

***Role of National Science Council
in Taiwan's Science and
Technology Development***

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Washington, D.C.***

Outline

- **NSC Missions**
- **Major Efforts in Recent Years**
- **Science Park Development**
- **International Science and Technology Collaboration**

NSC Missions

Promotion of National S&T Development

- ***Formulating Four-year plans***
- ***Reviewing, monitoring and evaluating of government S&T programs***

Support for Academic Research

- ***Funding research in physical sciences, life sciences, applied research and engineering, science education, humanities and social sciences.***
- ***International cooperation***

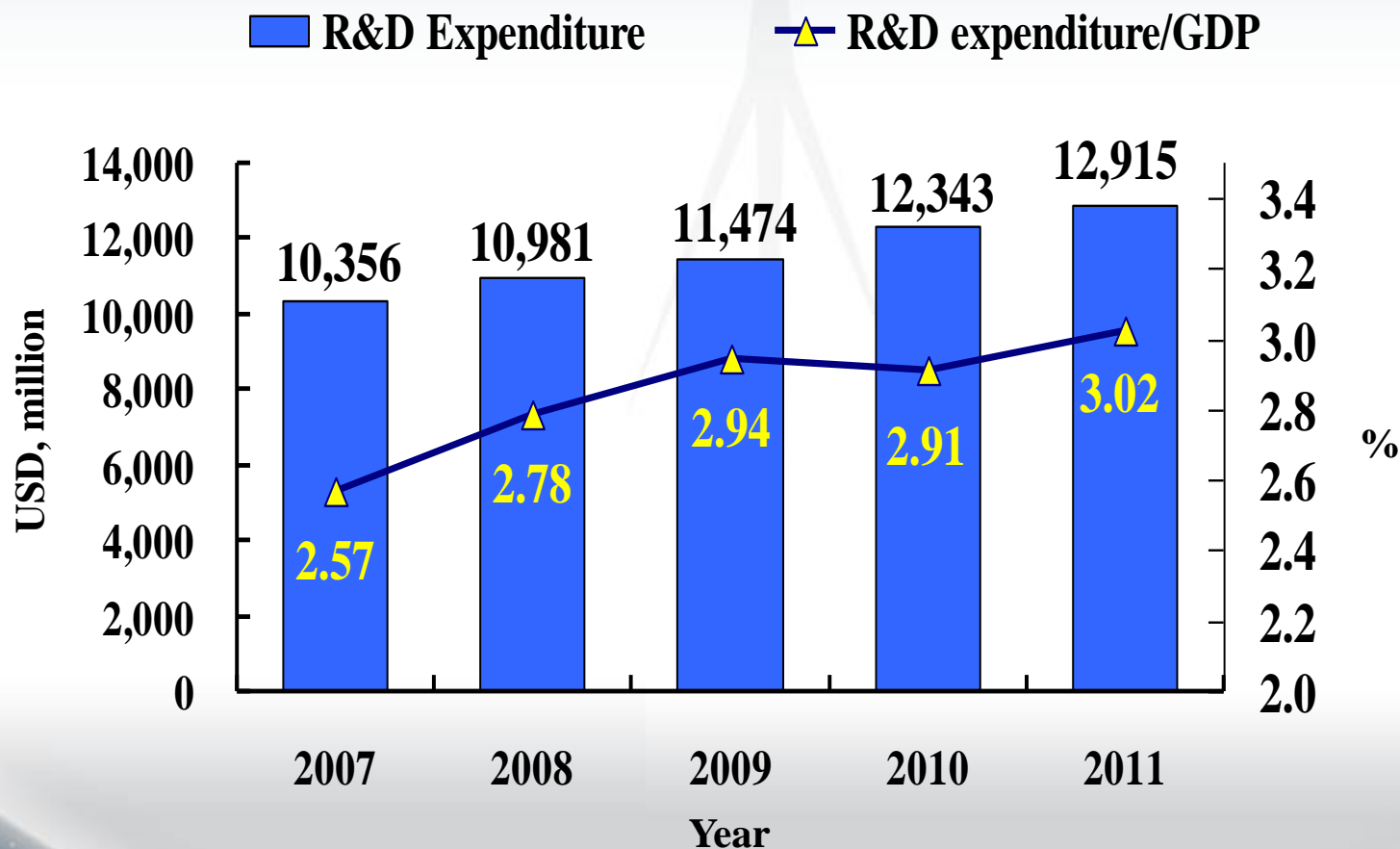
Development of Science Park

- ***Providing infrastructure & one-stop service to high-tech companies***
- ***Enhancing R&D and production capability***

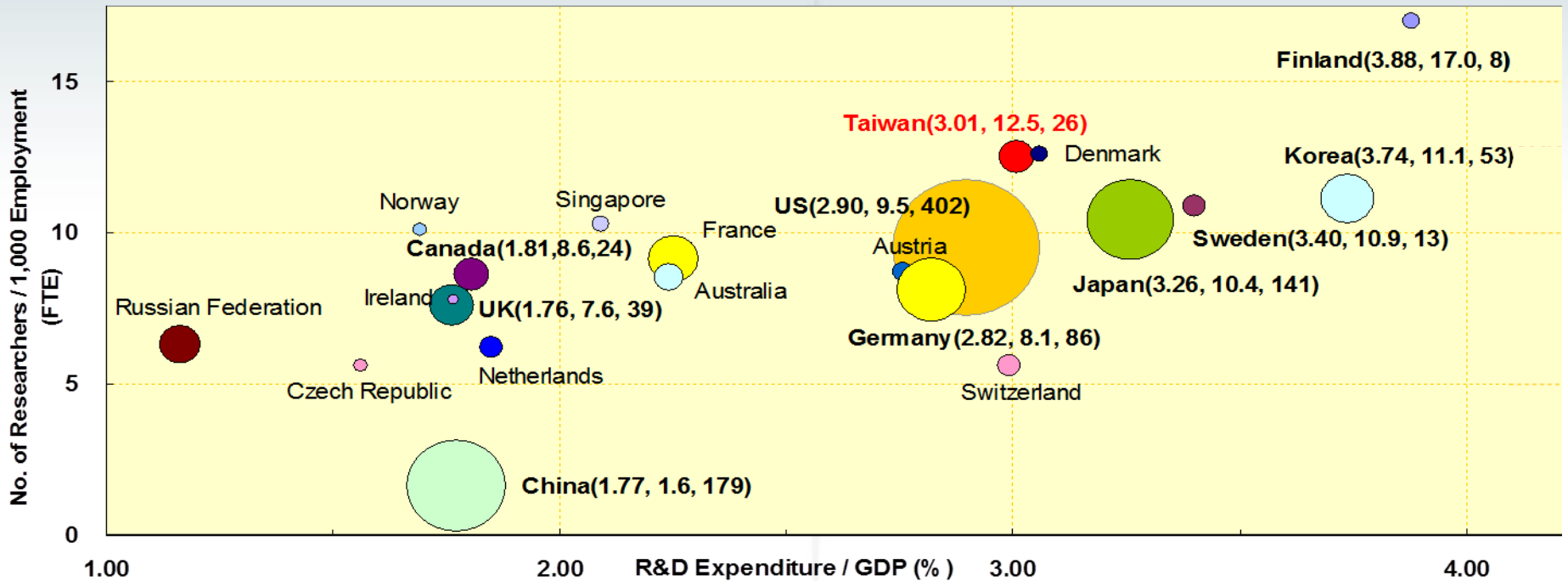
R&D Expenditure in Taiwan

Total: 12.9 Billion USD

(73.8% from private sector, 26.2% from government)

