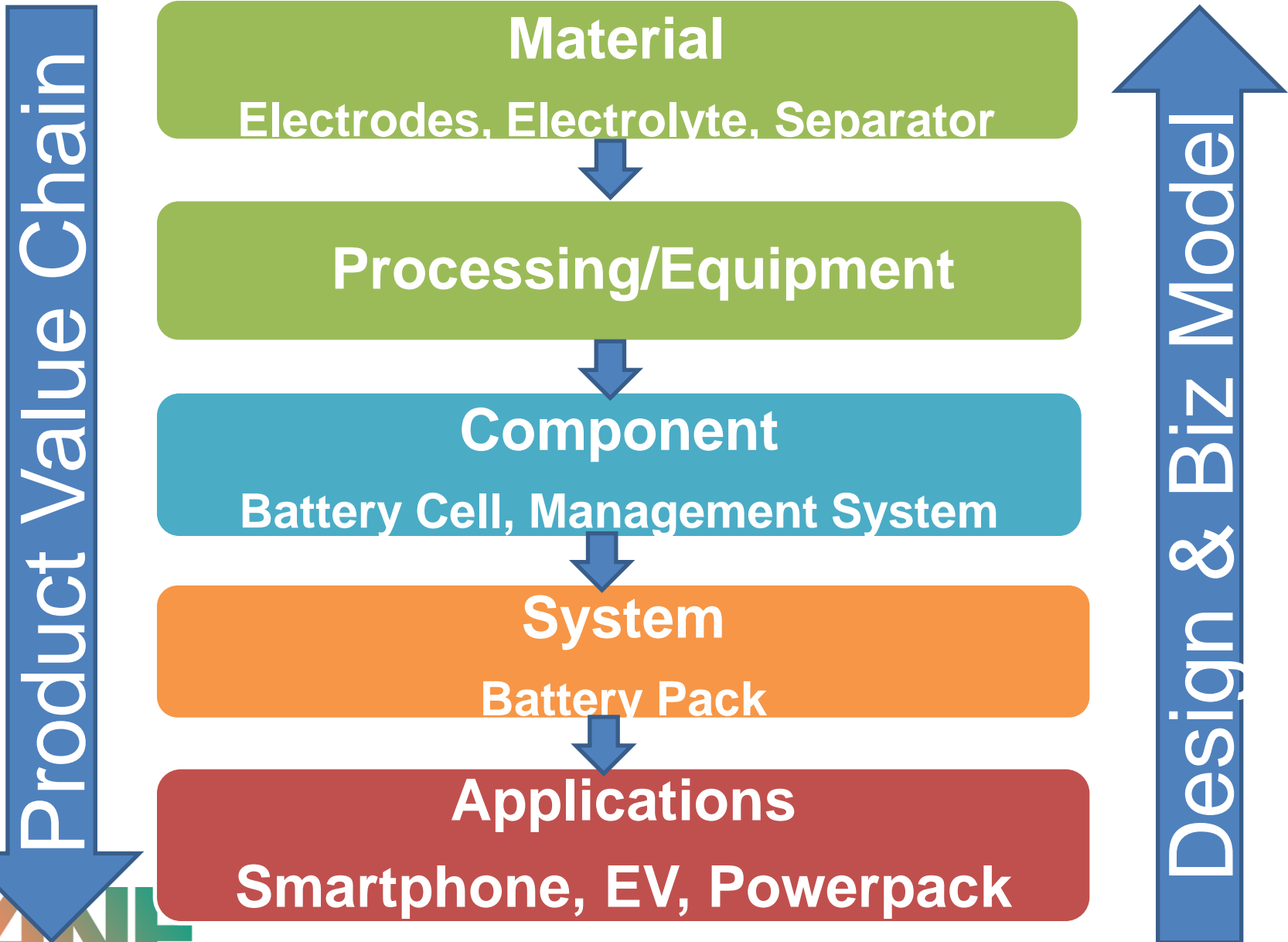
- Biz Model (including recycling)
- Funding/Revenue Source
- Milestones (POC, Scale-up, Growth)
- Marketing Strategy (Partners, Sustainability education platform, youth group etc)

# Responsible Innovation-Value Chain





# Current Battery Innovation-Value Chain



**Smartphone**

**Li-Ion  
Battery**

**LiFeSO<sub>4</sub>/  
LiMn<sub>2</sub>O<sub>4</sub>  
LiNi<sub>x</sub>Mn<sub>y</sub>Co<sub>z</sub>O<sub>2</sub>  
Compound**

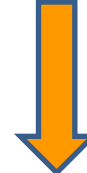
**Graphite  
CNT/VGCF  
Binders**

**Lithium+Met  
al  
Mining**

**Graphite  
Mining**

# Implications of Li-ion Battery Innovation

**System**  
Battery Pack



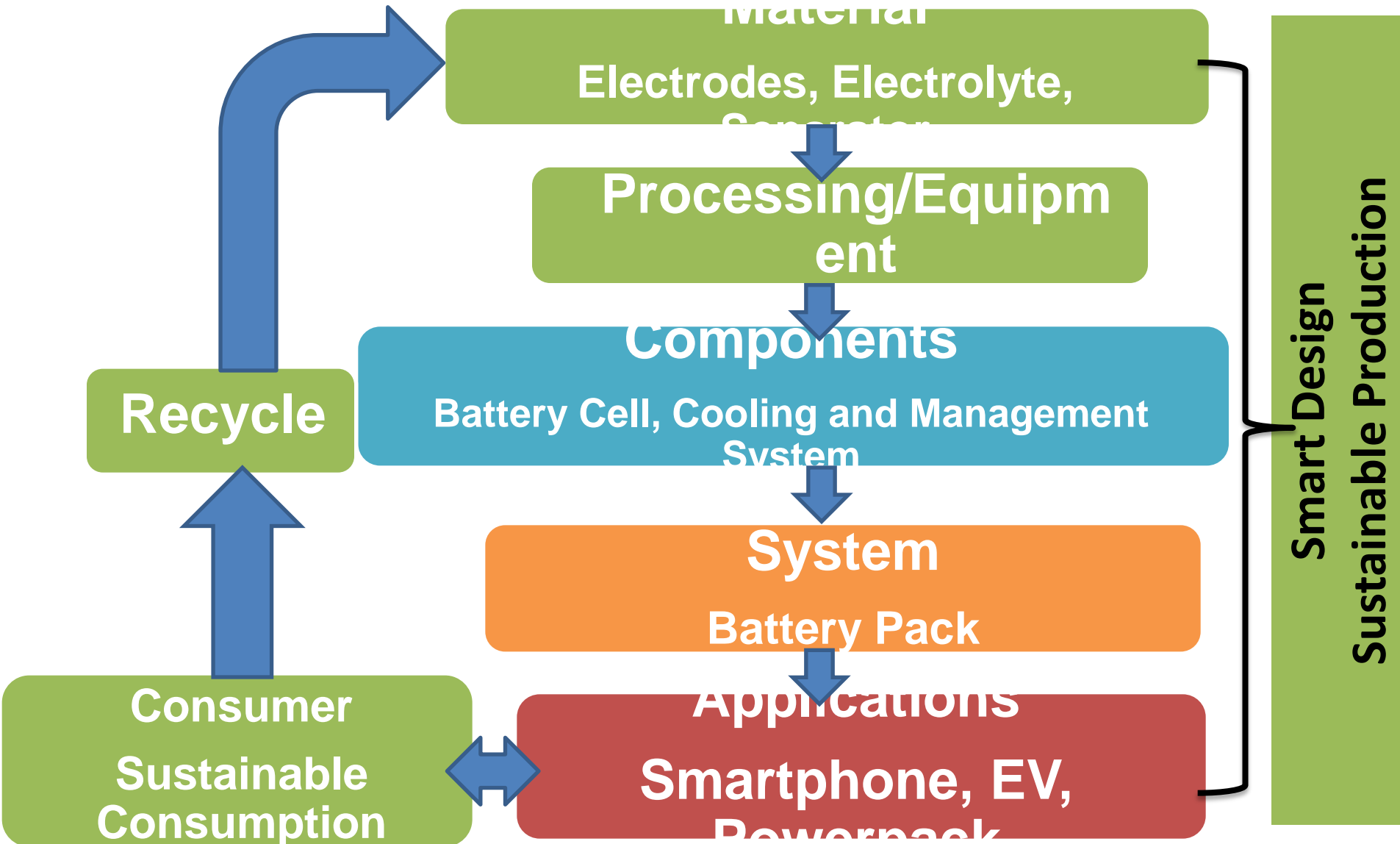
**Applications**  
Smartphone, EV,  
Powerpack

