



Asia-Pacific
Economic Cooperation

Earth Observation Technology to Combat Emerging Infectious Diseases

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Paradise Hotel, Busan, Korea

14 September 2006



Fly To Local Search Directions

e.g. Tokyo, Japan



Places

- ☒ [Thailand, Muang Uthai Thani](#)
- ☒ [Thailand, Muang Uttaradit](#)
- ☒ [Thailand, Muang Uttaradit](#)
- ☒ [Thailand, Muang Yala](#)
- ☒ [Thailand, Na Chaluai](#)
- ☒ [Thailand, Na Mon](#)
- ☒ [Thailand, Na Pho](#)
- ☒ [Thailand, Nakhon Chaisi](#)
- ☒ [Thailand, Nakhon Chaisi](#)
- ☒ [Thailand, Nakhon Thai](#)

Layers

- ☒ Layers
- ☒ terrain
- ☐ roads
- ☒ borders
- ☒ Populated Places
- ☐ Alternative Place Names
- ☐ 3D Buildings
- ☐ Gas, Food, Lodging
- ☐ National Geographic Magazine
- ☐ Google Earth Community
- ☐ Shopping and Services
- ☐ Transportation
- ☐ Geographic Features
- ☐ Parks and Recreation Areas

H5N1

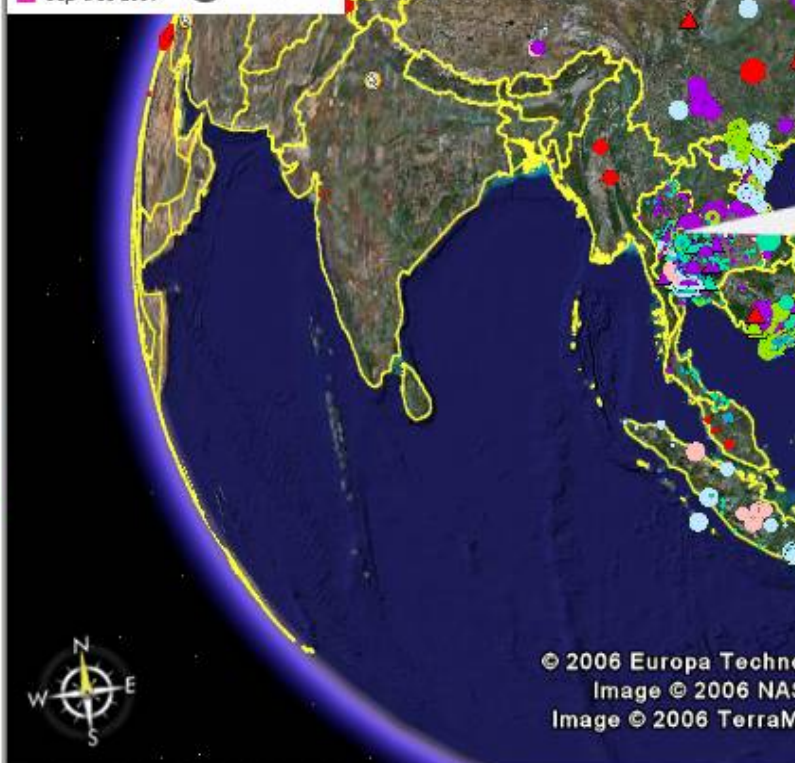
△ Human cases
○ Bird outbreaks

Period

- Jan-Apr 2006
- Sep-Dec 2005
- May-Aug 2005
- Jan-Apr 2005
- Sep-Dec 2004
- May-Aug 2004
- Jan-Apr 2004
- Sep-Dec 2003

Number of bird deaths

- < 10
- < 100
- < 1,000
- < 10,000
- < 100,000
- > 100,000



Pointer 16°44'40.33" N 102°04'25.24" E

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Image © 2006 NASA
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Streaming 100%

Eye alt 5278.58 mi

- ☐ Lodging
- ☐ Roads
- ☒ Terrain
- ☐ Dining
- ☐ Borders
- ☐ Buildings

Thailand, Nakhon Thai

Outbreak summary

Period: (4) Sep-Dec 2004

Country: Thailand

District: Nakhon Thai

Location name, if given: Boapho Subdistrict

Outbreak start:

Poultry at risk:

Cases:

Deaths:

Destroyed:

Slaughtered:

Culled:

Vaccinated:

Report date: 03/09/2004

Source: Oie Report

What Are Emerging Infectious Diseases?