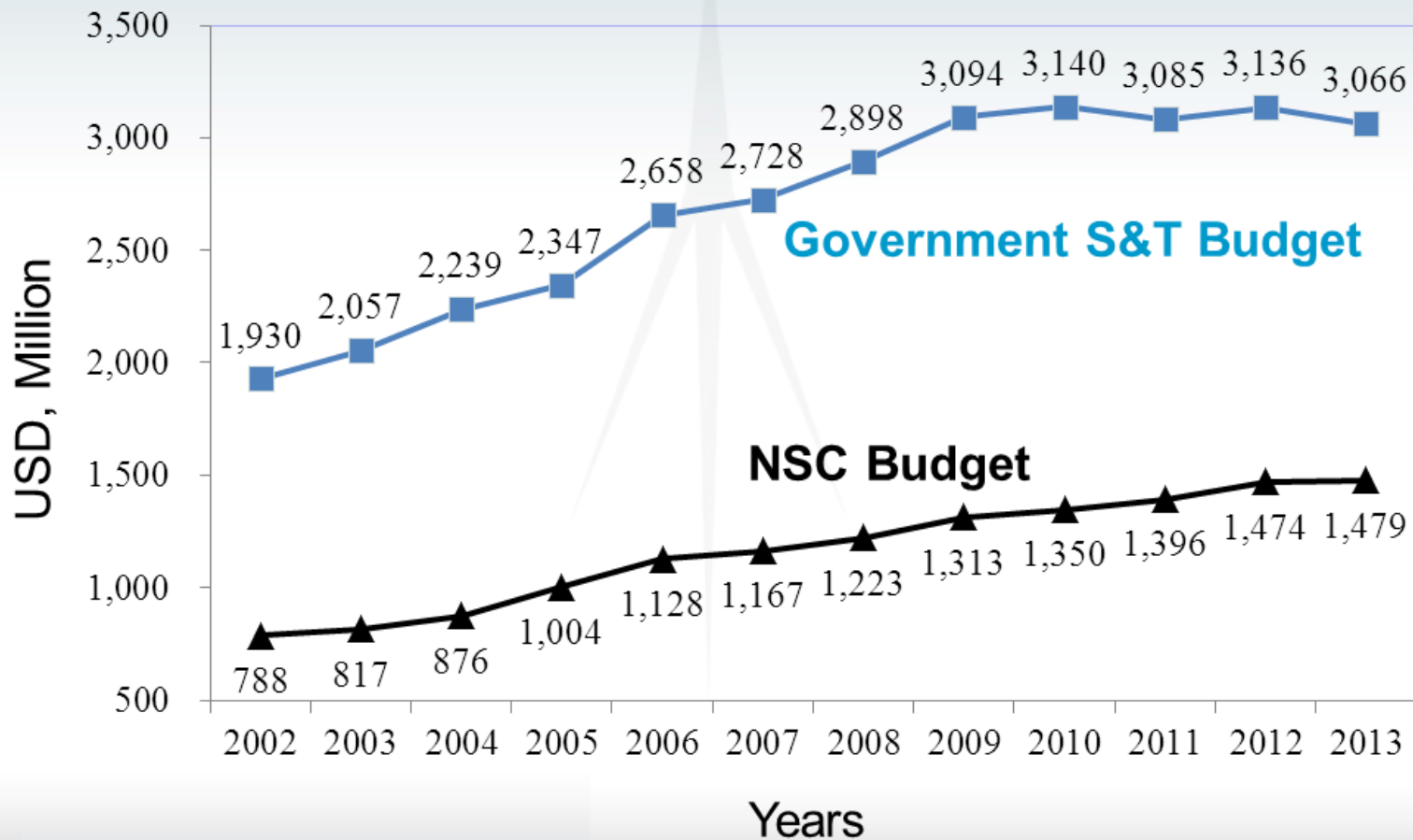


R&D Expenditure & Manpower

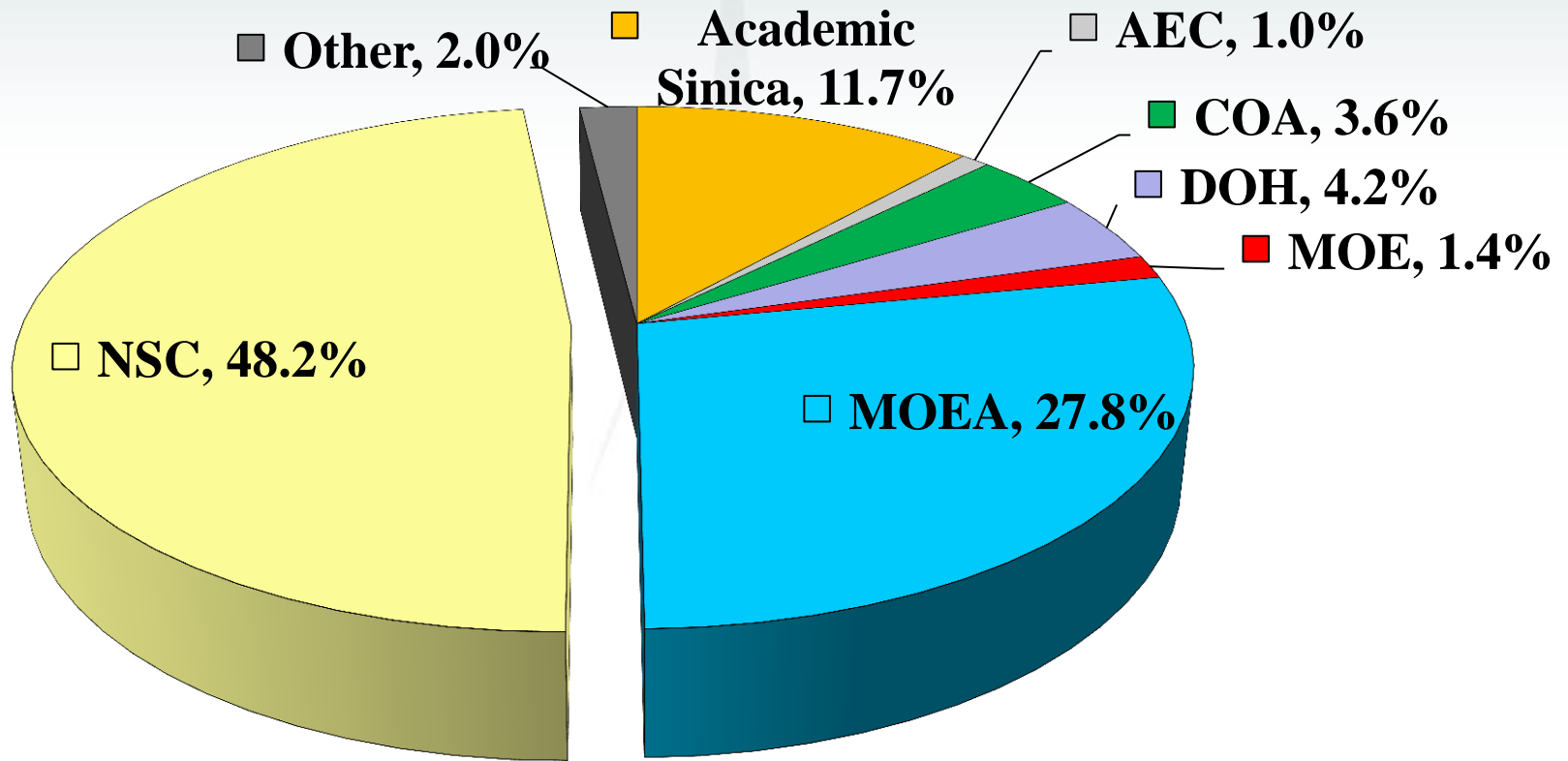


- Notes :**
1. Expenditure scale, calculated on Purchasing Power Parity (PPP), is indicated by colored circular area.
 2. Figures behind the country indicate R&D expenditure as a percentage of GDP(%), researchers per 1,000 employment (FTE), and R&D expenditure (Billion USD PPP) respectively.

