Universiti Malaysia PAHANG
Engineering • Technology • Creativity

GLOBAL HIGHER EDUCATION FORUM 2016

The Role of Higher Education In Developing Societal Resilience & Sustainability

THE ROLE OF HIGHER EDUCATION IN MANAGING CONFLICT SITUATIONS IN SOCIETY FOR SUSTAINABLE DEVELOPMENT:

A CASE STUDY OF UMP'S CONTRIBUTION IN THE CONTROVERSIAL LYNAS RARE EARTH PROJECT

Badhrulhisham Bin Abdul Aziz

5th April 2016

KNOWLEDGE & UNIVERSITY IN SOCIETY

Drew Faust, President Harvard Univ (2010)

"…university's place as a paramount player in a global system increasingly driven by knowledge, information and ideas. Knowledge is replacing other resources as the main driver of economic growth and education has increasingly become the foundation for individual prosperity and social mobility"

KNOWLEDGE & UNIVERSITY IN SOCIETY

Hiroshi Matsumoto, President Kyoto University [2012]

"…universities are unique communities within society; and therefore the university perpetually integrates with society, shaping its future."


Govt won't allow Lynas to operate if harmful
PM says dialogues needed to determine scientific and technical arguments
Lynas
MALAYSIA SDN. BHD.


Anti-Lynas group enters politics to bring down BN in Pahang
Universal Studios Package
From RM165 Only plus Hotel Stay Great Theme Park Family Fun


NATION 17
Workers: Lynas plant safe
They are convinced operations pose no risk


28-4-2012 12ptg
Dari KLCC to


Lynas pix


ic legacy in rare-earths village haunts Lynas
STOP


STOP

Govt objects to residents' suit over Lynas


PRIME NEWS
Lynas to start operations


02 NEWS WITHOUT BORDERS
In defence of Lynas plant
> Mustapa says spin-off activities, downstream development will benefit economy


KUALA LUMPUR
Lynas CEO wants to meet G
By HAKEEM KHAIRUDIN


Lynas price reflects differing views

LYNAS Issues : 'Big' Questions

* Acceptance; to be developed

(but not in my backyard?)

* Social, Economics & Politics

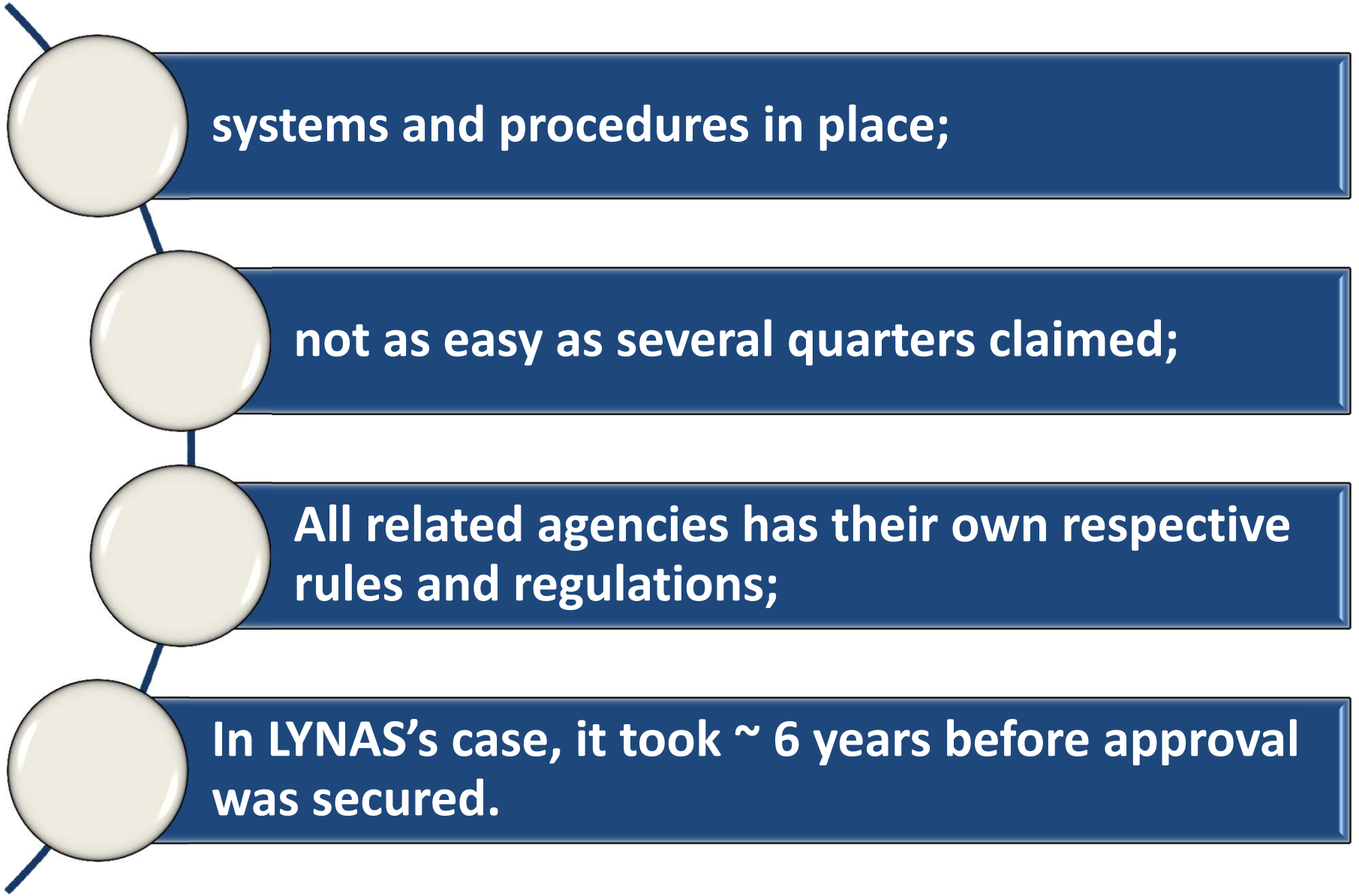
(merits and interests?)