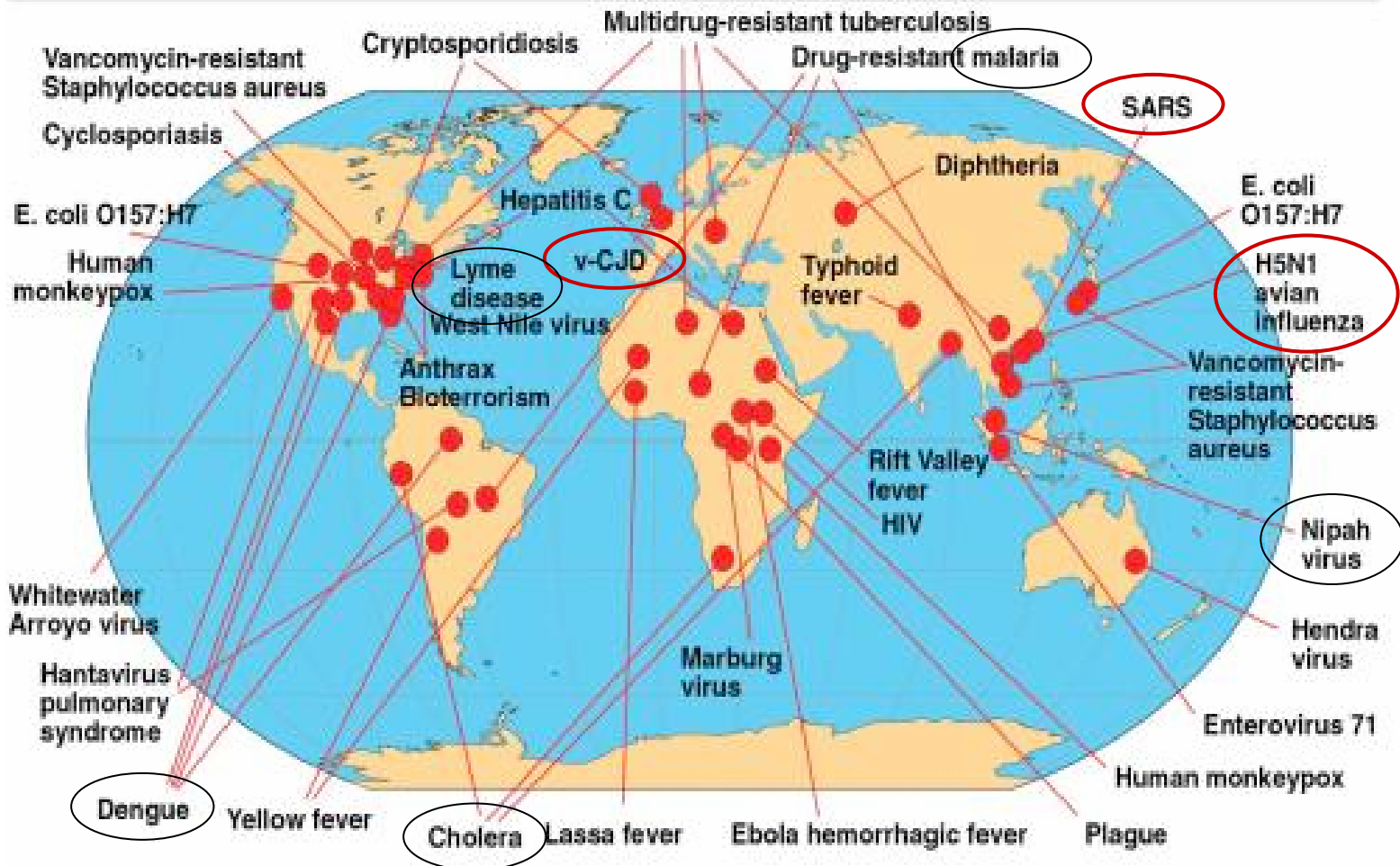
Emerging Infectious Diseases (EID) are infectious diseases that have recently become more prevalent or threaten to do so.

Source: DoD Global Emerging Infections Surveillance and Response Program

Prime examples of such infections include Severe Acute Respiratory Syndrome (SARS), Highly Pathogenic Avian Influenza (HPAI), Dengue, Tuberculosis, and enterotoxigenic *E Coli*.