**Rapid Growth of  
Consumption**

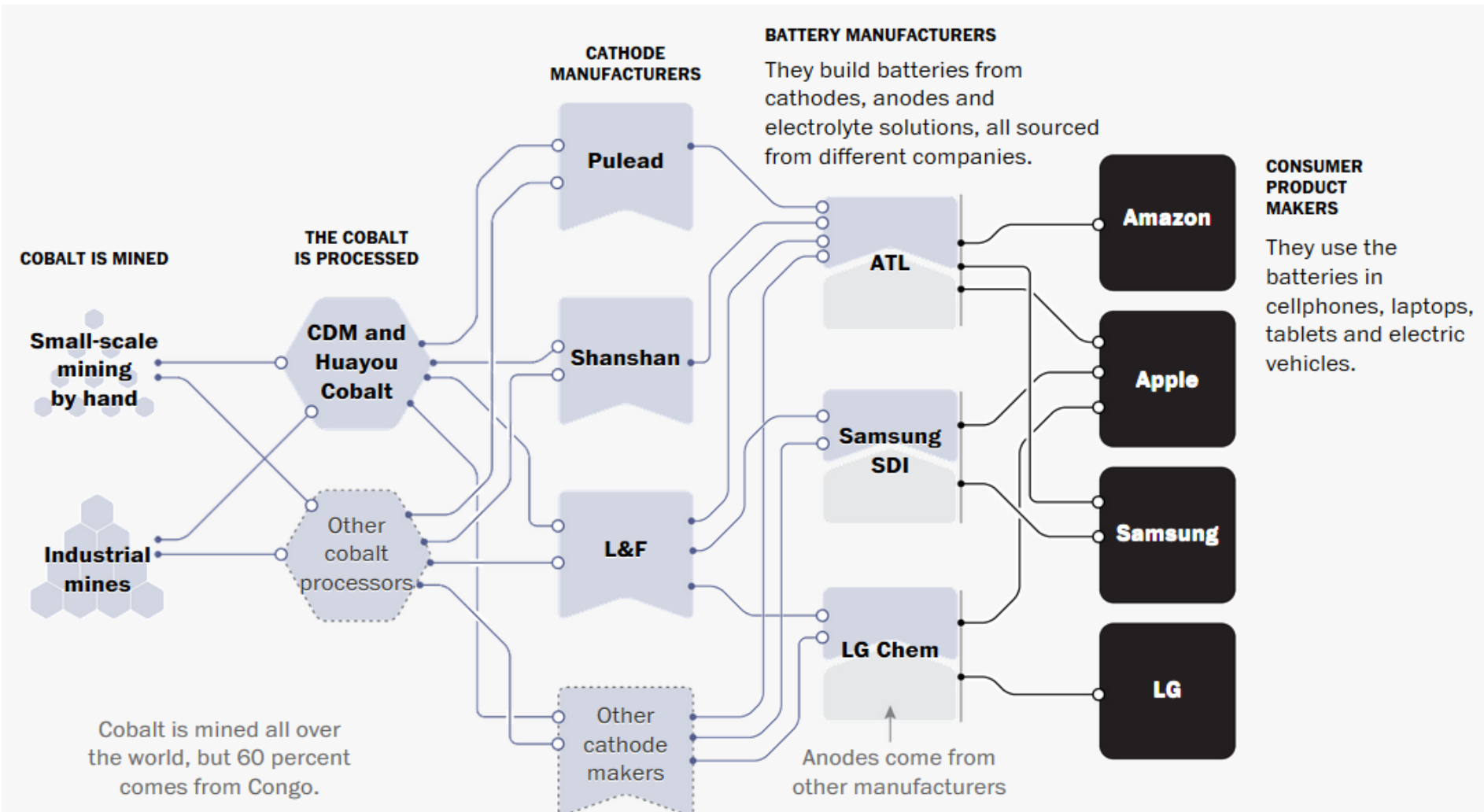


**Enormous  
Ewaste**  
Depleting  
Resources

# Proposed Battery Innovation Process

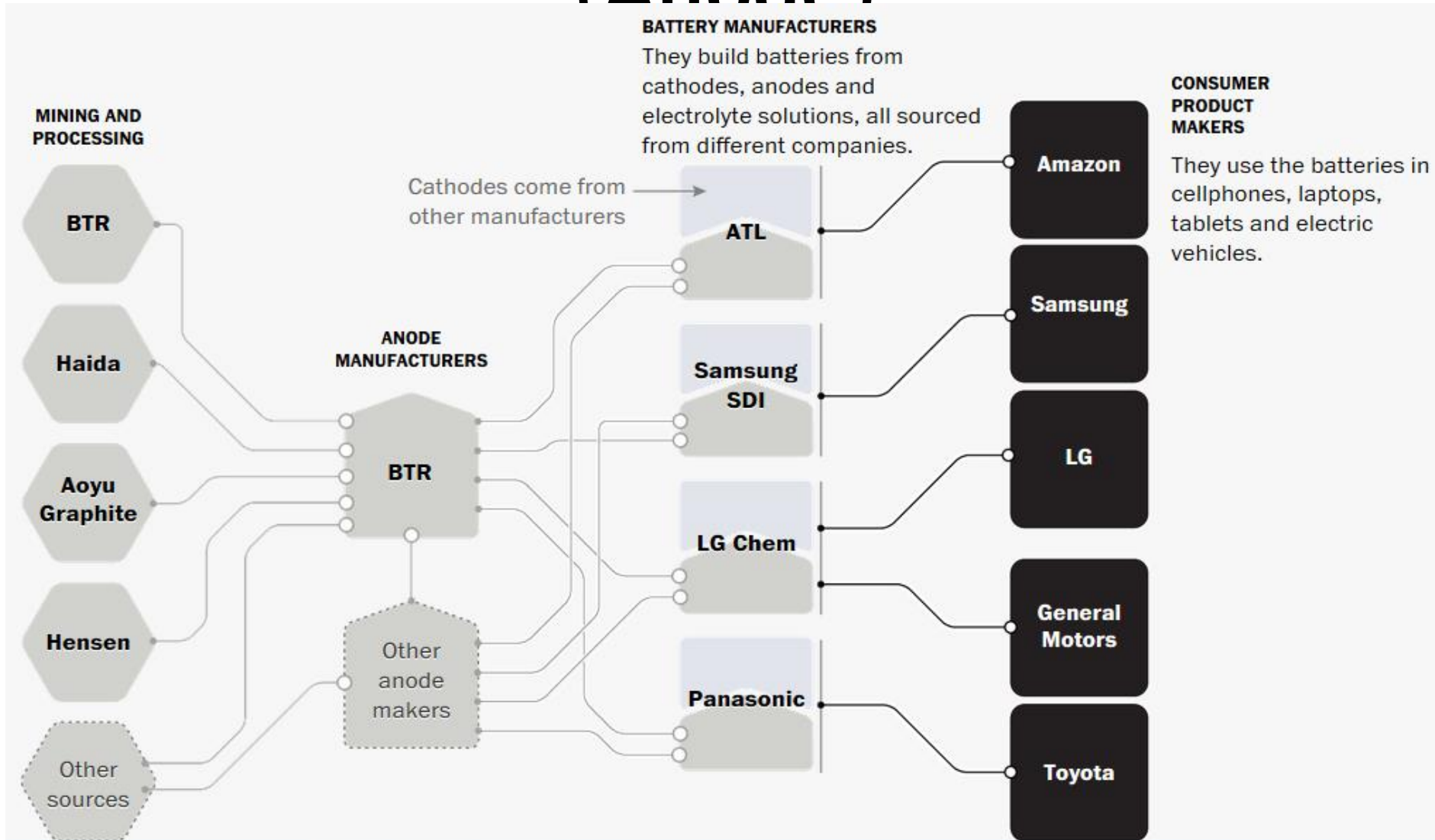


# Li-ion Battery Supply Chain (Cathode)

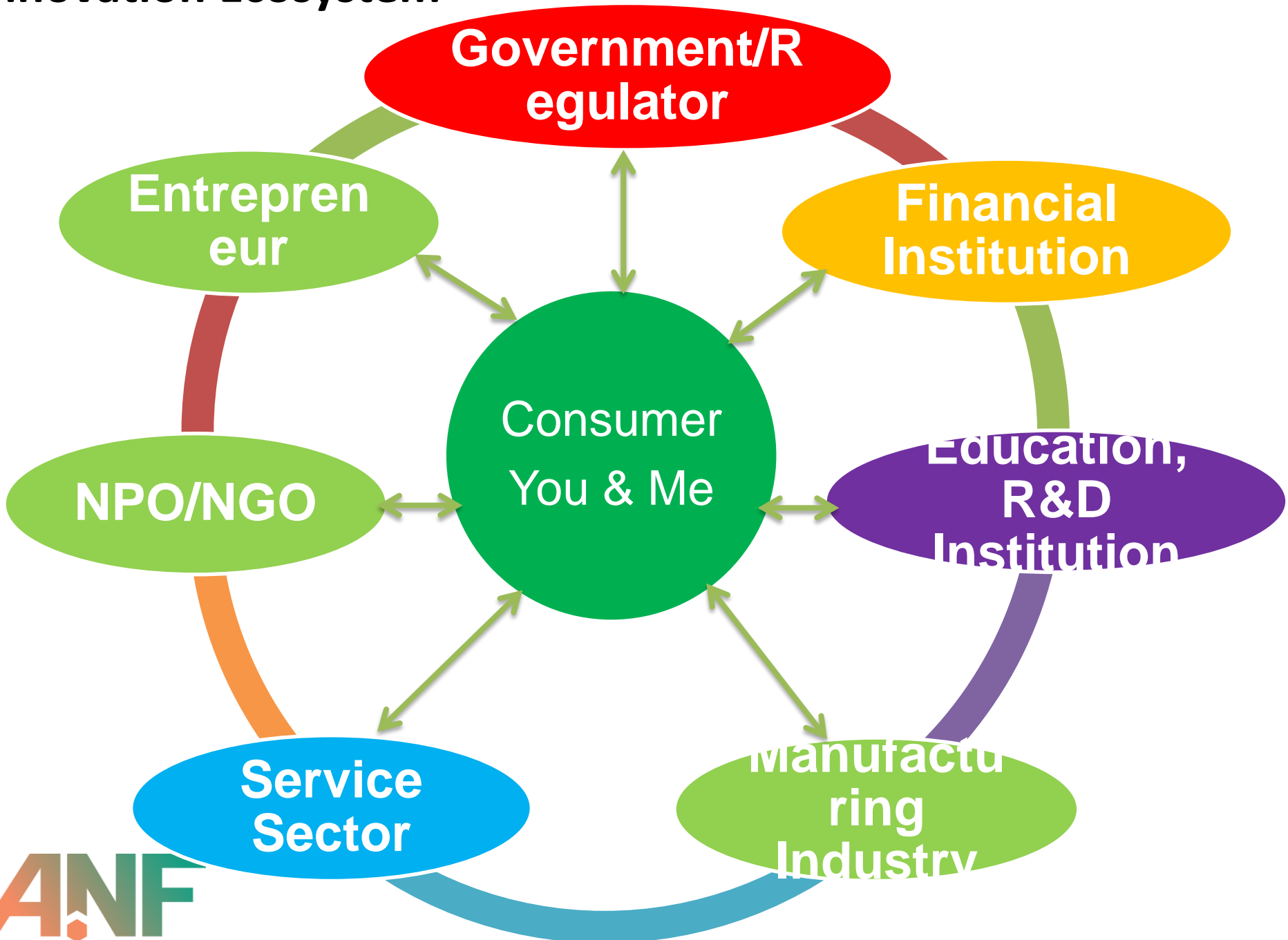


# Li-Ion Battery Supply Chain

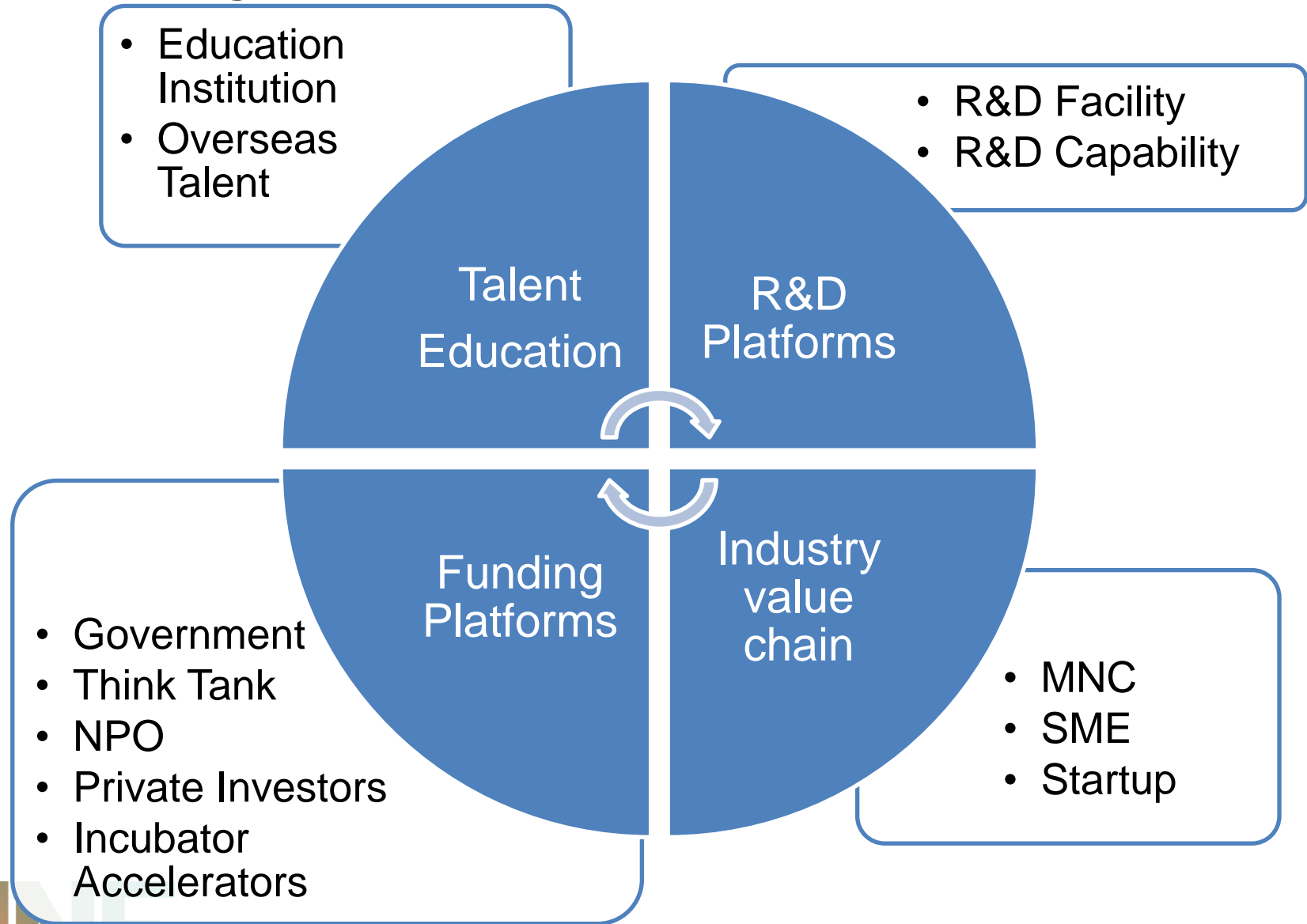
## (Anode)



# Innovation Ecosystem



# Ecosystem of Entrepreneurship





# Innovation & Nanotech for Sustainability

- Innovation on Waste Recycling, Reuse, Reprocess into value add materials
  - Agriculture waste: Sugar cane bagasse, pineapple & banana skin, coconut & rice husk, wood waste etc
  - Electronic Waste (smartphone, PC, PV panels, Batteries)
  - Waste cooking oil
  - Many more
- Advanced materials
- Green Manufacturing Processes
- Smart design
- **REDUCE Consumption!**

# ***Asia Nano Forum***

***Asia Nanotech Leaders Shaping the Future***

# ANF Global Coverage



# About Asia Nano Forum (ANF)

## Introduction

Asia Nano Forum (ANF) is a **network organization**, founded in May 2004 and became a registered society in Singapore in Oct 2007.

## ANF Mission

**promote** responsible development of nanotechnology that **educationally, socially, environmentally** and **economically** benefits members by fostering the **international network collaboration**

## 16 Member Economies

Australia, Austria, China, Hong Kong, India, Indonesia, Iran, Japan, Korea, Malaysia, New Zealand, Singapore, Sri Lanka, Taiwan, Thailand, UAE, and Vietnam

## Objective

**Foster** nanotechnology in the region by creating mechanisms to share information, human and physical resources and expertise

**Support** regional economic and environmental development through joint projects addressing major regional issues, with an emphasis on support of developing and emerging economies

**Coordinate** joint investment in and mutual access to major infrastructure by member economies

**Promote and coordinate standardization and safety** of nanotechnology concepts and measurements

**Act as an advocacy group** for nanotechnology in the region and for adequate regional representation of nanotechnology at global forums

**Initiate, promote and manage co-operative** scientific and technology research projects within the