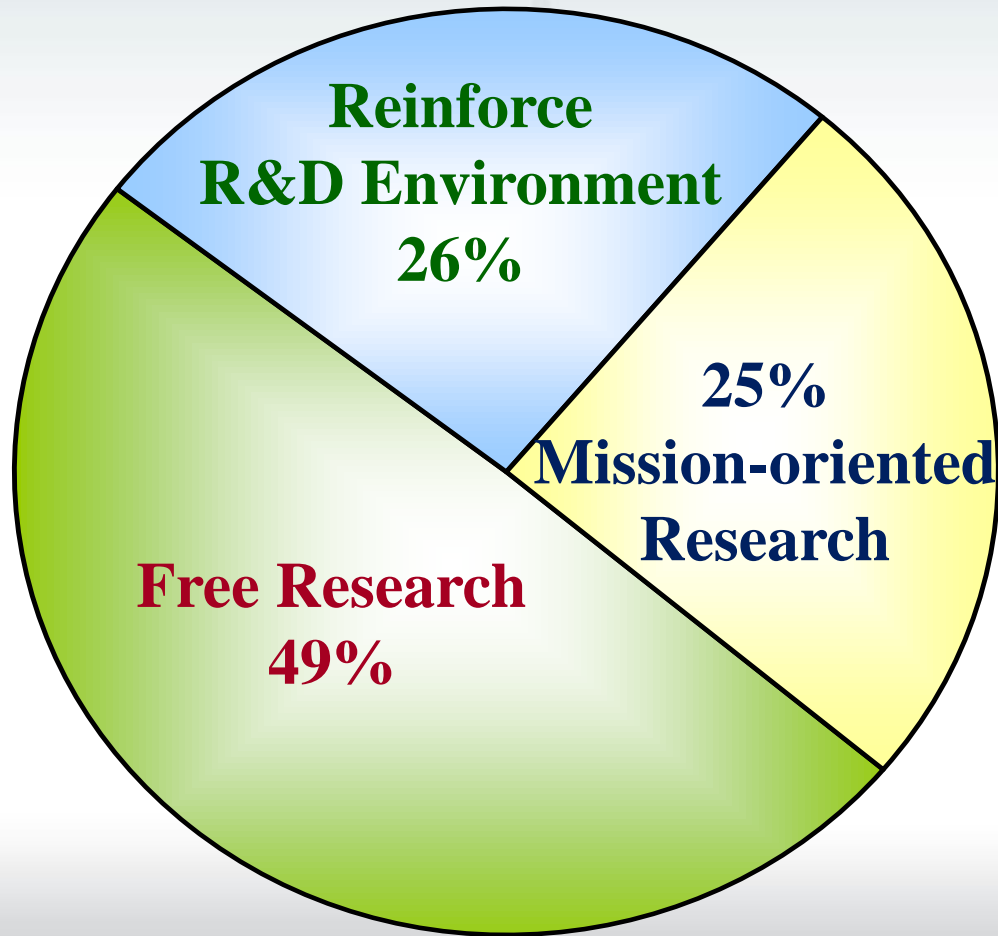
R&D Commitment by Government



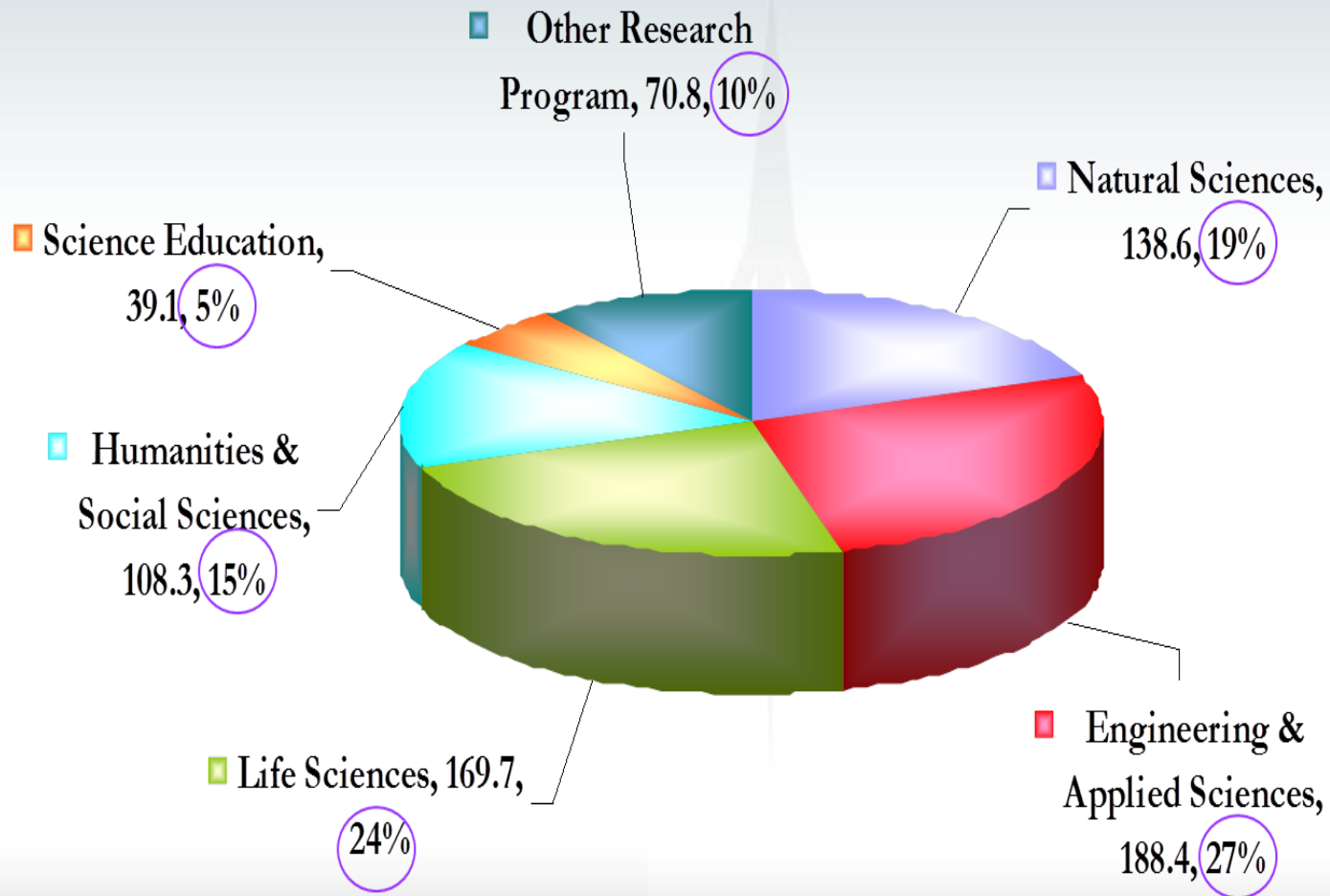
Distribution of Government S&T Budget (2013)



Distribution of NSC budget



NSC Funding by Research Field in 2011



Performance of S&T Research in Taiwan

Number of U.S. Granted Utility Patents and Rank by Taiwan

2007		2008		2009		2010		2011		2012	
No	Rank	No	Rank	No	Rank	No	Rank	No	Rank	No	Rank
6,128	5	6,339	5	6,642	5	8,239	5	8,781	5	9,907	4

SCI & SSCI & Citation Rankings of Publications from Taiwan

<i>SCI & SSCI Papers (2011 Rank)</i>	<i>Citation Times (2007-2011 Rank)</i>
26,648 (16)	427,324 (19)

Data source : U.S. Patent and Trademark Office and InCites, Thomson Reuters (2012)

Major Efforts in Recent years

Promoting innovation

- ◆ *Improve the evaluation mechanism*
- ◆ *Pioneer Grants*
- ◆ *Free-style Excellence Grant*

Cultivating talent

- ◆ *Postdoc/PhD student training abroad*

Promoting research translation

Promoting innovation

◆ *Improve the evaluation mechanism*

Abolished Rigid Research Performance Index

- ✘ “Objective, quantitative evaluation of research output”
- ✘ Mechanical calculation of Impact Factors and journal ranking
- ✘ Reviewers rely on index
- ✘ Heavily used by universities; neglected teaching and real impact

Replaced with flexible indicators on impacts

- ✘ Advanced science, engineering, human life, and social impacts

Promoting innovation

◆ *Pioneer Grant*

- ❖ Provide “wild” ideas a chance to try
- ❖ No need preliminary results
- ❖ “Innovation” rather than “past achievements”
- ❖ ~700 applications, ~200 selected after 1st round review
- ❖ Under 2nd round review

Promoting innovation

◆ *Free-style Excellence Grant*

- ✘ **No restrictions, No format**
- ✘ **7M USD/year for 2-4 grants (4 years)**
- ✘ **46 applications from 33 Institutions**
- ✘ **4 were selected in 2013, 0.8M to 2.3M**

Cultivating talent

◆ *Opportunities for Research Overseas* (*Outgoing and Incoming to Taiwan*) For Faculty

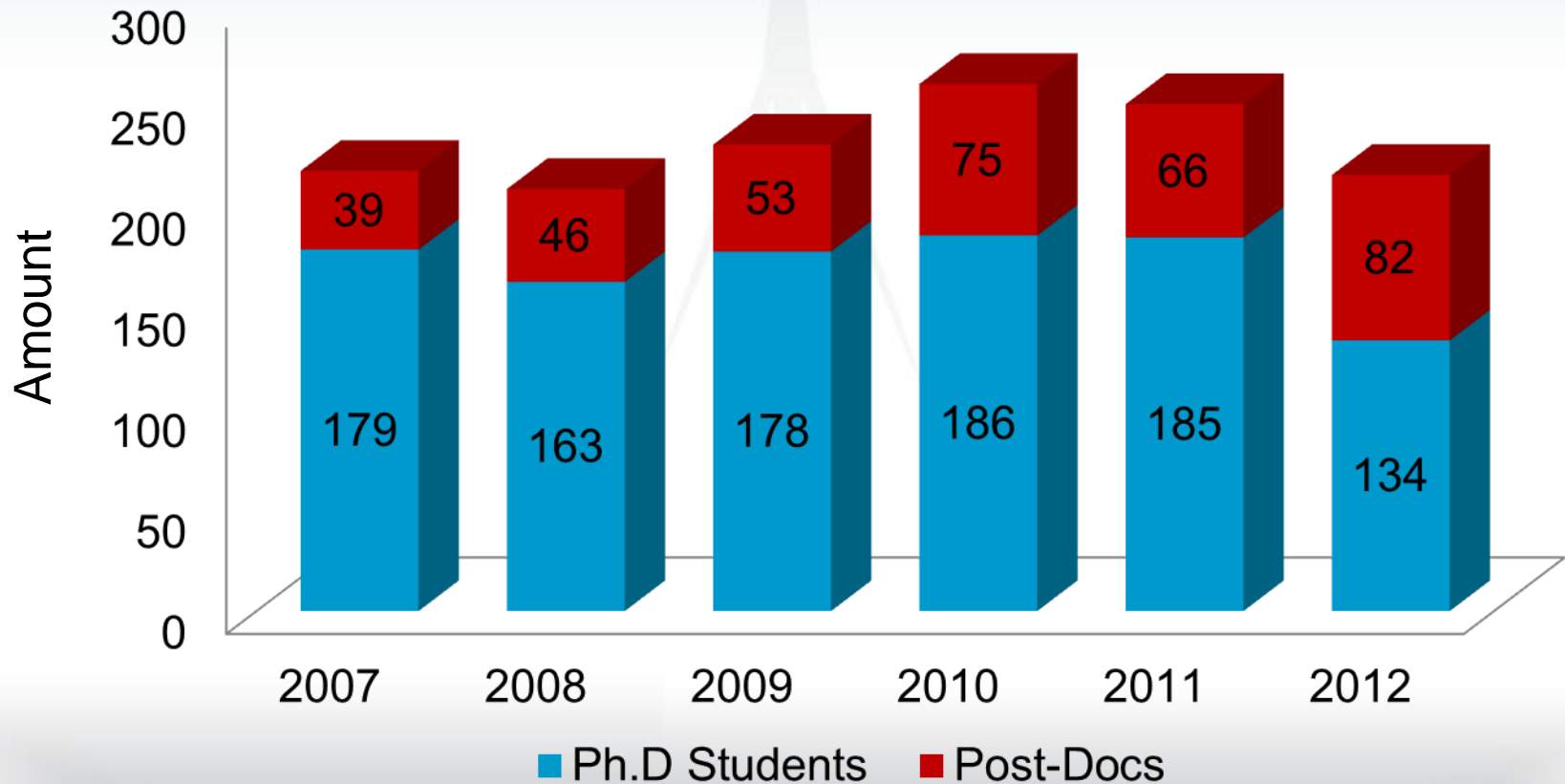
- ※ Short-term research stay overseas (3~12 months)
- ※ **Inviting faculty from abroad (one week)**
- ※ Attending international conferences held overseas
- ※ **Organizing international conference in Taiwan**