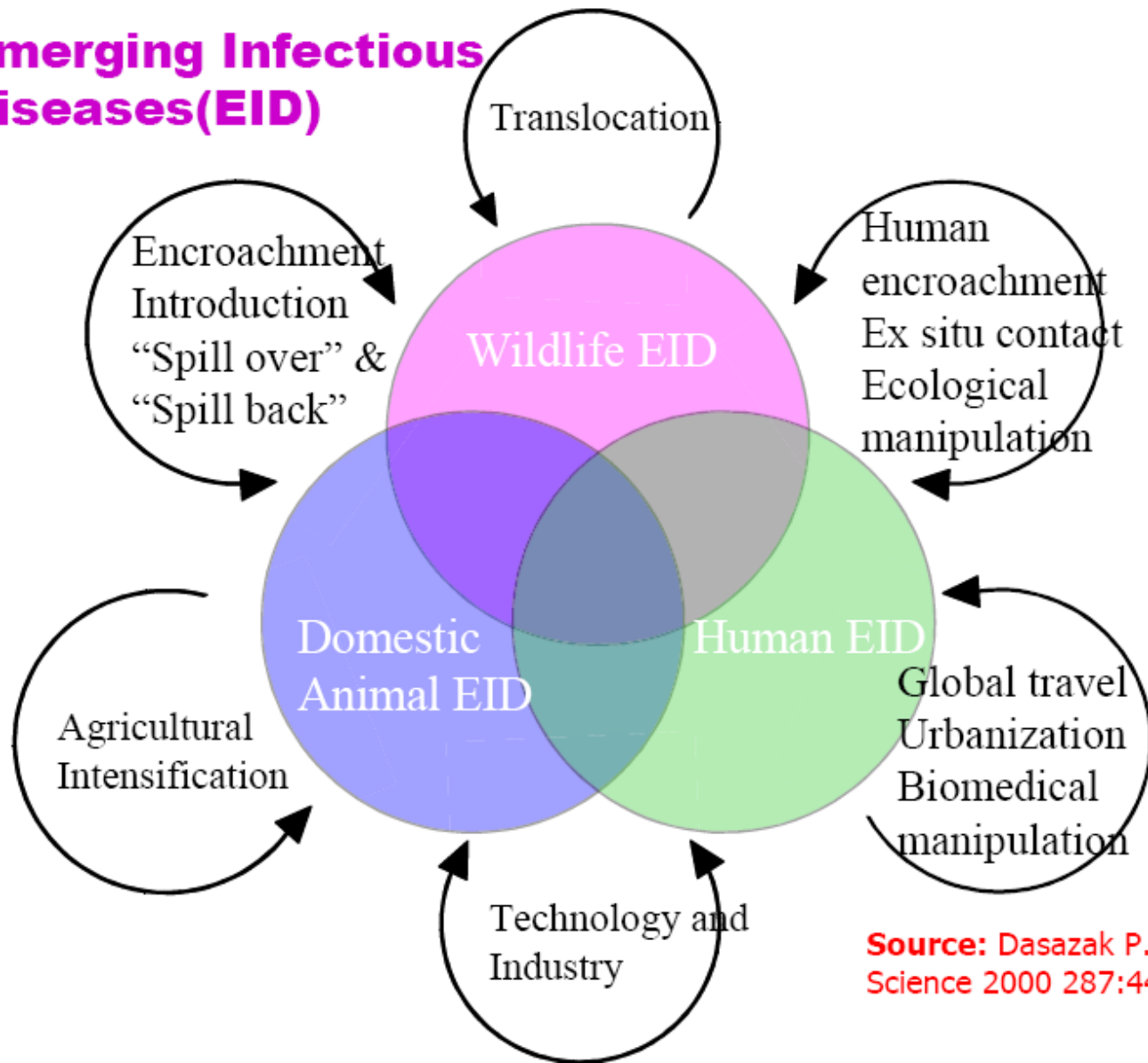
Source: APEC Emerging Infections Network (EINet)

Examples of Emerging and Re-Emerging Infectious Disease: past 10 years



Source: A Fauci, NIAID/NIH, 2005

Emerging Infectious Diseases(EID)