member economies

**Enhance** public awareness and education of nanotechnology and associated social, environmental, health and economic issues

# About Asia Nano Forum

## ANF Member Benefits

**Information Access:** ANF website access, quarterly newsletters and regional nanotechnology updates

**Networking** : Invitation to ANF flagship events and other ANF supported events at member discount rate including ANF Annual Summits, Asia Nanotech Camp, working group workshops, and etc.

**Member Nanotech and Events Promotion and Support**

**Summit and Asia Nanotech Camp Participation**

**Priority Access to ANF Network Nano Infrastructure/Facilities/Education Programs**

**Connect with and Become Part of the Nanotech Leaders Community**

## Working Group

**Education (ANC, INO)**

**Infrastructure (Japan/Singapore led)**

**Nanosafety and Risk Management (NanOEH)**

**Standardization (ISO-TC229)**

## Flagship Events

**Asia Nano Forum Summit (ANFoS)**  
– annual event where high level Nanotech leaders meet hosted by a ANF member

**Asia Nanotech Camp (ANC)** –  
annual event where young leading nanotech researchers meet and experience collaborations

# ANF ExCo Committee – Office Bearers (2016-)



**President**

**Ramam AKKIPEDDI**  
(A\*STAR, Singapore)



**Vice President**

**Junichi SONE**  
(JST, Japan)



**Vice President**

**Ali BEITOLLAHI**  
(INIC, Iran)



**Vice President**

**Rezal Khairi AHMAD**  
(Nano Malaysia)



**Secretary**

**T.K. LEE**  
(Academia Sinica, Taiwan)



**Founding Secretary**

**Lerwen LIU**  
(NanoGlobe, Singapore)

# ANF Former Presidents



**Founding Chairman**  
**Kazunobu TANAKA**  
(JST, AIST, Japan)



**President(2008-2009)**  
**Maw-Kuen WU**  
(Academia Sinica , Taiwan)



**President(2010-2011)**  
**Hak Min KIM**  
(KAIST, Korea)



**President(2012-2013)**  
**Teruo KISHI**  
(ISMA, Japan)



**President (2014-2015)**  
**Sirirug SONGSIVILAI**  
(NANOTEC, Thailand)

# *ANF ExCo Members*



**Alexander POGANY**  
(BMVIT, Austria)

**Toshihiko KANAYAMA**  
(AIST, Japan)

**Chung Yu WU**  
(NCTU, Taiwan)

**Sirasak TEPARKUM**  
(NANOTEC, Thailand)

**Abdul Kadi Masrom**  
(NND, Malaysia)



**Tran Dai LAM**  
(VAST, Vietnam)

**Werasak SURAREUNGCHAI CHENNUPATI Jagadish**  
(KMUTT, Thailand)

(ANN, Australia)