* Health, Safety & Environment

(risks and concerns?)

INVESTMENT: MERITS & RISKS

INVESTMENT IN MALAYSIA



Perception (or Politics?) vs Science

"Science may be vital, but the people with scientific knowledge seem less connected than ever to the people with power"

The Guardian (2012)

STEM CELL RESEARCH, BIRTH CONTROL AND GLOBAL WARMING

USA Today (2007)

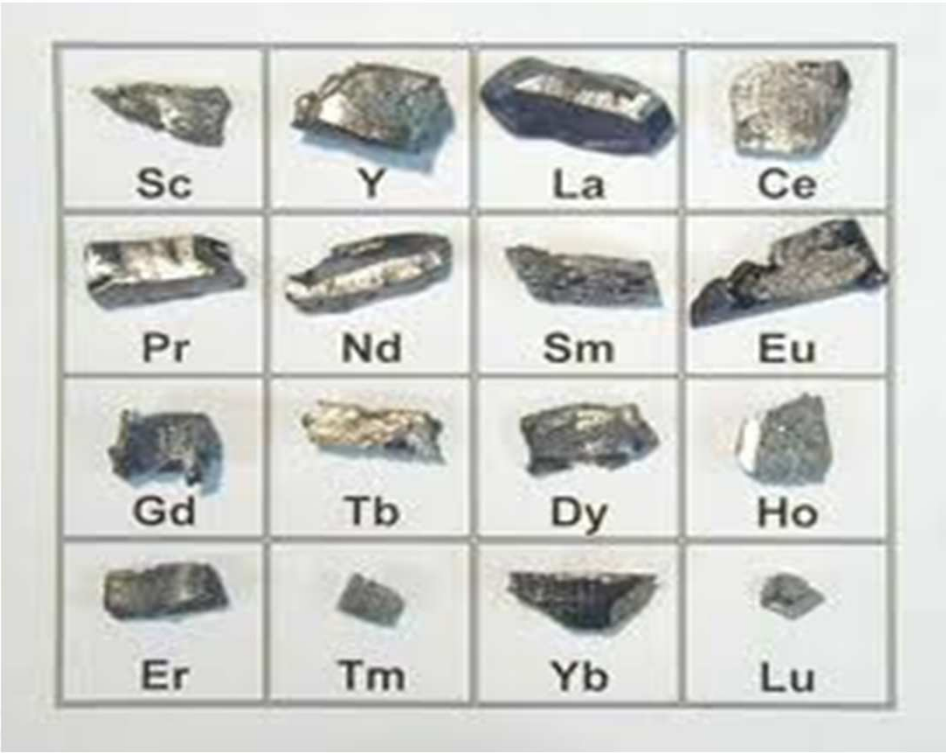
ACID RAIN SCIENCE AND POLITICS IN JAPAN

Kenneth E. Wilkening (2011)