For students (Ph.D./post-docs)

- ※ Attending international conferences
- ※ **Overseas Research Training Program**
for postdoctoral research up to 24 months
for graduate students up to 12 months
- ※ **Summer Institute in Taiwan program**

Cultivating talent

◆ Overseas Research Training Program



Cultivating talent

◆ *Dragon Gate Program*

- ✘ Targeted host institutions and fields
- ✘ Encouraging Taiwan team to develop long-term cooperative projects with its foreign partner
- ✘ Team: PI & 1~3 Ph.D. students or Post-Docs
- ✘ Visit: Ph.D. students or Post-Doc : 10 ~24 months
PI and Co-PI : 2 months/year

Cultivating talent

◆ *International Research-Intensive Center of Excellence (I-RiCE)*

✘ Collaboration between Taiwan research universities and top international research institutions

✘ Establish the Center as a research hub for international collaboration

✘ Granted 10 Centers between 2010 and 2013

*10 Granted **I-RiCE** Programs*

(5 years programs)

1. NTU-**INTEL**
 - **Connected Context Computing Center**
2. University System of Taiwan-**UCSD**
 - **Advanced Bioengineering Research Center**
3. NCU- **Beth Israel Deaconess Medical Center-Harvard Medical School (Biomedical Mathematics)**
 - **Center for Dynamical Biomarkers and Translational Medicine**
4. NTU- **UTMDACC**
 - **International Center of Excellence in Cancer Research**
5. NTU- **UC Davis**
 - **Plant and Food Biotechnology Center**



NSC

10 Granted I-RiCE Programs

6. NTU- *French National Center for Scientific Research-
Pierre and Marie Curie Univ*

- **Joint Center of Excellence in Intelligent Robotics and
Automation Research**

7. NCKU- *IBM*

- **Supercomputing Research Center**

8. NCTU- *UC Berkeley*

- **Advanced Heterogeneous-Integration of Green
Electronics Research Center**

9. NCKU- *Russian Academy of Sciences-Moscow MV
Lomonosov State Univ*

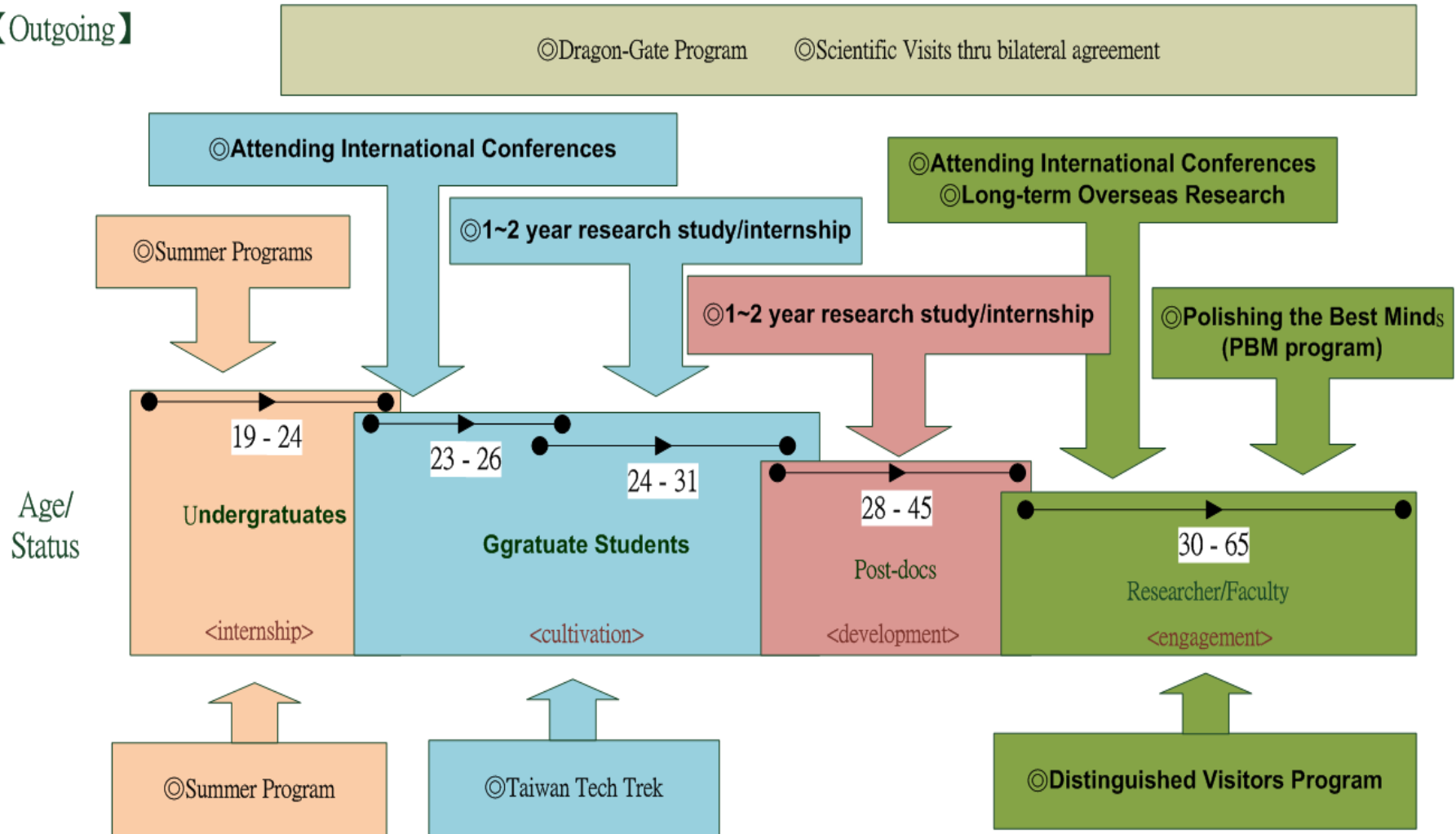
- **Int'l Wave Dynamics Research Center**

10. NTNU- *Pennsylvania State Univ*

- **The Advance Center for the Study of Learning Science**

NSC International Exchange Programs and Manpower Cultivation Funding Opportunities

【Outgoing】



【Incoming】

◎International Research-intensive Center of Excellence (I-RICE) ◎Scientific Visits thru bilateral agreement

◆ *Bridging the Gap between Academia and Industry*

- 1. Meeting industrial needs**
- 2. Providing core technology**
- 3. Concurrent technology and business development**
- 4. Fostering Techno-entrepreneurship**
- 5. Supra Integration and Incubation Center (Si²C)**
- 6. Stanford-Taiwan Biomedical (STB) Program**

Promoting research translation

◆ *Pioneer Grants for Academia-Industry Cooperation* *Meeting industrial needs*

1. Industries raise the needs, and academia provide the solutions
2. Aiming at international competitiveness and technology breakthrough
3. ~ 5M USD/year/grant x 5year
4. Cooperates provide >\$2.7M matching funds
5. Approved 2 projects in 2013 :
 - (1) **Path finding for 7–5 nm Semiconductor Technology Nodes**
(NTU + Taiwan Semiconductor Manufacturing Company).
 - (2) **Advanced Technologies for Next-generation Steel and Its Green Processes as well as Innovative Applications in Steel Products**
(NCKU + China Steel Corporation).