**Takahiro FUJITA**  
(NIMS, Japan)

**Kyung-ho SHIN**  
(KoNTRS, Korea)



# *ANF ExCo Members*



**Nurul Taufiqu ROCHMAN**  
(LIPI, Indonesia)



**Xijun ZHANG**  
(Suzhou nanotech, China)



**Shrikant JOSHI**  
(ARCI, India)

# ANF Member Networks

<i>Economy</i>	<i>Network</i>	<i>POC</i>	<i>Network Website</i>
India	Advanced Research Centre International (ARCI)	Joshi SHRIKANT	<a href="http://www.arci.res.in">www.arci.res.in</a>
Australia	Australian Nanotechnology Network (ANN)	Jagadish CHENNUPATI	<a href="http://www.ausnano.net">www.ausnano.net</a>
Austria	Austrian Ministry for Transport, Innovation and Technology (BMVIT)	Alexander POGANY	<a href="http://www.bmvit.gv.at/">www.bmvit.gv.at/</a>
Australia	Department of Industry, Innovation and Science (DIIS)	Alison HEMMINGS	<a href="http://www.innovation.gov.au">www.innovation.gov.au</a>
Hong Kong	Hong Kong University of Science and Technology (HKUST)	King Lun YEUNG	<a href="http://www.ust.hk">www.ust.hk</a>
Indonesian	Indonesian Institute of Sciences (LIPI)	IKHLASUL Amal	<a href="http://www.nano.or.id">www.nano.or.id</a>
Taiwan	Innovation and Application of Nanoscience Thematic Program (IANTP)	K.T. LEE	<a href="http://www.nano-taiwan.sinica.edu.tw">www.nano-taiwan.sinica.edu.tw</a>
Singapore	Institute of Materials Research & Engineering (IMRE)	Ramam AKKIPEDDI	<a href="http://www.imre.a-star.edu.sg">www.imre.a-star.edu.sg</a>
Iran	Iran Nanotechnology Initiative Council (INIC)	Ali BEITOLLAHI	<a href="http://www.en.nano.ir">www.en.nano.ir</a>
Japan	Japan Science and Technology Agency (JST)	Junichi SONE	<a href="http://www.jst.go.jp">www.jst.go.jp</a>
UAE	Khalifa University of Science, Technology and Research (KUSTAR)	Ali DAWOOD	<a href="http://www.kustar.ac.ae">www.kustar.ac.ae</a>



National Nanotechnology Directorate  
Ministry of Science, Technology & Innovation



MALAYSIA



独立行政法人  
物質・材料研究機構  
National Institute for Materials Science



Australian Government  
Department of Industry,  
Innovation and Science



Federal Ministry  
for Transport,  
Innovation and Technology



# ANF Member Networks

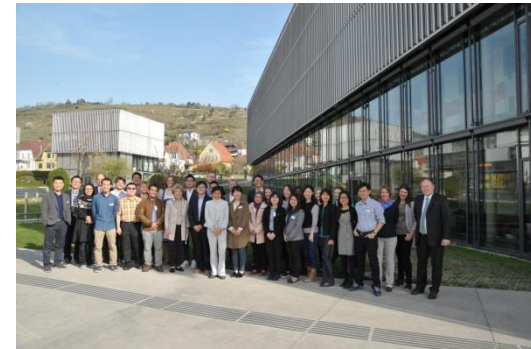
<i>Economy</i>	<i>Network</i>	<i>POC</i>	<i>Network Website</i>
<i>Thailand</i>	<i>King Mongkut's University of Technology Thonburi (KMUTT)</i>	<i>Werasak SURAREUNGCHAI</i>	<a href="http://www.global.kmutt.ac.th">www.global.kmutt.ac.th</a>
<i>Korea</i>	<i>Korean Nanotechnology Researchers Society (KoNTRS)</i>	<i>Kyung-ho SHIN</i>	<a href="http://www.kontrs.or.kr">www.kontrs.or.kr</a>
<i>New Zealand</i>	<i>MacDiarmid Institute for Advanced Materials and Nanotechnology</i>	<i>John V. KENNEDY</i>	<a href="http://www.maddiarmid.ac.nz">www.maddiarmid.ac.nz</a>
<i>Malaysia</i>	<i>Nano Malaysia</i>	<i>KAMARULZAMAN Kamaruddin</i>	<a href="http://nanomalaysia.com.my">nanomalaysia.com.my</a>
<i>Japan</i>	<i>National Institute of Material Science (NIMS)</i>	<i>Shigeyuki MATSUNAMI</i>	<a href="http://www.nims.go.jp/eng/">www.nims.go.jp/eng/</a>
<i>Japan</i>	<i>National Institute of Advanced Industrial Science and Technology (AIST)</i>	<i>Toshihiko KANAYAMA</i>	<a href="http://www.aist.go.jp/index_en.html">www.aist.go.jp/index_en.html</a>
<i>Thailand</i>	<i>National Nanotechnology Centre (NANOTEC)</i>	<i>Siritham Na Ranong</i>	<a href="http://www.nanotec.or.th/index.php">www.nanotec.or.th/index.php</a>
<i>Malaysia</i>	<i>National Nanotechnology Directorate (NND)</i>	<i>Nur Aainaa Syafini Mohd RADZI</i>	<a href="http://www.mosti.gov.my">http://www.mosti.gov.my</a>
<i>China</i>	<i>Peking University</i>	<i>Alice ZHANG</i>	<a href="http://www.sinano.ac.cn">www.sinano.ac.cn</a>
<i>China</i>	<i>Suzhou Nanotech Co. Ltd</i>	<i>ZHANG Xijun</i>	<a href="http://www.nanoctr.cn">www.nanoctr.cn</a>
<i>Vietnam</i>	<i>Vietnam Academy of Science and Technology (VAST)</i>	<i>Tran Dai LAM</i>	<a href="http://www.ncst.ac.vn">www.ncst.ac.vn</a>

# Asia Nanotech Camp

ANF co-organizes Asia Nanotech Camp annually in different member economies

- **Fosters** young nanotechnology leaders (pursuing PhD, postdoc) in Asia.
- **Offers** unique educational opportunities for the young scientists in Asia to learn about the state-of-the-art nanotech advancements in different member economies
- **Provides** a platform for young aspiring researchers to communicate, network, inspire and share learnings from each other.
- **Launching** International Nano Olympiad (INO) 2017