LYNAS (Gebeng) and RAPID (Pengerang)

Parliament Hansard on PSC Lynas (2012)

INTRODUCING RARE EARTH

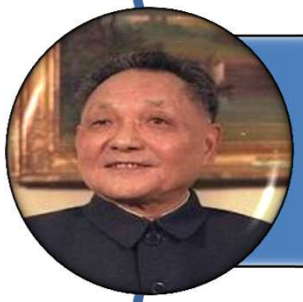


ABOUT RARE EARTH MINERALS

- ARE NOT REALLY RARE ;
- WIDELY SPREAD THROUGH OUT THE EARTH'S CRUST IN SMALL CONCENTRATIONS;
- CANNOT BE MINED ECONOMICALLY.

Why Rare Earth?

Green Economy – Climate Change, Alternative and Conservative Energy

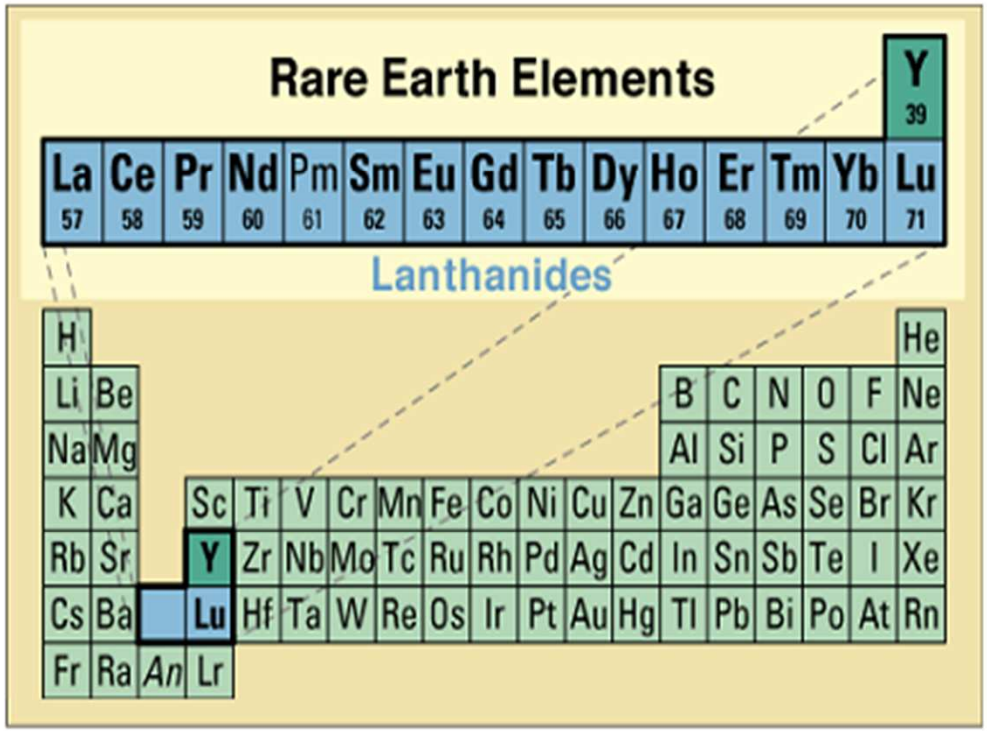


Strategic – “Middle East has Oil, China has Rare Earth” (Deng Xiao Peng 1987)

Human Capital Development – High Technology Experts

Rare Earths cannot be substituted in many applications

RARE EARTHS: LANTHINIDES PLUS YITTRIUM – UNIQUE PROPERTIES



- **Chemical**
  - Unique electron configuration
- **Catalytic**
  - Oxygen storage and release
- **Magnetic**
  - High magnetic anisotropy and large magnetic moment
- **Optical**
  - Fluorescence, high refractive index
- **Electrical**
  - High conductivity
- **Metallurgical**
  - Efficient hydrogen storage in rare earths alloys

Rare Earths underpin new materials technology required to sustain the needs of today's society

Energy efficiency through lower consumption	Environmental protection through lower emissions	Smaller yet more powerful digital technology
		