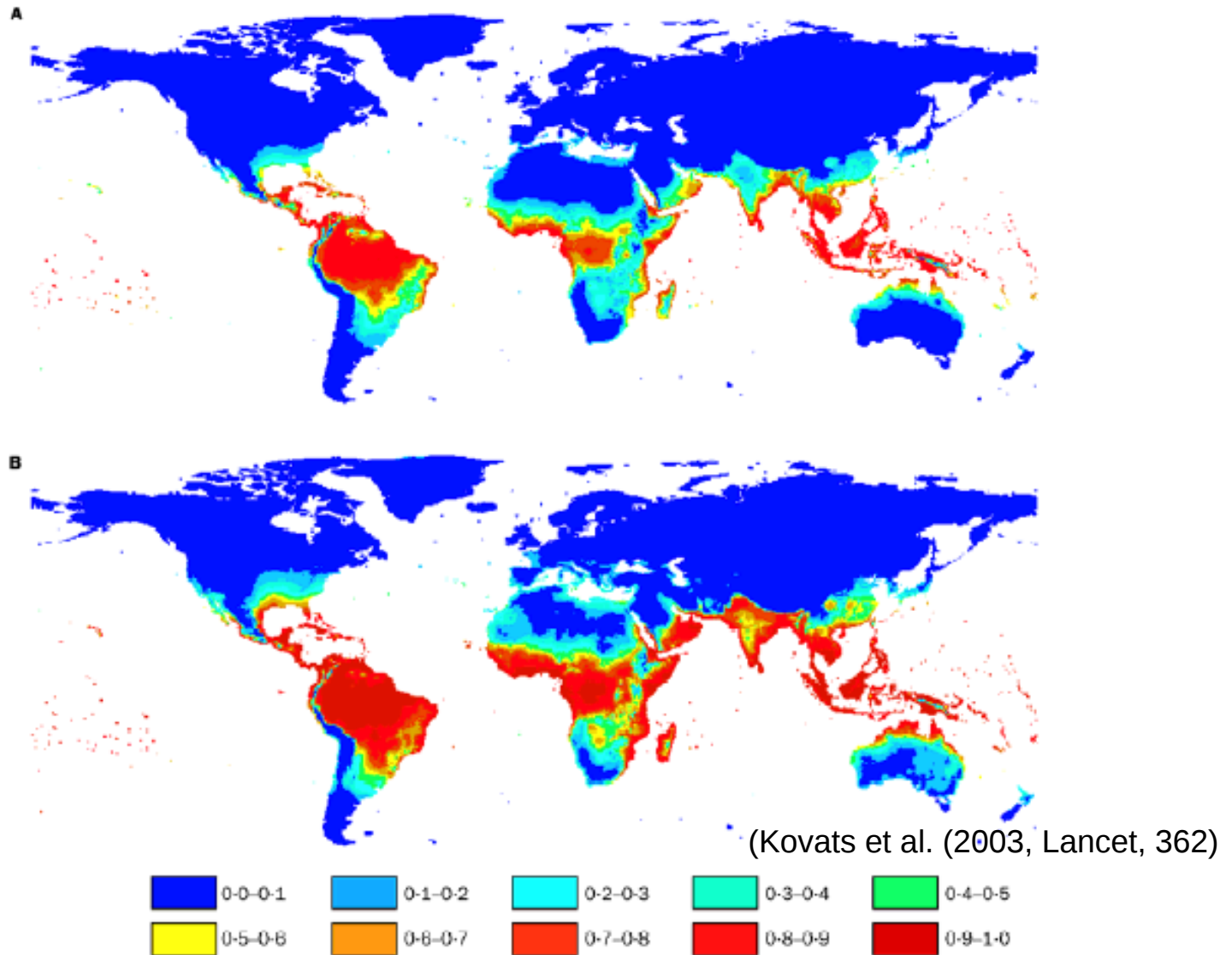
Source: Dasazak P. et.al.
Science 2000 287:443

The effect of climate change on the emergence and re-emergence of infectious diseases

- An analysis of more than more than 300 human diseases found that the distribution pathogens worldwide is strongly linked to climate, and that climate change could lead to a massive increase in human vector-borne diseases.
- Variability in rainfall was the climatic factor most closely linked to pathogen diversity, backing the idea that alternating wet and dry periods are a key factor in disease transmission.