Promoting research translation

◆ Industry-Academic Technological Alliance

Collaborative Projects

Providing core technology



Up to 100K USD
Per Project



Core Technology

Technology
Service
Advice



Inter-industry Members

Promoting research translation

◆ *From IP to IPO Program*

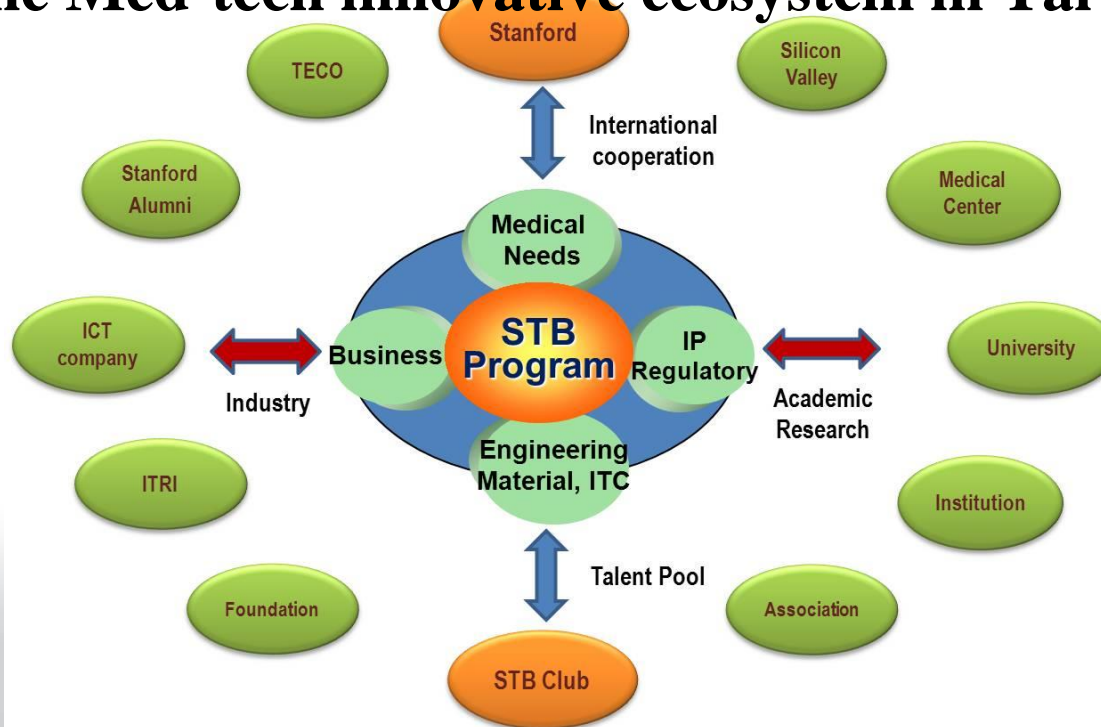
Fostering Techno-entrepreneurship

- ❖ **Call for business plans from universities**
- ❖ **Step-wise selection (over 6 month):**
- ❖ **242 applications => 40 => 20 => 10 => 4-6 winner teams**
- ❖ **67K USD prize as investment fund**
- ❖ **Invited heavy-weight corporations, international entrepreneurs to provide lectures and mentorship**

Promoting research translation

◆ *Stanford-Taiwan Biomedical (STB) Program*

- ❖ A unique blend between the innovative Med Tech culture in the Bay Area and brilliant young scientist from Taiwan.
- ❖ Training the next generation of medical technology innovators/entrepreneurs.
- ❖ Build-up the Med-tech innovative ecosystem in Taiwan.



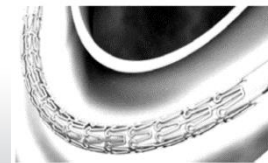
Promoting research translation

◆ *STB Achievement 2008-2013*

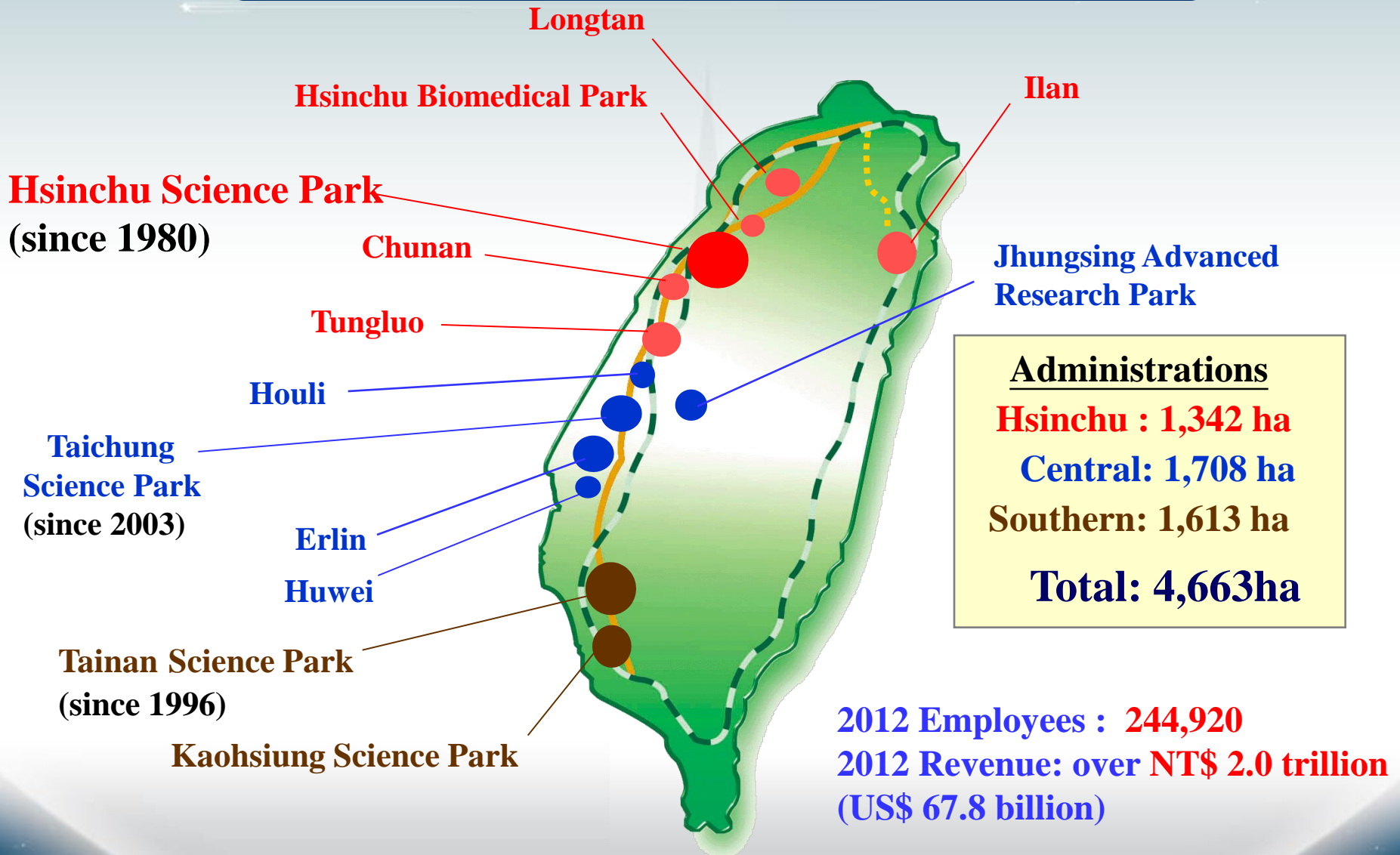
MedTech Talent Training

Stanford Training

- Total 360 applicants including 50 MD and 125 PhD
- 27 STB scholars selected: 11MD, 14 PhD
- 7 entrepreneurs/5 start-ups



Science Parks Development





Taiwan's Biotech Clusters

The 3 Bioparks which have strong ties with Si²C

NanKang Biotechnology Plaza
Focus on Pharmaceutical
(Academia Sinica, Universities, Hospitals)

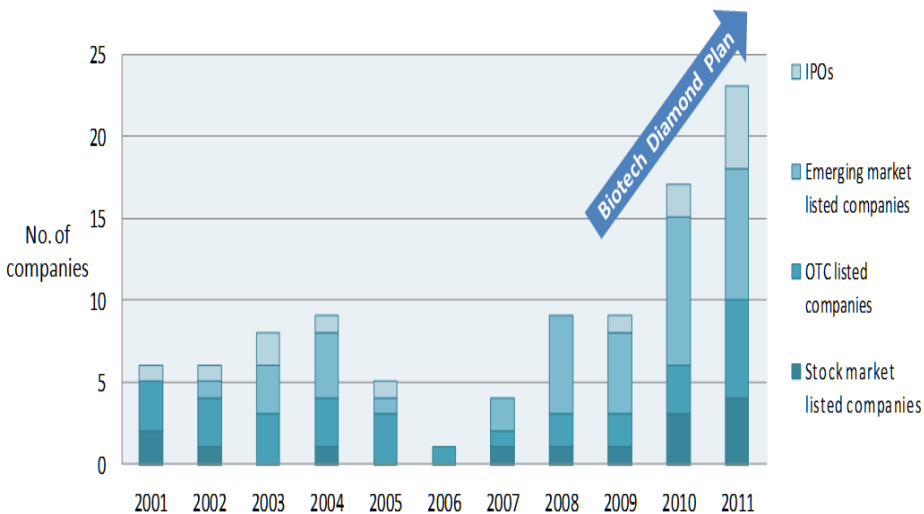
Hsinchu Biomedical Science Park
Leveraging ICT industry, focus on Medical Device
(ITRI, NHRI, FERDI, Universities, Hospitals)