• Compact Fluorescent Lights • Hybrid vehicle • Weight reduction in cars	• Wind turbine • Auto catalytic converter • Diesel additives	• Flat panel displays • Disk drives • Digital cameras

Rare Earth Advanced Materials

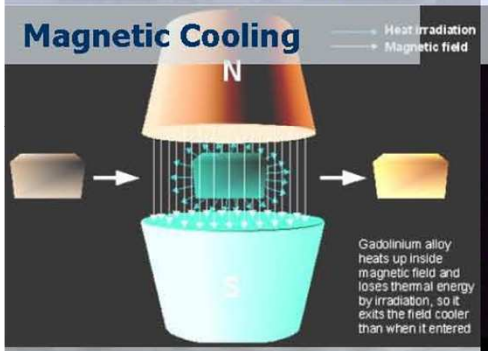
Magnets

catalysts

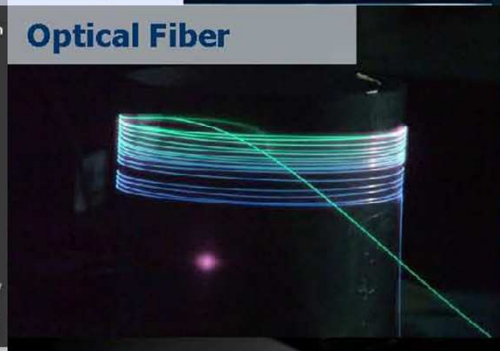
Phosphor

Hydrogen **Storage**

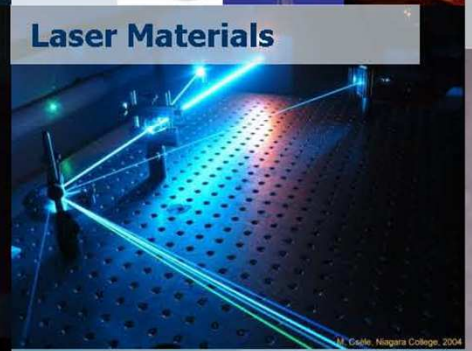
Magnetic Cooling



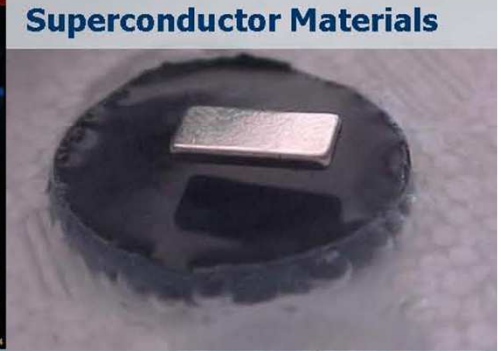
Optical Fiber



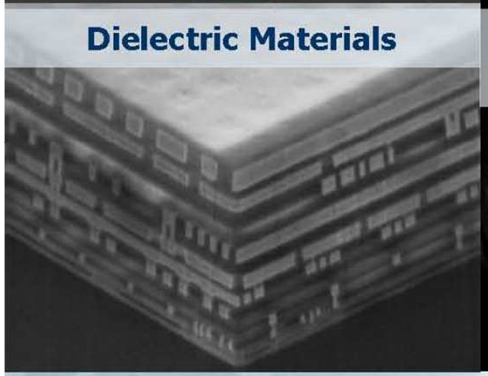
Laser Materials



Superconductor Materials