Randerson, 2004

Predicted risk of dengue fever in 1990, and following a climate change in 2085

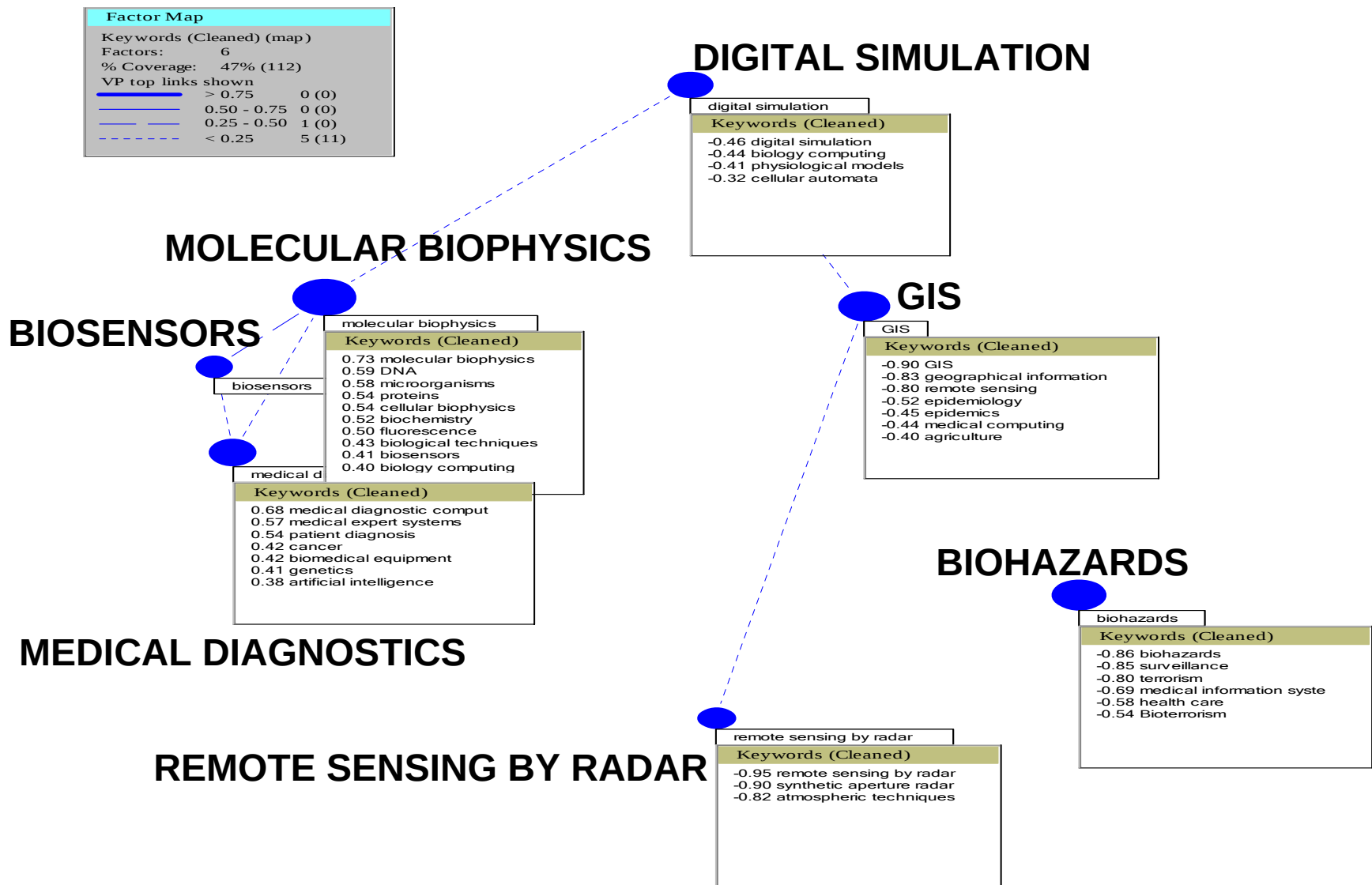


Potential benefits that earth observation can bring to the prevention and management of EIDs

- Earth observation provides a broad range of information types: digital elevation maps, urban maps, cartography, maps of water bodies, vegetation maps, land surface temperature maps, and monitoring of wind-blown dust.
- This information is used in applications such as malaria and meningococcal meningitis epidemic early warning, in planning fieldwork campaigns for research into the Ebola virus's reservoir, and in the management of development projects in public health.

Gemperli et al, 2005

Bibliometric Analysis: Illustrative Case Study for ICT Technologies related to Emerging Infectious Diseases



What Are Converging Technologies?