Southern Taiwan Science Park
Focus on Dental & orthopedics tools and instrument
(MIRDC, Universities, Hospitals)

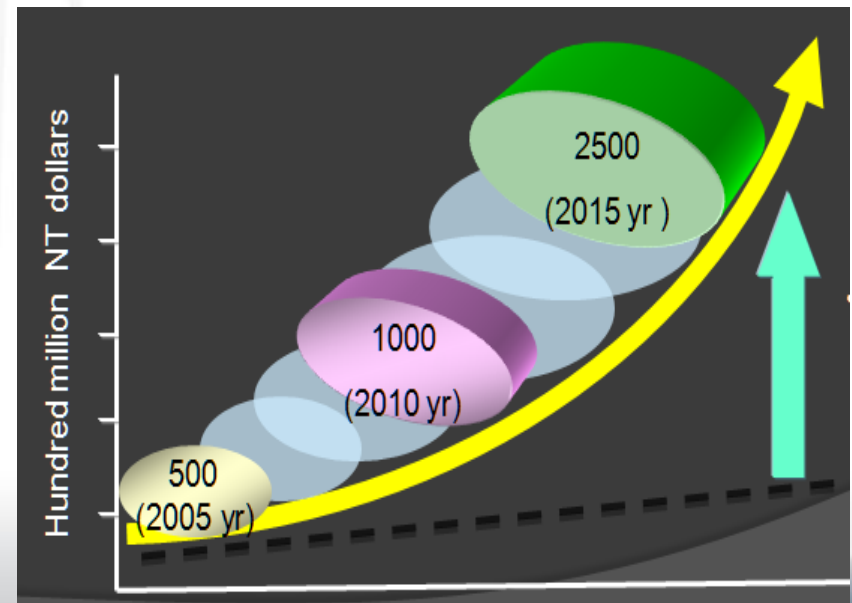


Taiwan Biotech Industry Becoming More Attractive

Domestic investors and venture capital industries are more interested in biotech sector. Since June 2009, 43 biotech companies have successfully raised capital through initial public offerings of common stock.



Number of new biotech companies approved to be listed in Taiwan stock exchange market

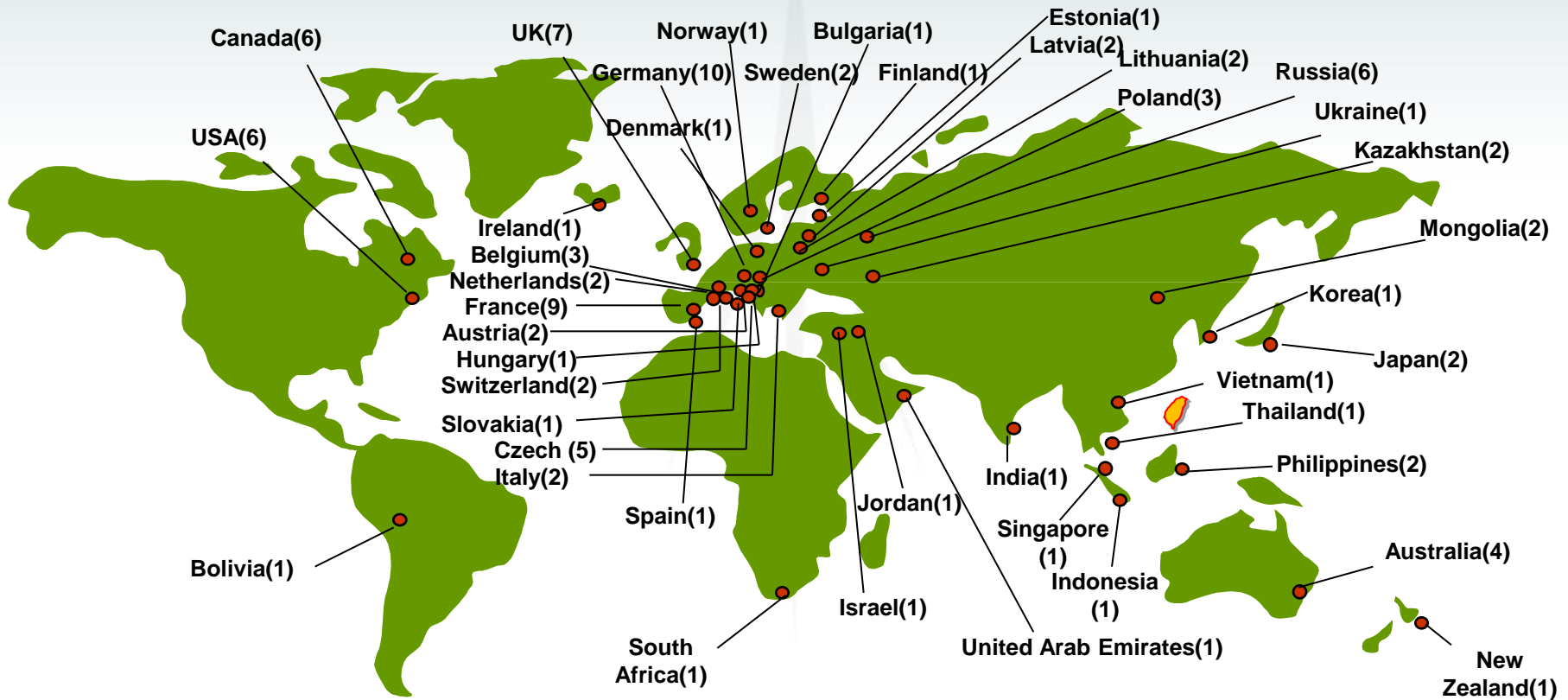


Strength of Taiwan in Biotech Development

- ※ **Excellent Researchers, Competitive, Strong R&D Activities and Manufacturing Capabilities in Computer Sci., Electric Engineering, Biotech, Clinical Medicine**
- ※ **Excellent Health Care System, National Health Insurance: $\geq 98\%$**
- ※ **State-of-the-Art Resource Center & National Core Facility**
- ※ **Government's Investment and Support**