2016 @ Austria



2015 @ Singapore

2013 @ Indonesia

2012 @ China

2011 @ Korea

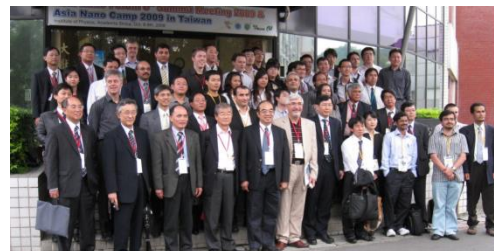


2010 @ SG & Malaysia

2009 @ Taiwan

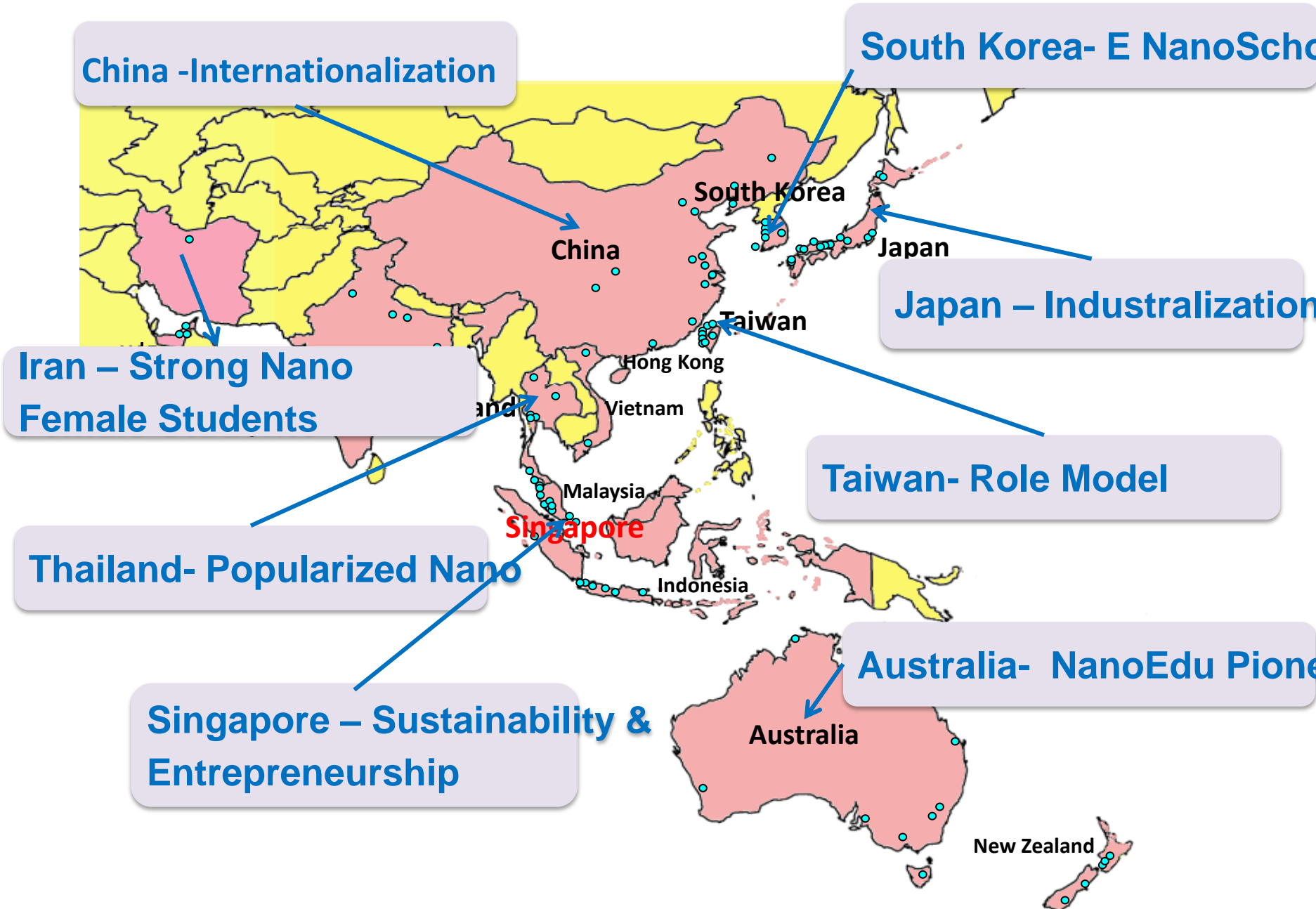
2008 @ Japan

2014 @ Iran





# Asia NSEE Highlights

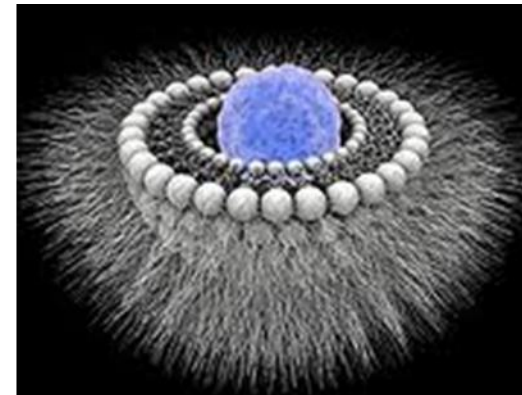
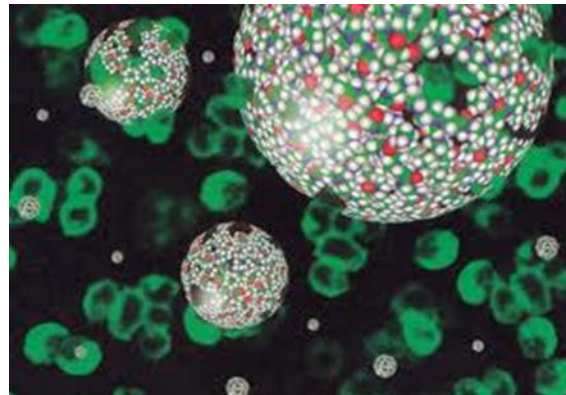
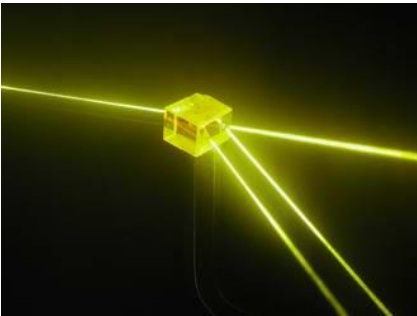


# Nano Education Pioneer: Australia

- Flinders Nanotechnology Degree - **World's first undergraduate degree in Nanotechnology**
- Various universities offer nanotech programs at both undergraduate and graduate level across Australia

# Nanotechnology Degrees

- Two streams for BSc, BSc (Hons) and BSc (Enhanced Hons 5Y)
  - **Quantum Nanostructures**
    - Prerequisites Year 12 Physics, Chem, Maths 1
  - **Biomedical Nanotechnology**
    - Prerequisites - Year 12 Chem
- **Masters of Science**– 1 yr course work, 1 yr research



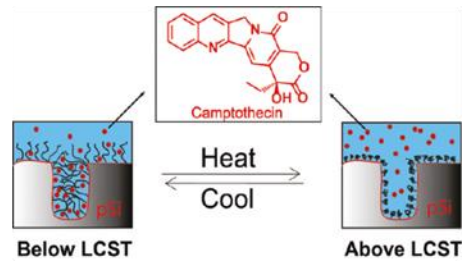


# Our students

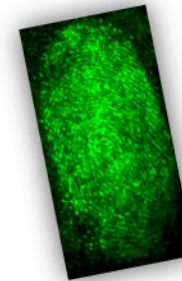
Examples of exciting projects our students are working on



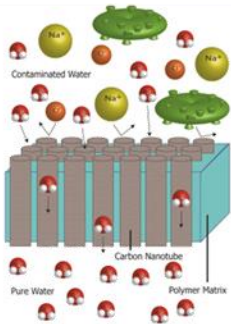
Solar Cells



Drug delivery



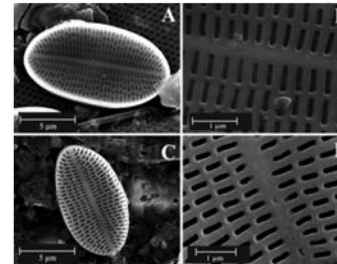
Forensic fingerprinting



Water treatment



Explosives

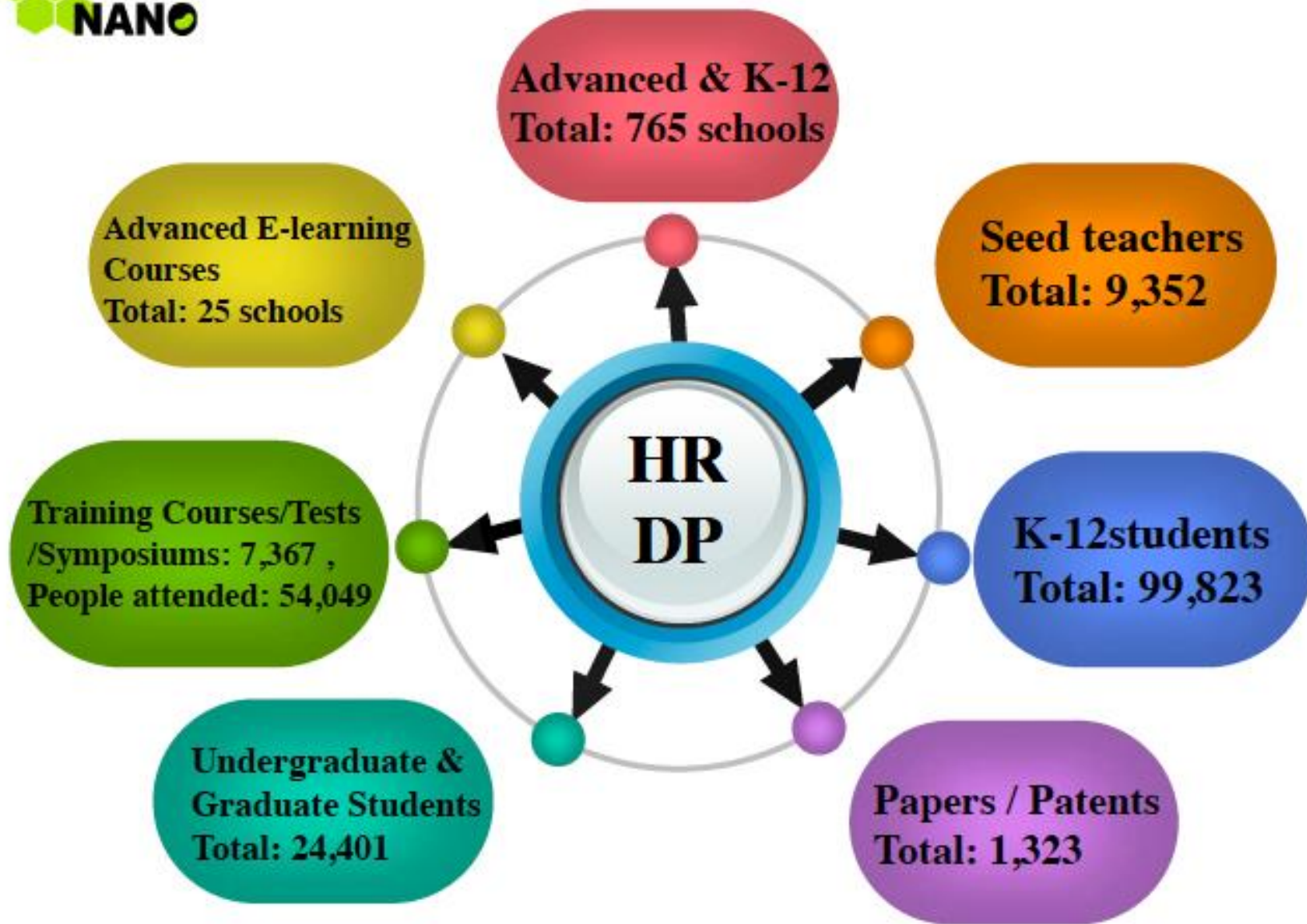


Climate change monitoring



# Role Model: Taiwan

- Top-Down, allocated 2.5% of total National Nano Program budget
- Integrated Approach: from K12, University, Industry to Public
- Textbooks for K12 Teacher & Students and for University
- Education focuses on Sustainability, Societal and International relevance
- Details at [nano.narl.org.tw](http://nano.narl.org.tw)





## K-12 Nanotechnology Education Program

Integrating Regional Nanotechnology K-12 Education Development Center resources and nurturing nanotechnology seed teachers



Constructing different-stage nanotechnology teaching media, and editing nanotechnology common materials used for national primary and secondary schools



Promoting K-12 Nanotechnology Education for International Exchange, and building a platform for resource sharing and exchange of experience



Developing support-materials for K-12 international publications, to promote the work in nano-science and technology education with the world



## Advanced Nanotechnology Education Program

Integrating regional training center in nanotechnology forward-looking personnel resources to help universities and colleges set up an interdisciplinary course of study and course of the nanotechnology



Producing nano-science and technology of digital multi-media teaching materials to promote the inter-institution distance learning courses, and introducing of experimental operations training courses



Organizing academic exchanges at home and abroad Nanotechnology seminars, creative activities such as competitions and science lecture



Establishing international academic exchange and cooperation channel to promote the internationalization of talent through training.