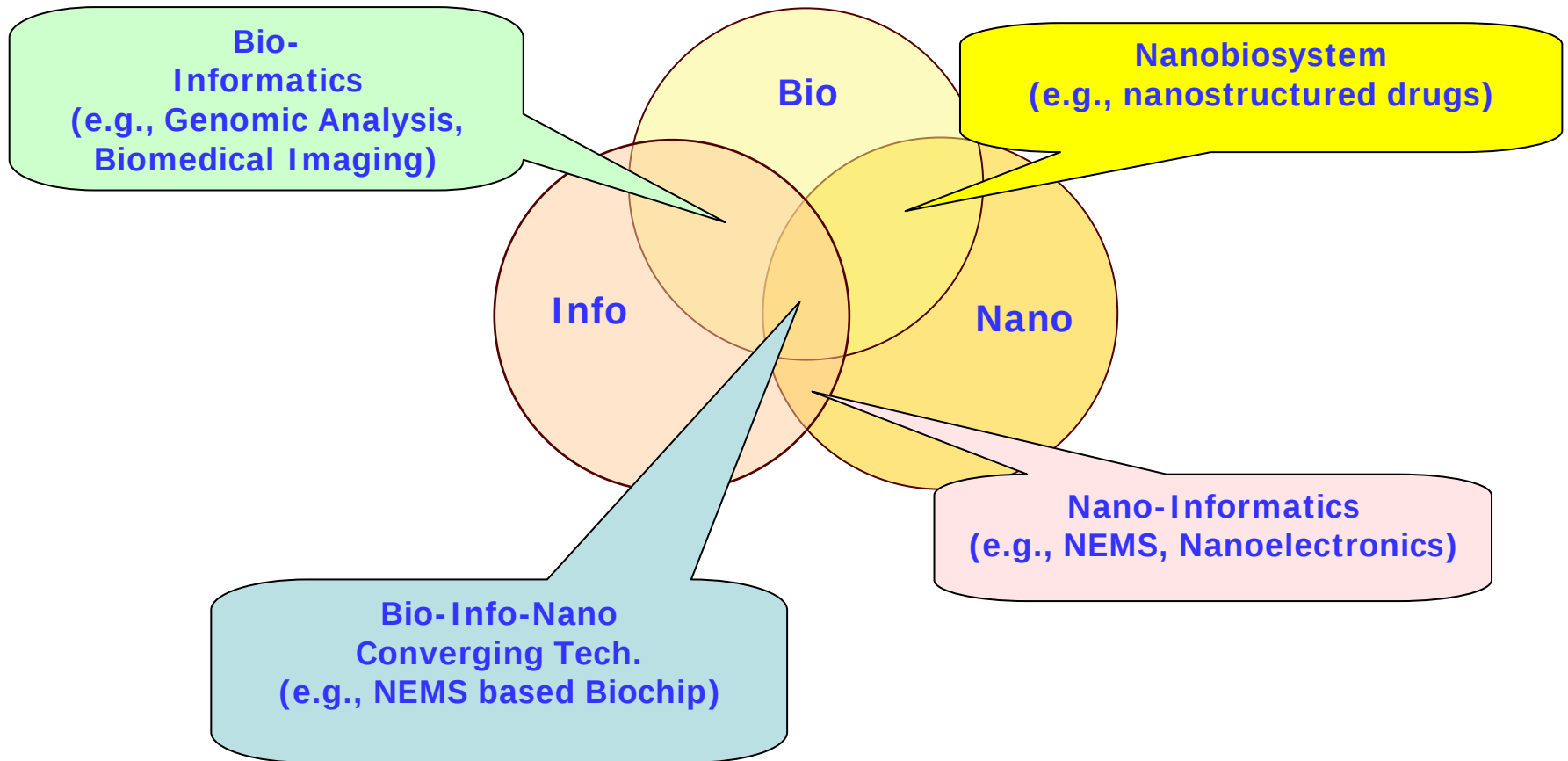
Converging technologies are enabling technologies and knowledge systems that enable each other in the pursuit of a common goal.

Source: Converging Technologies – Shaping the Future of European Societies, The European Commission Research (2004)

The coming together of two or more disparate disciplines or technologies.

Source: Toward Understanding Science and Technology Convergence, Science and Technology Foresight Directorate, Government of Canada (2005)

Examples of Converging Technologies



Source: Suthee Phucharoenchanachai, NECTEC (2005)

How Converging Technologies Could be Applied to Combat EID: The Application Perspective

- **Prevention of EID**

- Risk assessment of EID
 - Travel & trade, agriculture, climate & ecological change
- Assessing tools
 - patient's respiratory and health status
- Disease Surveillance
 - Local, regional, global
- Early warning & Remote sensing of EID
 - Traceability of tiny outbreak
- Rapid & field diagnosis
 - Reagents & test kits
- Pathogen Identification
- Vaccination & Tech-based barriers

- **Management of EID**

- Infection data management
- Strategy for drug administration
- Preparedness & Rehearsal
- Treatment Facilities (Hospitals)
- On-demand Experts/ Pub Services
- International Collaboration
- Policy Supporting Framework
- Public Supply (e.g. water) Network Management

Roadmapping Converging Technologies to Combat Emerging Infectious Diseases: *An APEC-wide Project*