*International
Science & Technology
Collaboration*

105 S&T cooperation agreements with counterpart organizations in 43 countries



**NSC Participation in International Organizations:
APEC, EU, ICSU**

Funding Mechanisms for International Collaboration

A. People Mobility

1. Exchange of visits + overseas research study/training
2. Summer Institutes in Taiwan

B. Joint Research Projects

1. Bottom up free application
2. Top-down joint call for proposals

C. Mission-Oriented Programs



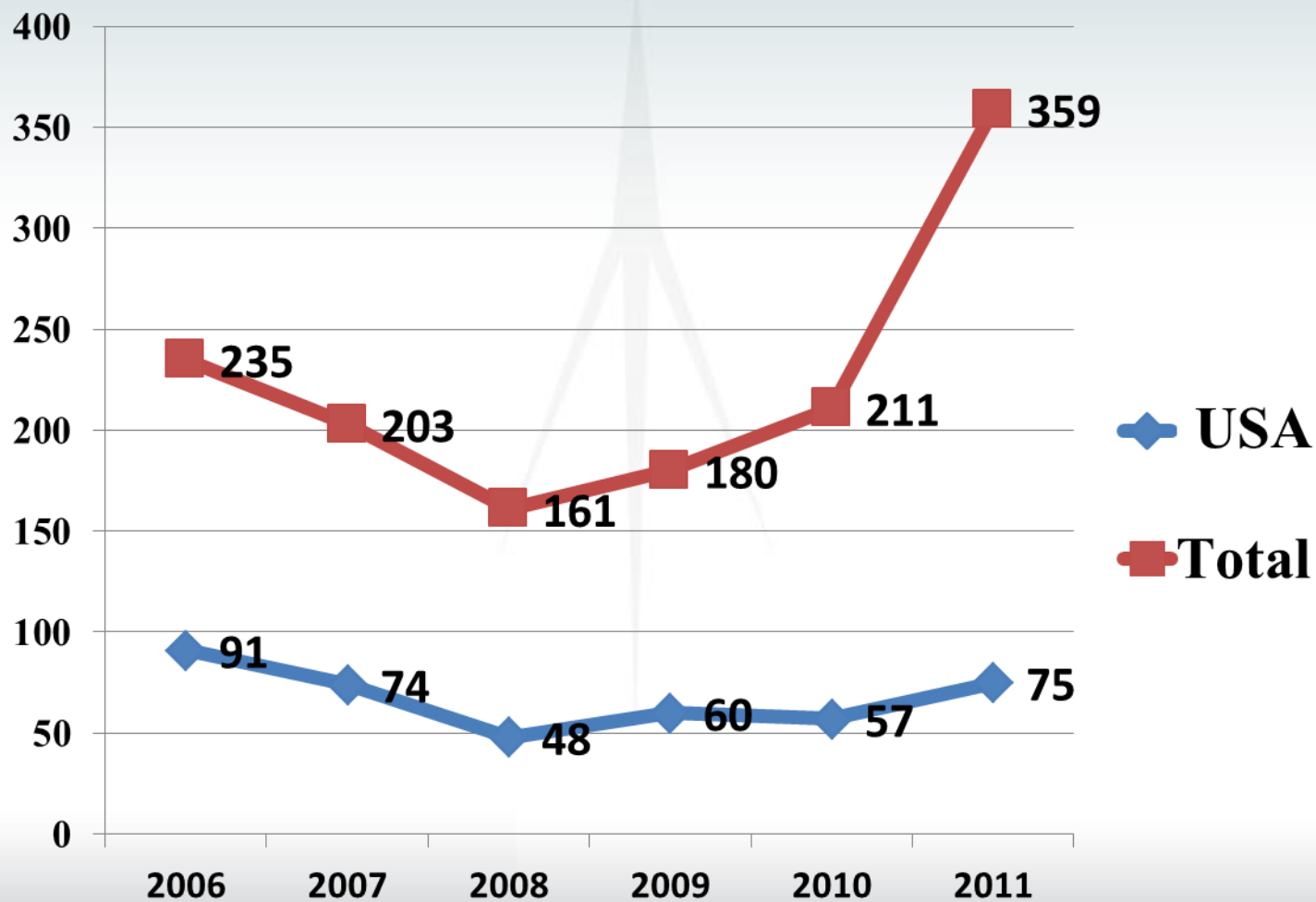
A. People Mobility Programs

Overseas Research Training Programs

Year	Ph.D students 7-12 months	Post-docs 1-2 years
2007	179	39
2008	163	46
2009	178	53
2010	186	75
2011	185	66
2012	134	82

- The NSC has programs subsidize Taiwanese postdoctoral researchers to conduct research abroad to
 1. gain research experience overseas
 2. develop their global perspective
 3. Strengthen international collaborations

B. International Joint Research Projects

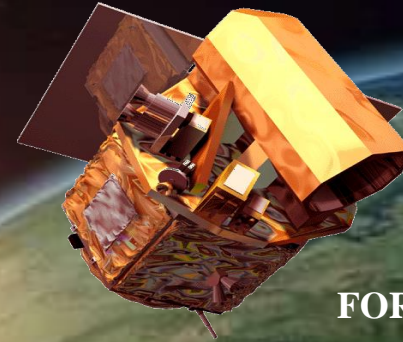


Two Examples of Taiwan-US Collaborative Projects

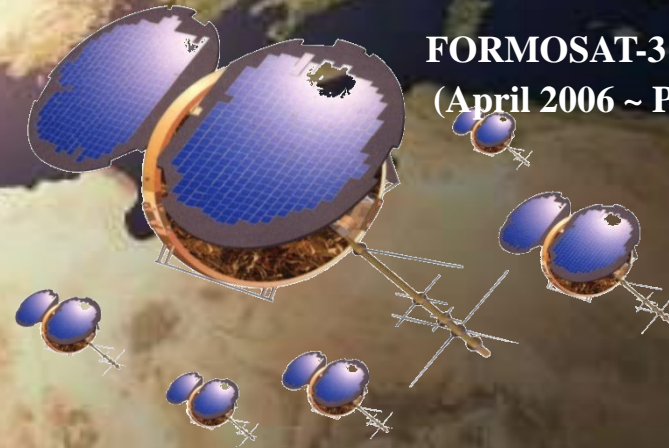
(1) Deployment of Satellite Programs



FORMOSAT-1
(Jan 1999~ June 2004)



FORMOSAT-2
(May 2004 ~ Present)



FORMOSAT-3
(April 2006 ~ Present)



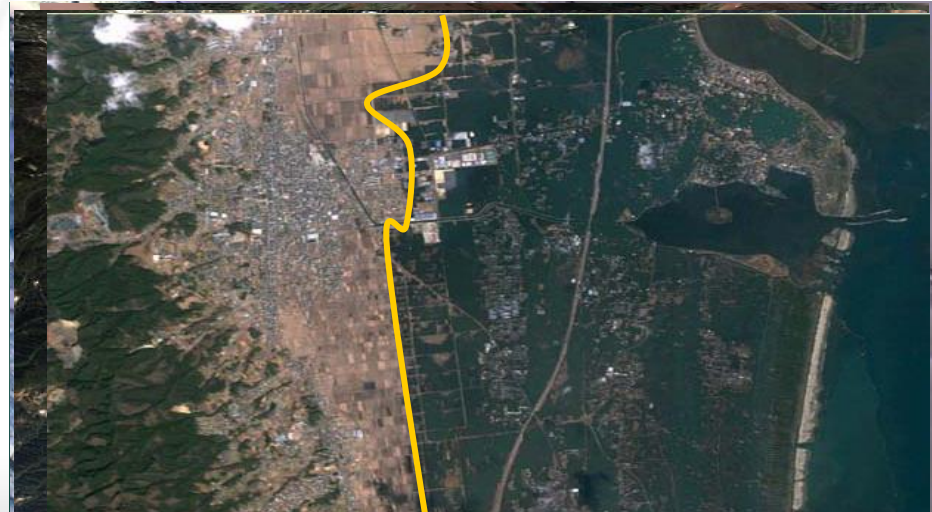
NSC

FORMOSAT-2

Support to Worldwide Nature Disaster Relief



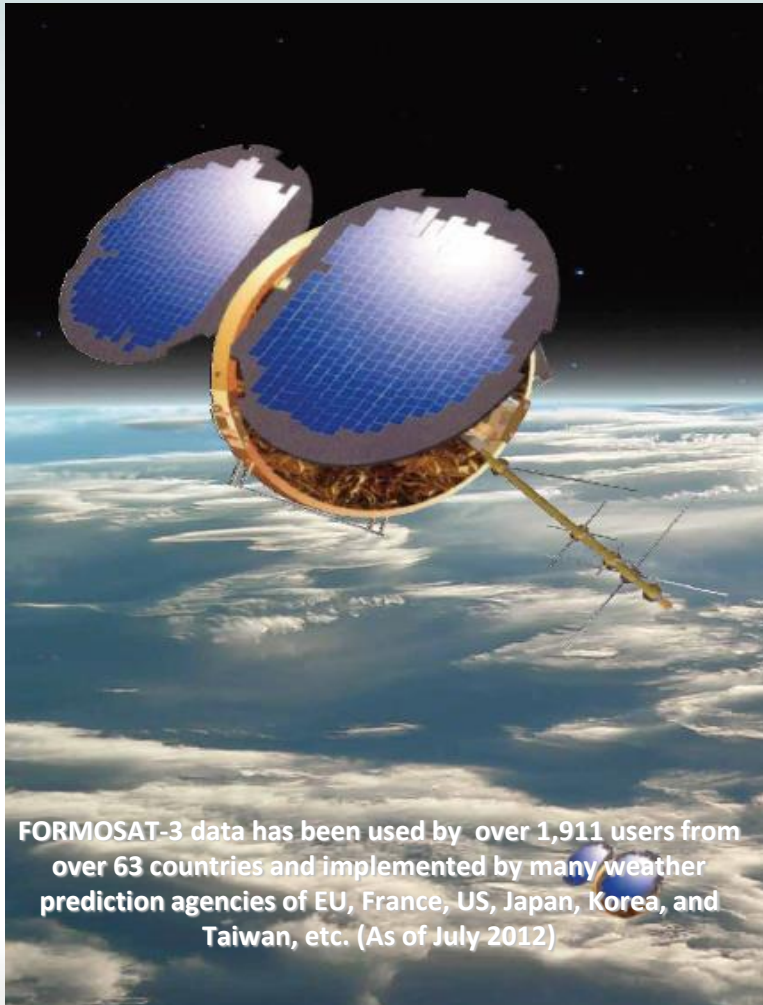
- 2004 Southern Asia Tsunami
- 2008 Wilkins Ice Shelf Corrupton
- 2008 Sichuan Earthquake
- 2011 Eyjafjallajokull Volcano
- Shinmoedake Volcano
- 2011 Japan Earthquake



FORMOSAT-2 is supporting to the major disaster relief organizations including Sentinel Asia, International Charter, UNOSAT, and Tzu Chi Foundation. As of June 2012, FORMOSAT-2 supports 242 events since its launch.