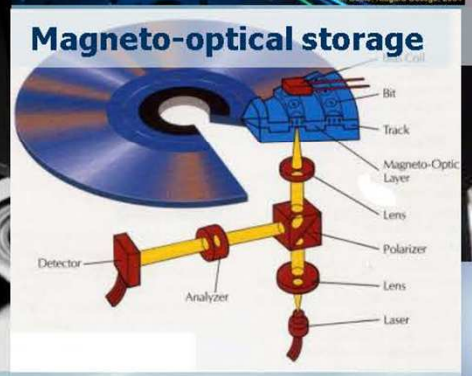


Dielectric Materials



Giant (colossal) magnetoresistance

Magneto-optical storage



Optical Glass&Polishing

Importance of REES to Modern Industry

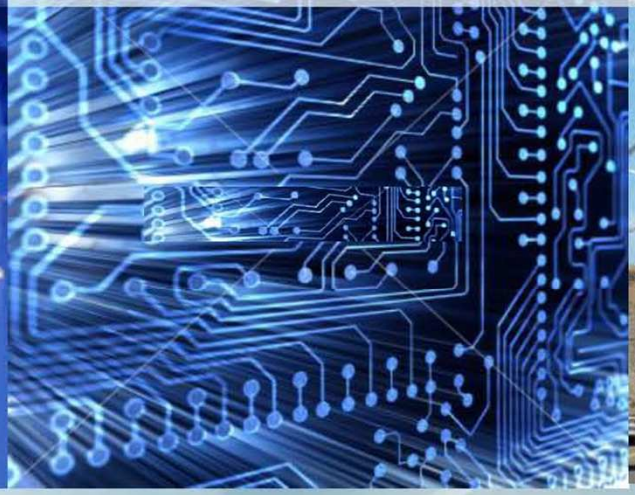
aerospace industry

aviation industry

medical equipment

Information Technology

Electronics Industry

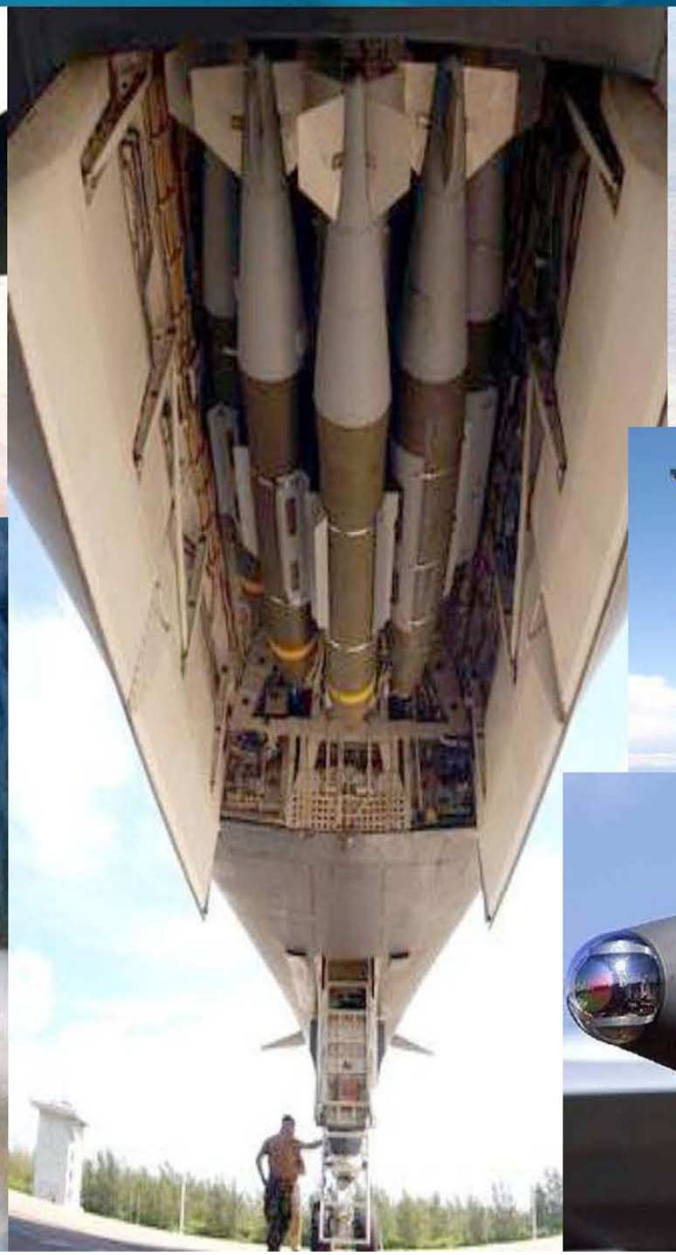


Energy and Transport

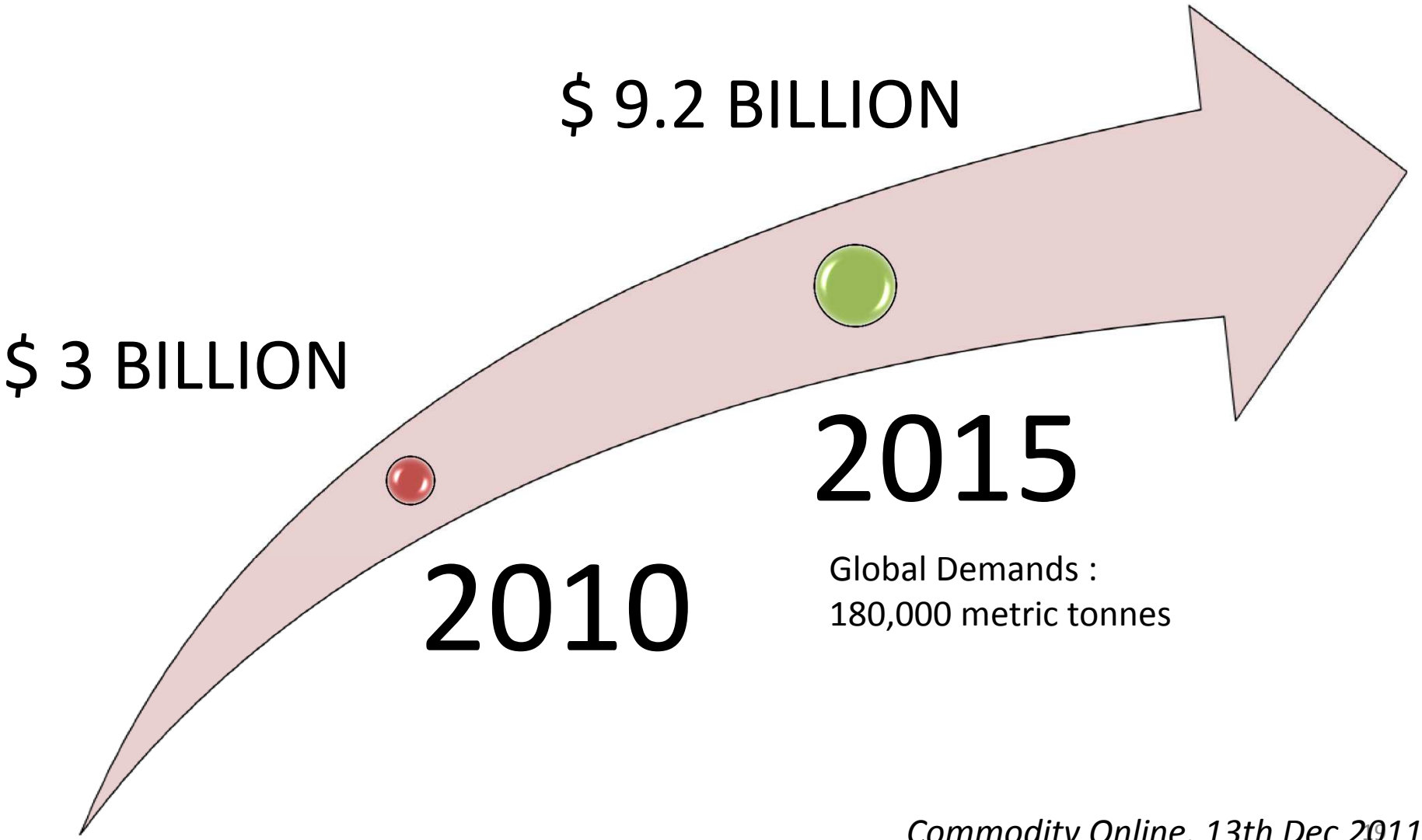
Consumer Electronics

Green Technology

Green Energy | Electronics | Defense--missile guidance & Smart Bombs

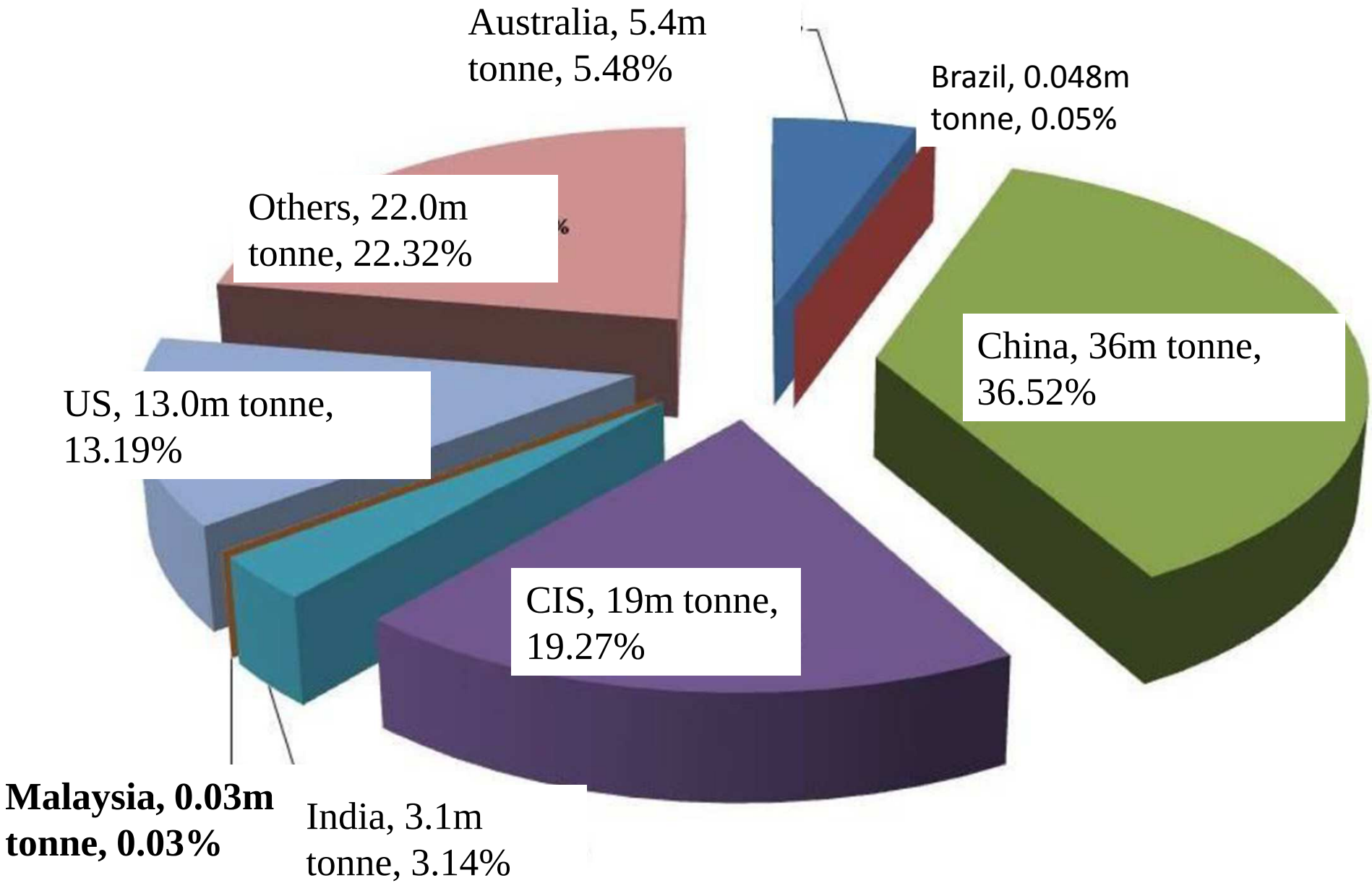