# E-Learning Platform- Korea

- Created the e-learning platform called e-NanoSchool system which also provides online lecture services
- Developed roadmaps for nano-education towards 2025 in progress
  - With the rapid growth of nano-related departments at universities, a systematic governance for nano-education is becoming an urgent necessity
  - With the increase in demand for specialized nano workforces, the reinforcement and the materialization of nano-education are necessary

# Nano Education 2025 : Main Theme in the 4<sup>th</sup> Phase NT Initiatives

## Vision

Establish the education ecology system for a creative NT professionals → Country with well Developed NT

## Target

Develop professionals with NT expertise through systemized education program

## University

- ▲ Develop Curriculum & Textbooks
- ▲ Certification
- ▲ Education linked to jobs
- ▲ R&D with Nanoinfra Structures
- ▲ Internationalized Education
- ▲ Consortium

## Industry

- ▲ NCS
- ▲ NT Lisense
- ▲ Program for Employee
- ▲ Lifetime Training Program

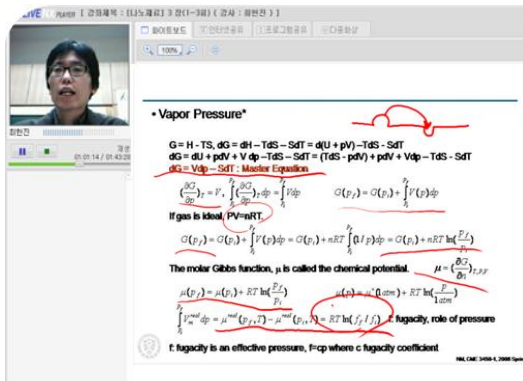
## Public

- ▲ Develop NT Contents
- ▲ Training Program for Teachers
- ▲ Nanocamp for Students
- ▲ NT Advertise for Publics

## 1 e - Nanoschool

### Description

The Nanotechnology Research Council operates an e-Nanoschool, a specialized educational program for nanotechnology. The e-Nanoschool consists of various programs, such as the e-Class, e-Journal Club, e-Tutorial etc., targeting undergraduate and graduate students, for the dissemination and vitalization of specialized knowledge.



- On-line lecture series on nanotechnology
- Invited lecturers are recommended by the Operation Committee
- Open to university students and people in the private sector
- Official Homepage : [e-nano.kontrs.or.kr](http://e-nano.kontrs.or.kr)

Program	Contents	Detailed Contents
e-Class	Online lecture that teaches basic subjects (university level) related to nano science and technology (twice a week for each subject)	
e-Journal Club	Recent research outputs	Online seminars directly by the authors that introduces the recent research results of domestic researchers published in top journals (once a month)
e-Tutorial	Online concentrated education during the vacation by the experts in relevant fields with the selected professional nano subjects (twice for each subject)	
System Improvement	Mobile system construction	Mobile system construction and upgrade





# Industry Relevance: Japan

- Osaka University offers multidisciplinary and Academia-Industry nano education program at graduate school level ([http://www.insd.osaka-u.ac.jp/index\\_e.html](http://www.insd.osaka-u.ac.jp/index_e.html) and <http://www.sigma.es.osaka-u.ac.jp/pub/nano/Homepage%28Eng%29/index.htm>)
- Tsukuba University (one of the key members of the Industry Consortium “Tsukuba Innovation Arena (TIA)” ) Offers PhD Honors Program on Nanoelectronics Including Exchange Program with a Network of International Nanoelectronics centers (<http://en.tsukuba-honorspg.jp/>)

# Nanoscience and Nanotechnology Research and Education in Osaka University: Interfaculty Organization for Planning and Development



**Education,  
Research Promotion,  
and  
University-Industry  
Collaboration Boards**

**Graduate Schools:** Science, Medicine,  
Pharmaceutical Science, Engineering,  
Engineering Science, Frontier Bioscience  
**Research Institutes and Centers:**  
Scientific Industrial Science, Joining and  
Welding Research, Laser Engineering,  
Ultra-high Voltage Electron Microscopy,  
Quantum Science and Technology under  
Extreme Conditions, Solar Energy  
Chemistry, NanoScience Design



**OU Academia-Industry Liaison Consortium  
for Human Resource Development on  
Nanoscience and Engineering (ALICE-ONE)**

**Support  
and Advise**



**OU Institute for  
NanoScience Design**

Nano-related education and research  
training design under intra- and inter-  
university cooperation, academia-  
industry liaison and international  
academic exchange

**Proposal**

**Support  
and Advise**

**OU Nanoscience and  
Nanotechnology Alliance**  
Interfaculty Organization for Planning  
and Development of Research

**Mutual**

**Cooperation**

**Sub-committees**

**Future Research Initiative  
Group Project Support  
for nano-related research**

- Nano Science Technology Alliance
- Computational Nano-Material Design: New Strategic Materials
- Green New Material 'making things'
- Electronics of Organic Materials

**Investigation and Discussion  
of Research Trend**

**Research Planning and  
Project Support**

**Regional and  
International  
Cooperation**

**Information Dispatch**

**Committee for Implementation  
of Education and Research  
Training Programs**

**MSc course:**

Advanced Interdisciplinary Education Program

**PhD course:**

Academia-Industry Liaison Project-Aimed  
Learning and Training (AIL-PAL)

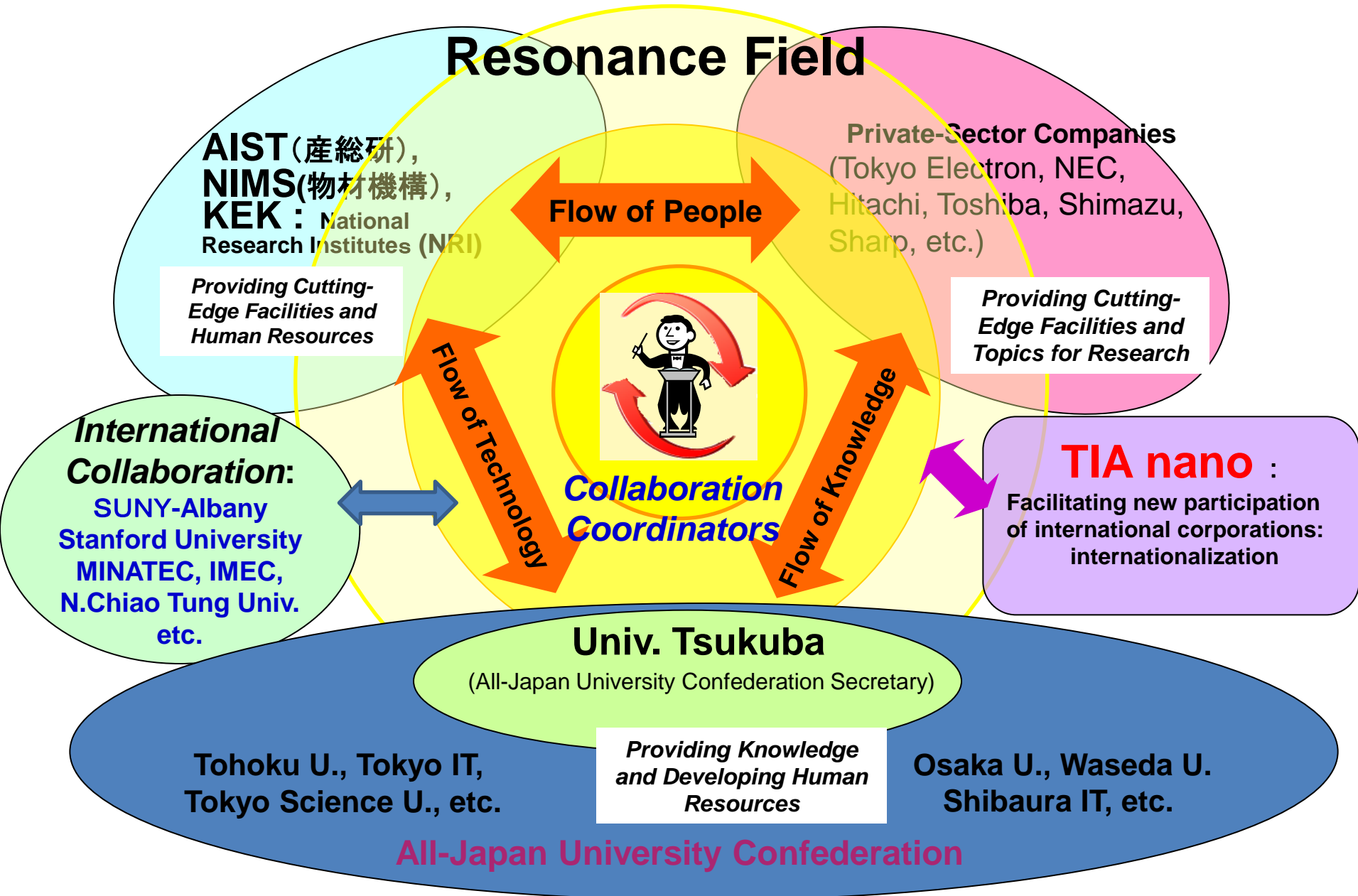
Advanced Multi-Disciplinary Exploratory  
Research (AMER)

**Refresher course for part-time students:**

Graduate-level refresher program



# Tsukuba University/NRI/Industry Collaborative System for World-Level Education and Research



# Internationalization: China

- Funded by the MOE as the only Nano Focused Univ. among the 17 selected “Pilot Universities”
- Joint Curriculum between Soochow University (inside Suzhou Industry Park where Nanopolis is located) and Univ. of Waterloo for Bachelor Degree in NanoMaterials and Technology
- Joint Graduate Program (MSc and PhD) with a few Canadian Univ.

# University Innovation Capacity Building Program- 2011 Program

On 11 April 2013, Ministry of Education awarded 14 2011 Collaborative Innovation Centers (CICs).