FORMOSAT-3

The Most Accurate Thermometer in Space




nature
news
ECMWF Newsletter
Number 111 - Spring 2007
Assimilation of GPS radio occultation measurements
Value of targeted observations
Ensemble streamflow forecasts over France
New web-based seasonal forecast products

Science
NEWSFOCUS
ATMOSPHERIC SCIENCE
Technique From Outer Space Takes On Earth Observation
By keeping a close eye on GPS satellites, a team of researchers hopes to measure atmospheric temperatures on the deep.
Watchful eyes. The six Taiwan-built Cosmic satellites will do the job of the hundreds of radiosonde weather balloons launched each day.
www.sciencemag.org SCIENCE VOL 312 7 APRIL 2006
Published by AAAS

Applications of Constellation Observing System for Meteorology, Ionosphere & Climate
Lee, Liu-Chiang
Rocken, Christian
Kursinski, Robert (Eds.)

COSMIC
COSMIC
COSMIC
COSMIC

BAMS
Volume 87 Number 3 March 2008
Bulletin of the American Meteorological Society
THE MONSOON CLIMATE CHALLENGE
HURRICANES AND GLOBAL WARMING

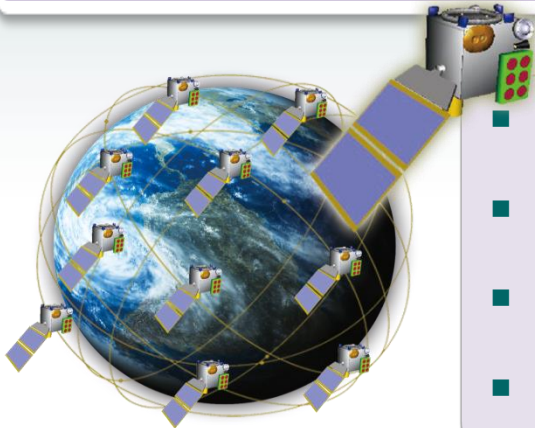
COSMIC
AN ATMOSPHERIC SOUNDING REVOLUTION

FOTMOSAT-3 reported by the major science Journals and articles

Saturation coverage: six microsatellites will improve the coverage and accuracy of
© 2001 Macmillan Magazines Ltd

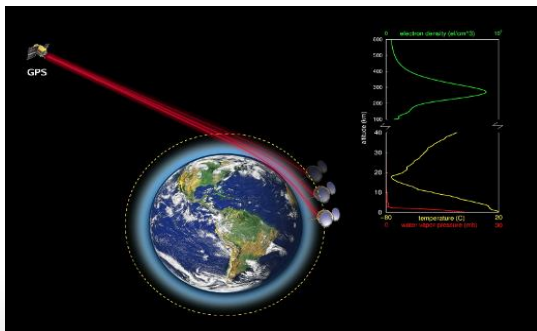
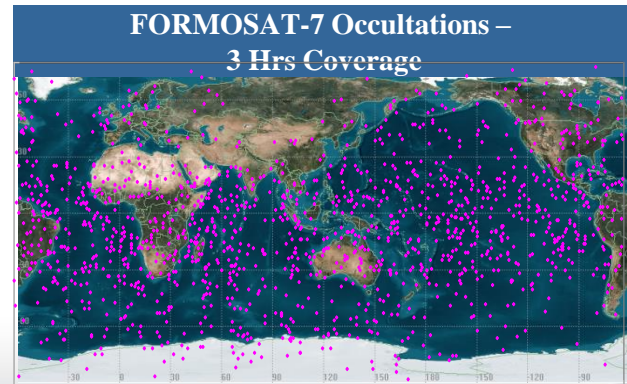
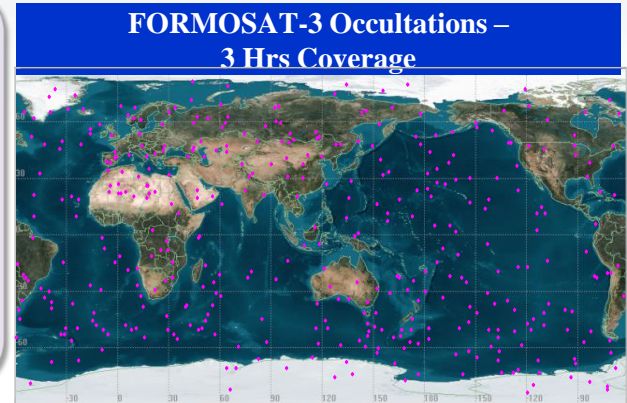
FORMOSAT-7/COSMIC-2 Program

Mission: To deploy an operational constellation system of 12 satellites to perform GNSSRO atmospheric and ionospheric soundings for weather forecasting and space weather monitoring



(Target launch in 2016 & 2018)

- Acquire the international cooperation
- Build-up indigenous spacecraft technology
- Enhance domestic data processing capability
- Promote GNSSRO data utilization and application



GNSS Radio Occultation



(2) ALMA Overview

✘ The largest ground-base telescope project

- A transformational millimeter/submillimeter interferometer
- 5000m (16,500 Ft) site in Chilean Atacama desert
- An array of 66 antennas (54x12 antennas + 12x7m antennas)
- Total shared cost ~ 1.3 Billion USD (2006)

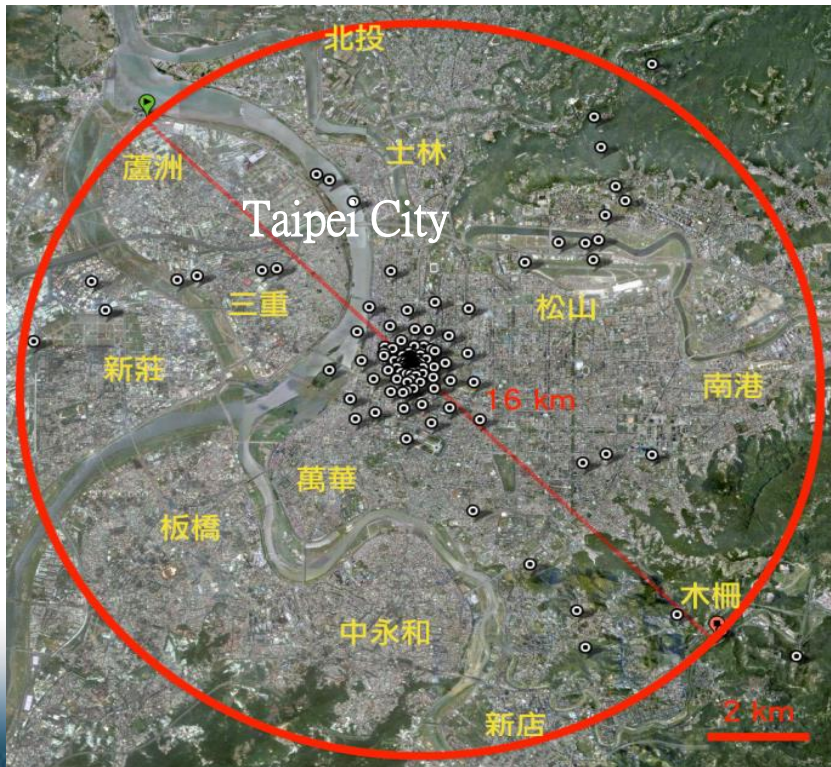
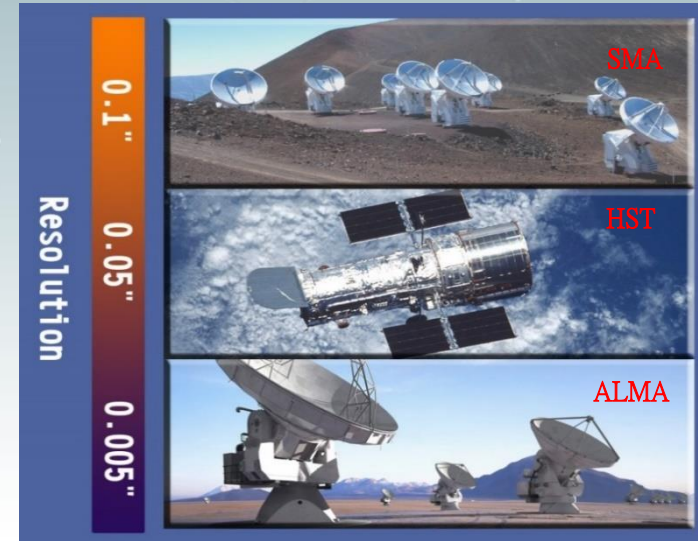
✘ A global partnership: 57 institutes over the world

- North America (US, Canada, **Taiwan**)
- Europe (ESO)
- East Asia (Japan, **Taiwan**)
- In collaboration with Chile



ALMA specification:

- Precision imaging from 3mm to 0.3mm
- High angular resolution (10x Hubble Telescope)
 - baselines up to 16 km
 - highest angular resolution: 0.005 arcsecond
- High sensitivity
 - state-of-the-art low-noise receivers
 - and large collecting area (66 antennas)





Thank you for your attention