MARKET DEMAND : SALES OF RE

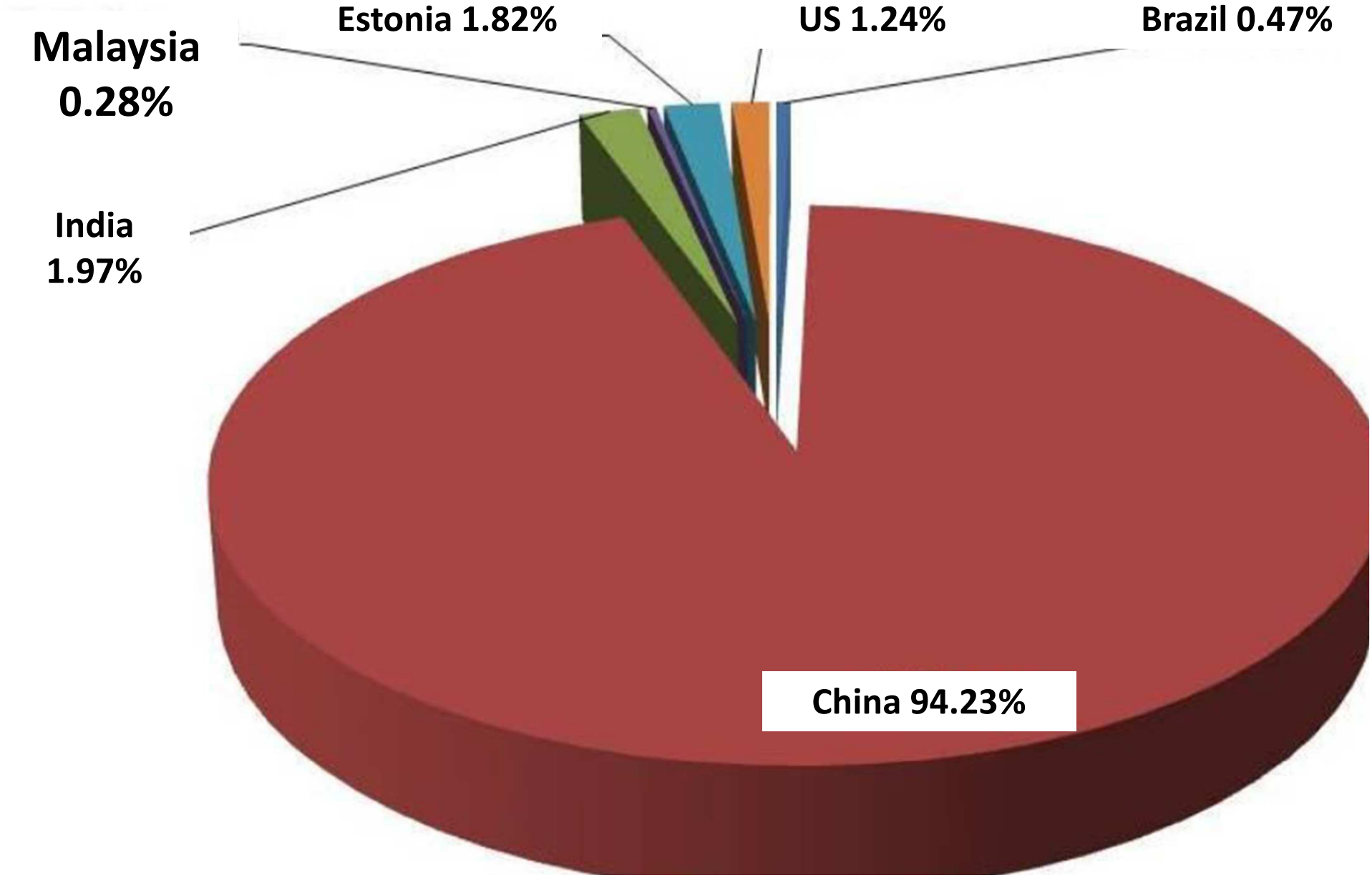


Commodity Online, 13th Dec 2011

Rare Earth Demand



The world rare earth resource distribution (USGS 2010)



The world rare earth supply in 2009 (USGS 2010)

REE Process

Ore

Crusher

Ore is crushed into gravel size

Mill

Gravel is milled into silt

Floatation Process

Mineral containing REE is extracted
i.e.: Bastnaesite
Monazite
xenotime

Separation Process

REE is separated from mineral

Oxide

REE is first separated as an oxide

Metal

Oxides are turned into metals

Alloy