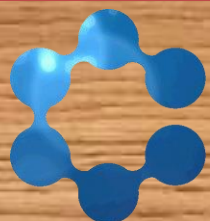
*Soochow University was awarded "Collaborative Innovation Center of Suzhou Nano Science and Technology"*

**2011 program** aims to promote **collaborative innovation** among higher education institutes in the areas of science, technology, economy and culture, so as to build **innovation capacity** & enhance **national innovativeness & competitiveness.**

新闻  
“2011”计划：首批国家协同创新中心名单

中心名称	主要单位	类别
苏州纳米科技协同创新中心	苏州大学 苏州工业园区等	区域
江苏先进生物与化学制造协同创新中心	南京工业大学 中科院过程所等	区域

“2011计划”首批认定名单公示  
高等教育第三个国家工程正式实施



**One  
Major**

**Nano Materials &  
Technology**

**Three  
Directions**

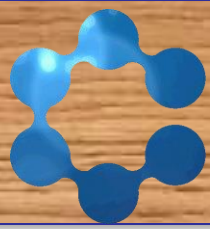
**Nanomaterials Science &  
Engineering**

**Nanobiotechnology**

**Nano Optoelectronics**



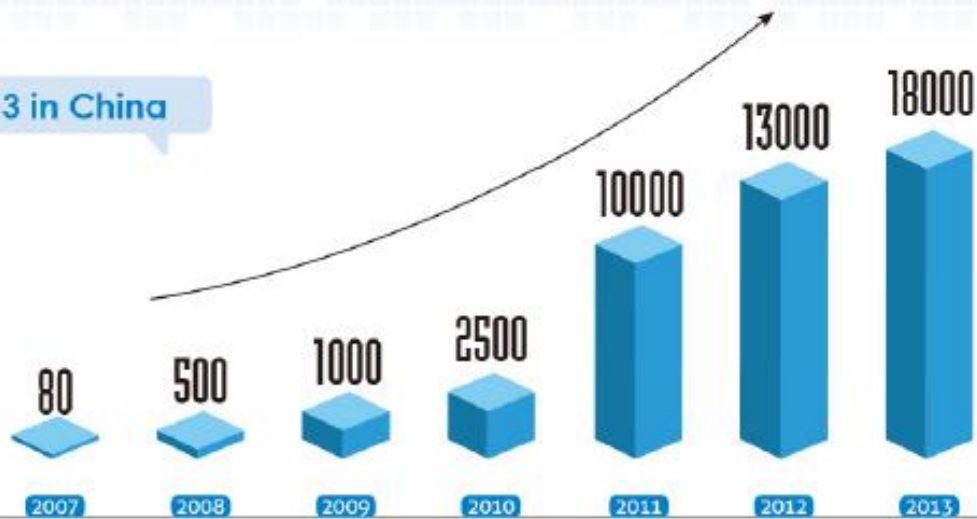
- ✓ International Curriculum System
- ✓ All courses taught in English



- “2+2” Doctoral Degree Program ;
- “3+1+1” Bachelor & Master Degree Program ;
- Exchange Student Program;
- Co-op students from Waterloo;
- Summer Courses



iCAN'07-13 in China

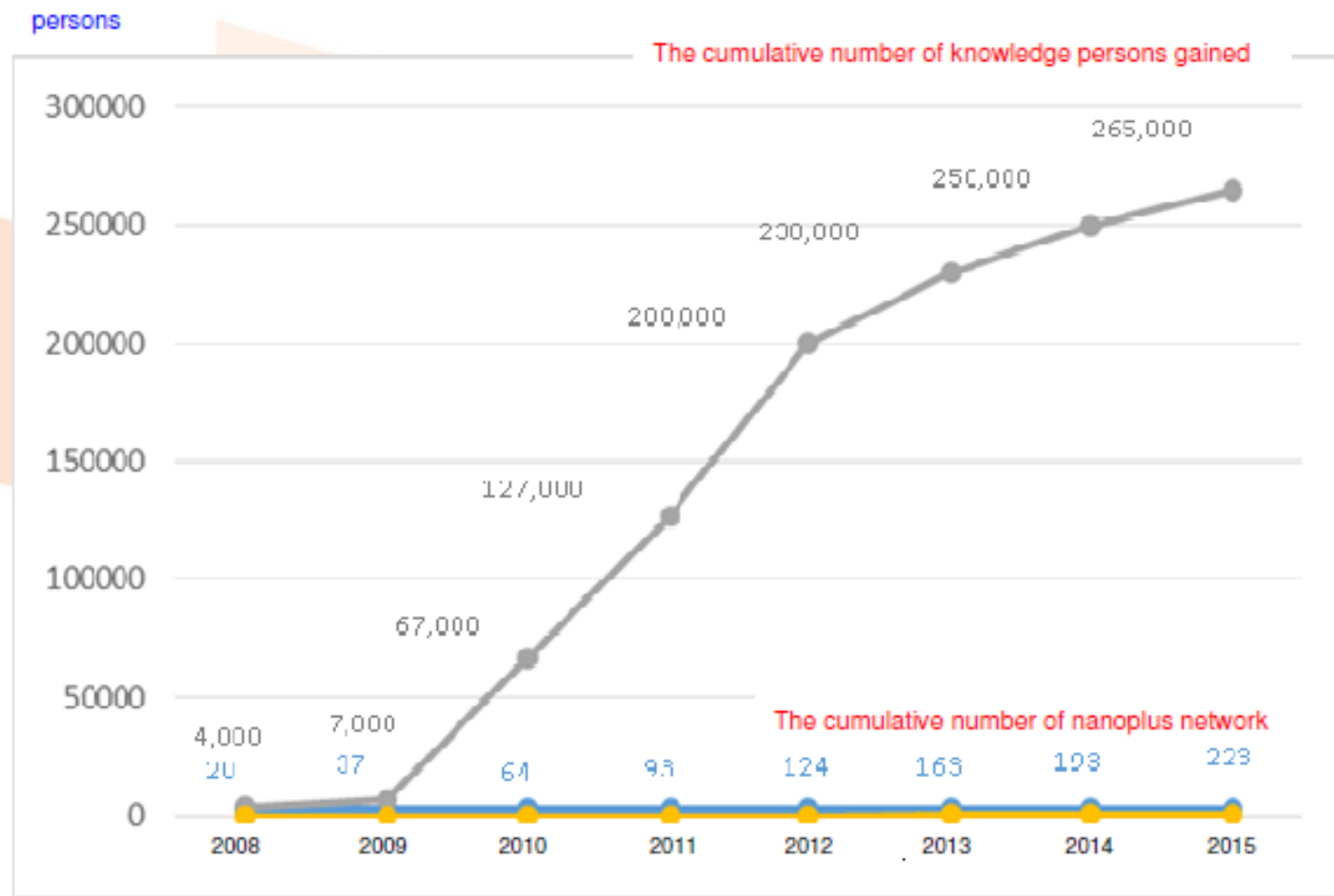




# Public Outreach- Thailand

- Aim to become ASEAN leader in nano education
- National Nanotech Center (NANOTEC) operates the Nanotechnology Learning Center (NanoPlus Learning Center) has reached to 270,000 trainees since 2008 with 230 networks established
- E Learning platform with 16 nanotech online courses
- Popularized Nano and reached out to the Royal Family
- Technology & Innovation for Sustainability Module at KMUTT

# Graph showing implementation of activities to targeted Audience from 2008 - 2015



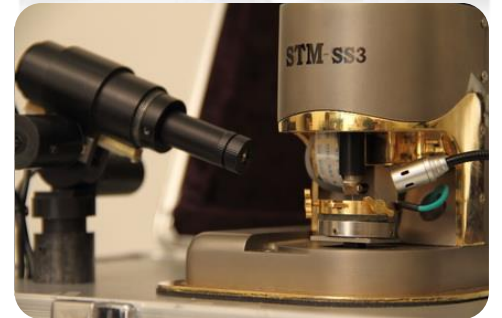
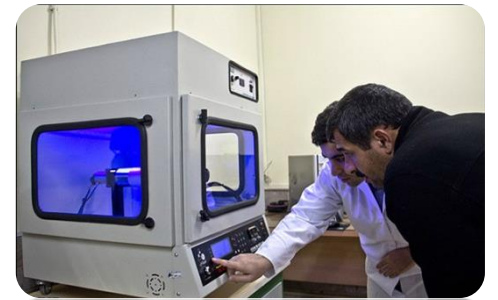
# Nano Olympiad with Majority Girls

## Participation: Iran

- Fast growth in both high school and university education (350,000) in Lab equipped with home-made instruments.
- Strong female participation in Nano
- Total of about 20,000 nano scientists including research students

# Student Educational Programs in Iran

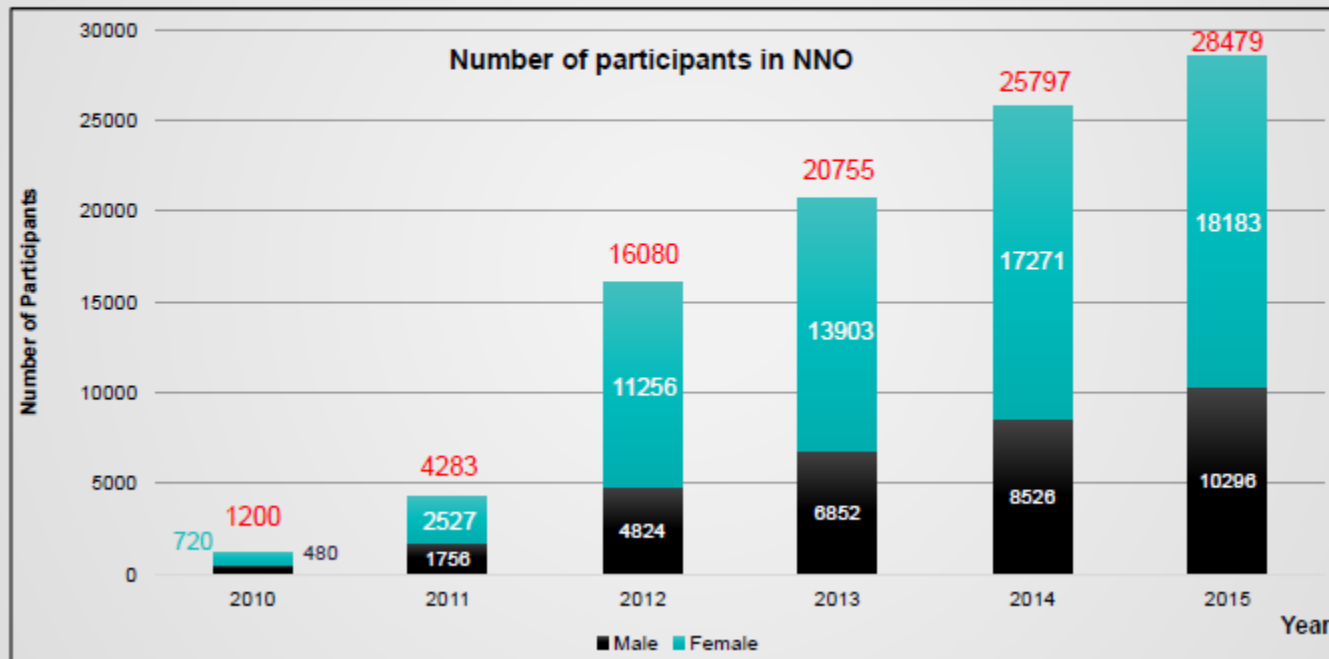
- More than **350,000** high school students have been trained about nanotechnology by **NANOCLUB** activities (2008-2014)
- Establishing **8** Educational Nano-Labs for High School Students equipped with instruments such as STM, Electro-spinning, Wire Electrical Explosion, Desktop Sputtering, ...