Multiple Scenarios of the Future

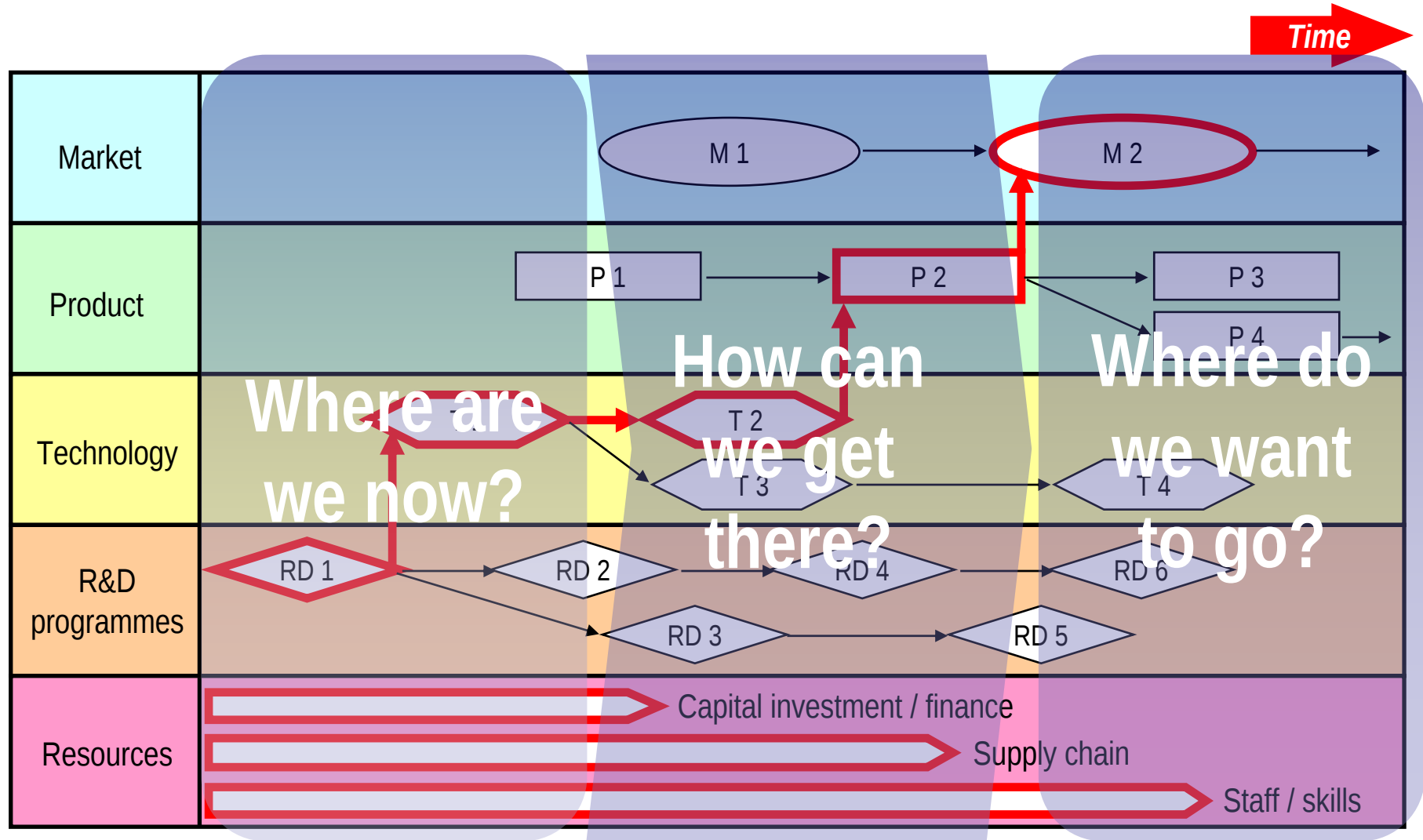
with policy recommendations for APEC member economies



Source:
Siemens
“Pictures of the
Future” 2005

* Scenarios will be produced at an APEC-wide workshop in 2006.

A Technology Roadmap Links the future to present, and resources to market/applications

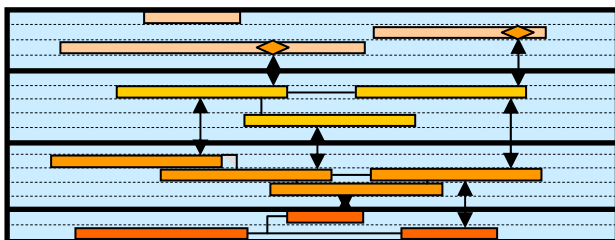


Source: Centre for Technology Management, University of Cambridge

Technology Roadmaps (TRMs)

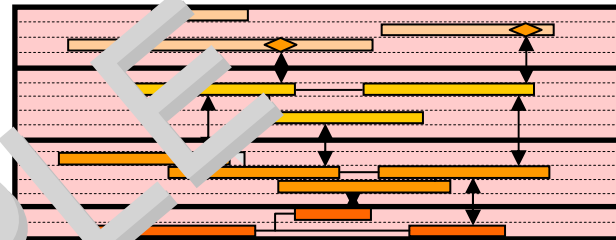
with recommendations for industrial technology development

(1)



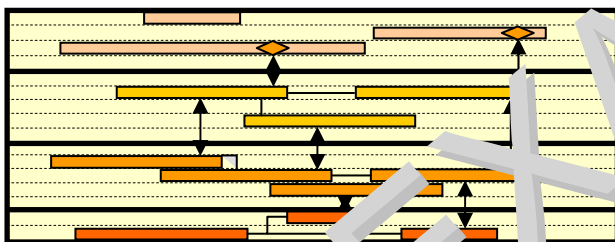
TRM for Vaccines and Drugs

(3)