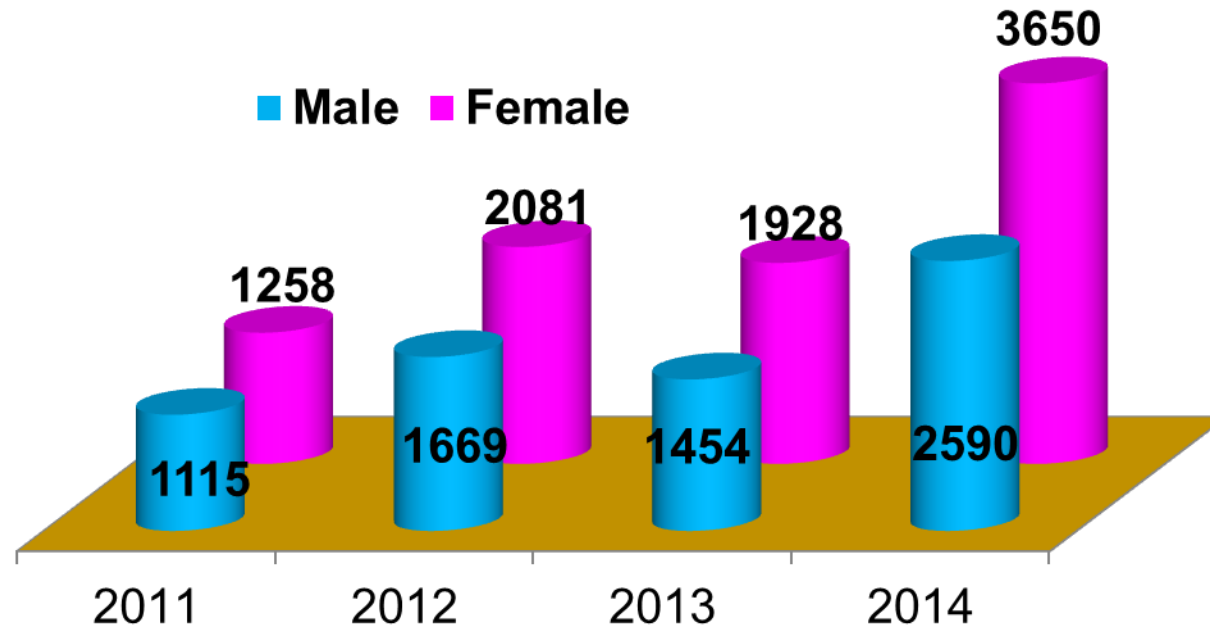
# NANO - OLYMPIAD

- More than 28000 students participated in 2015 Nano-Olympiad
- Iran is the only country which has held such competition.

National Nanotechnology Olympiad (High School level)



# Annual Nanotechnology Competition for University students



# Sustainability and Entrepreneurship: Singapore

- Nanotechnology Diploma at Nanyang Polytechnic
- National University Singapore (NUS) pioneered (with Support of EDB) Nano Education in Singapore in 2002
  - Nano Engineering Module
  - Minor Programme in Nanoscience
  - General Education Module: Introduction to the Nanoworld
  - General Education Module: Designed for Training Holistic Thinking
    - Problem Solving Skills Development
    - Nano Enabled Solutions for Sustainability



# Nanotechnology for Everyone- From Smartphone, Innovation to Entrepreneurship

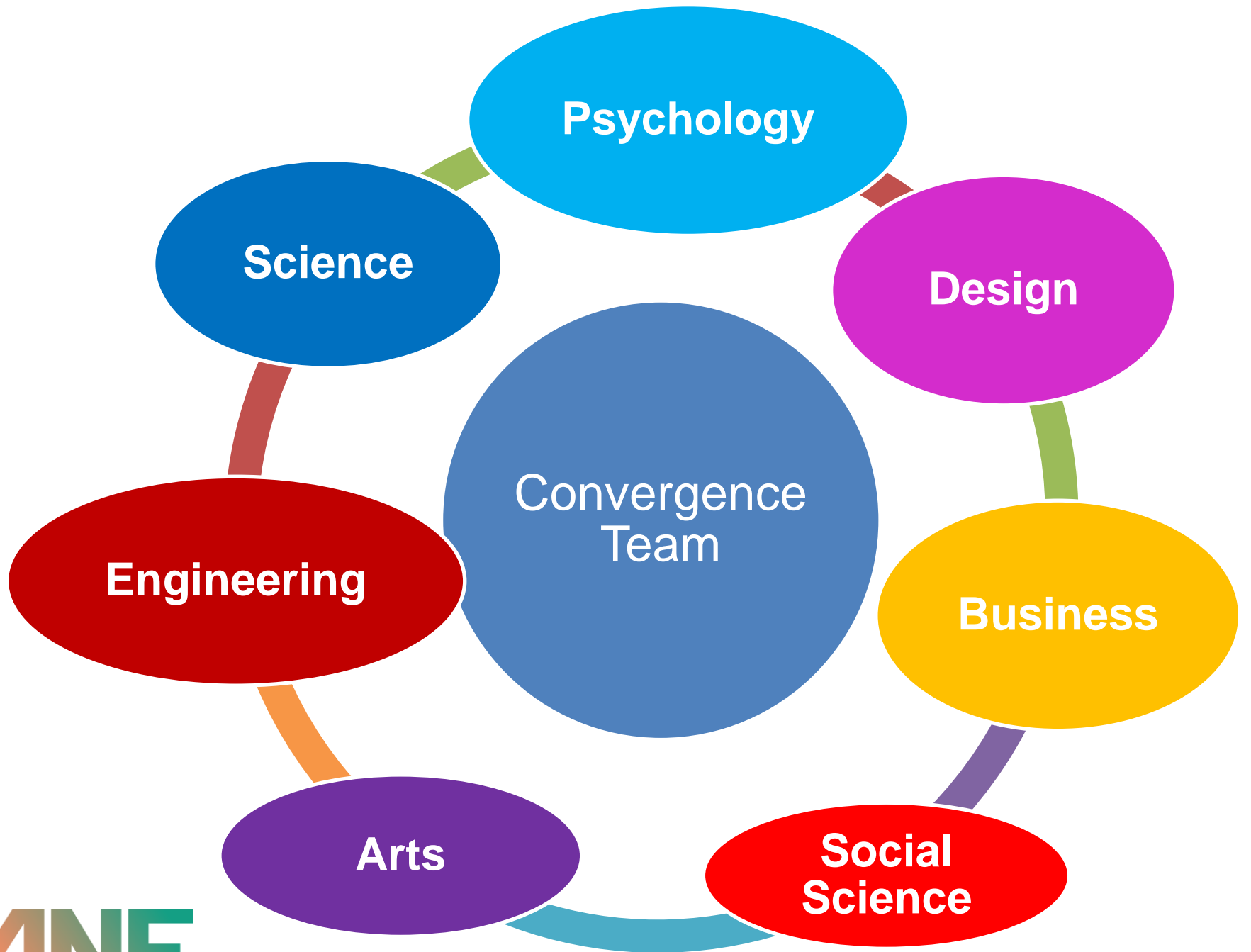
We created a special course addressing Innovation and Entrepreneurship based on theme of Nanotech & Sustainability.



- ✓ **Technical Areas-** Bioinspired Nanotech, Carbon Nanomaterials, Solar Technology, Battery Technology, Green Materials, and Nanoelectronics
- ✓ **Empower** students with the holistic mind set and soft skills in addition to science and engineering knowledge
- ✓ **Attract Diversity**
- ✓ **Simulate Entrepreneurship-** Expose students to entrepreneurs, investors, scientists, and policy makers
- ✓ **Inspiring Disruptive Innovation-**transforming industry and economic landscape









**Responsibility**

**Passion**

**Appreciation of Diversity**

**Skills & Qualities**  
Obtained from the course

**Business Development**

**S&T Knowledge**

**Communication**

**Entrepreneurship**

**Organization**

**Problem Solving  
(Analytic and Strategic)**

# Closing

- *ANF Education Working Group Coordinates Sustainable Development activities*
- *Will present SNO Meeting Highlights at Japan Nanotech 2017 during Feb. 15-17 to ANF Executive Committee*
- *Austrian Member (BMVIT) leads Sus Nano initiative.*
- *Next SNO International meeting in Vienna?*
- *I would like to thank SNO and ANF members for supporting this presentation!*
- *Thank YOU for your kind attention and Together we will transform our world towards sustainability!*