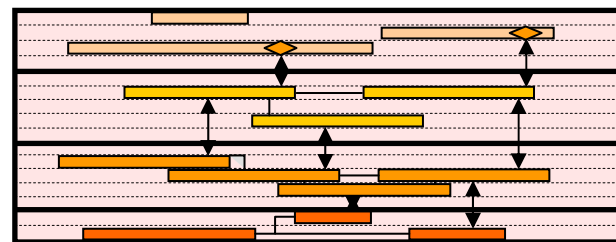
TRM for Diagnostic Kits

(2)



TRM for Information Infrastructure

(4)



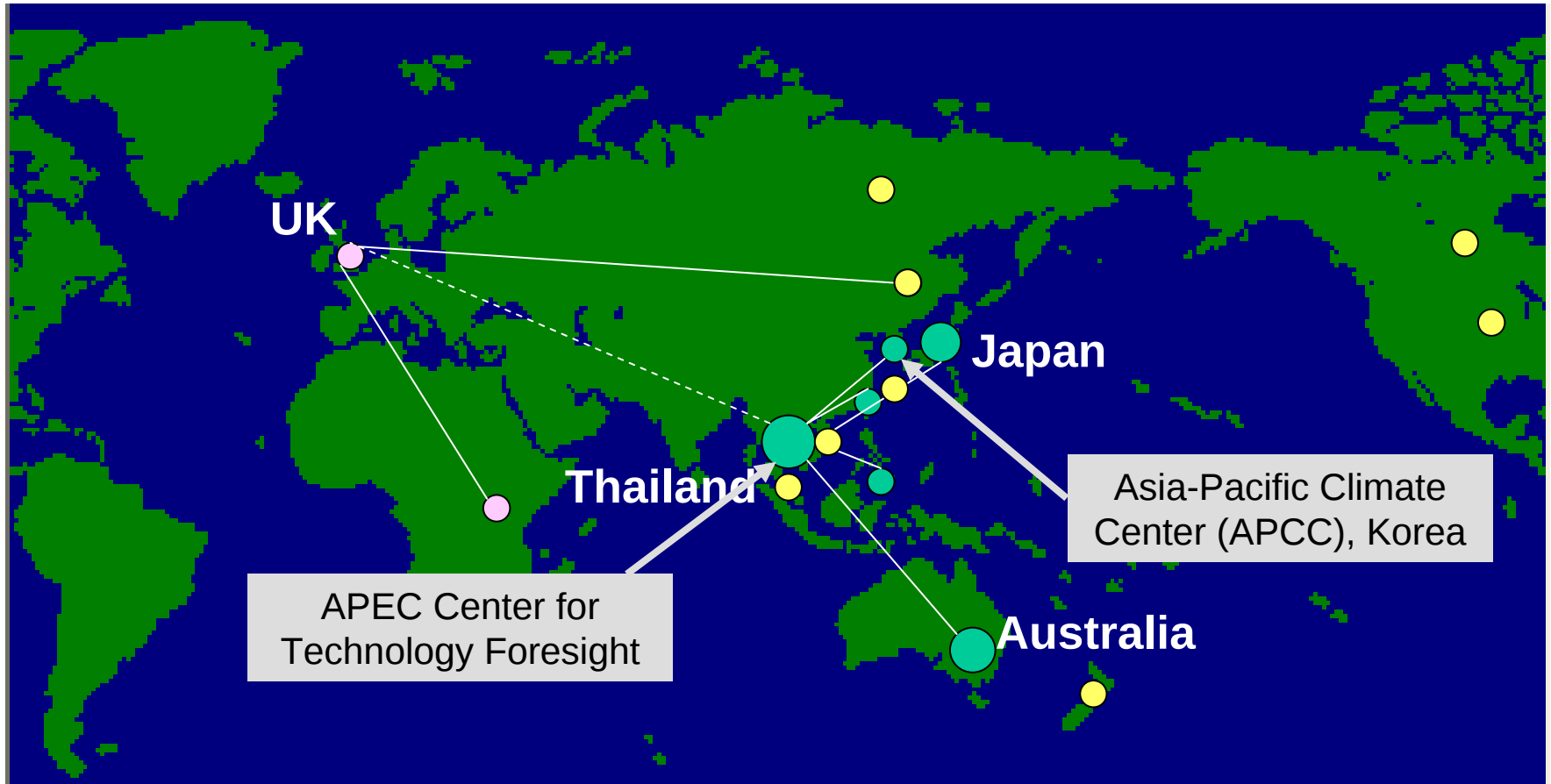
TRM for Earth Observation & Climate

* Technology Roadmaps will be produced through 2 APEC-wide workshops during 2007.

Collaborators

As of June 2006

● Current collaborators ● Co-sponsors ● Non-APEC network



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