Metals are combined to create alloys

High tech applications

There are hundreds of high tech applications for REE.

Green energy
Hybrid electric vehicles
Water treatment
Defense
High tech

Diagram 1

CONTRIBUTING FACTORS TO OPPOSITION OF THE PROJECT

- FUKUSHIMA TRAGEDY
- EXPERIENCE OF A.R.E BUKIT MERAH
- MISLEADING AND CONFUSION ON THE REAL ISSUE

COMPARISONS

A.R.E. BUKIT MERAH, PERAK
&
L.A.M.P. [LYNAS] GEBENG, PAHANG

A.R.E. BUKIT MERAH CHRONOLOGY

(based on Dr Meor Yusoff's presentation captured in PSC Report)

ASIAN RARE EARTH (ARE) – Establishment and Objective

- 23 Nov 1979 – ARE was incorporated, the company a joint venture between the Japanese (Mitsubishi Chemicals Ltd) and Malaysian (BEH minerals, Tabung Haji and individuals) investors to recover rare earth compounds from local monazite

ASIAN RARE EARTH (ARE) – operating license

- Apr 1982 – ARE started its operation at 7.2 km Jalan Lahat in Bukit Merah Industrial Estate with initial license issued by Health Ministry
- 8 Nov 1985 – Stop of operation order by the AELB as the company operate without license.
- 16 Jan 1987 – AELB issued a Class A license (interim operation) to the ARE

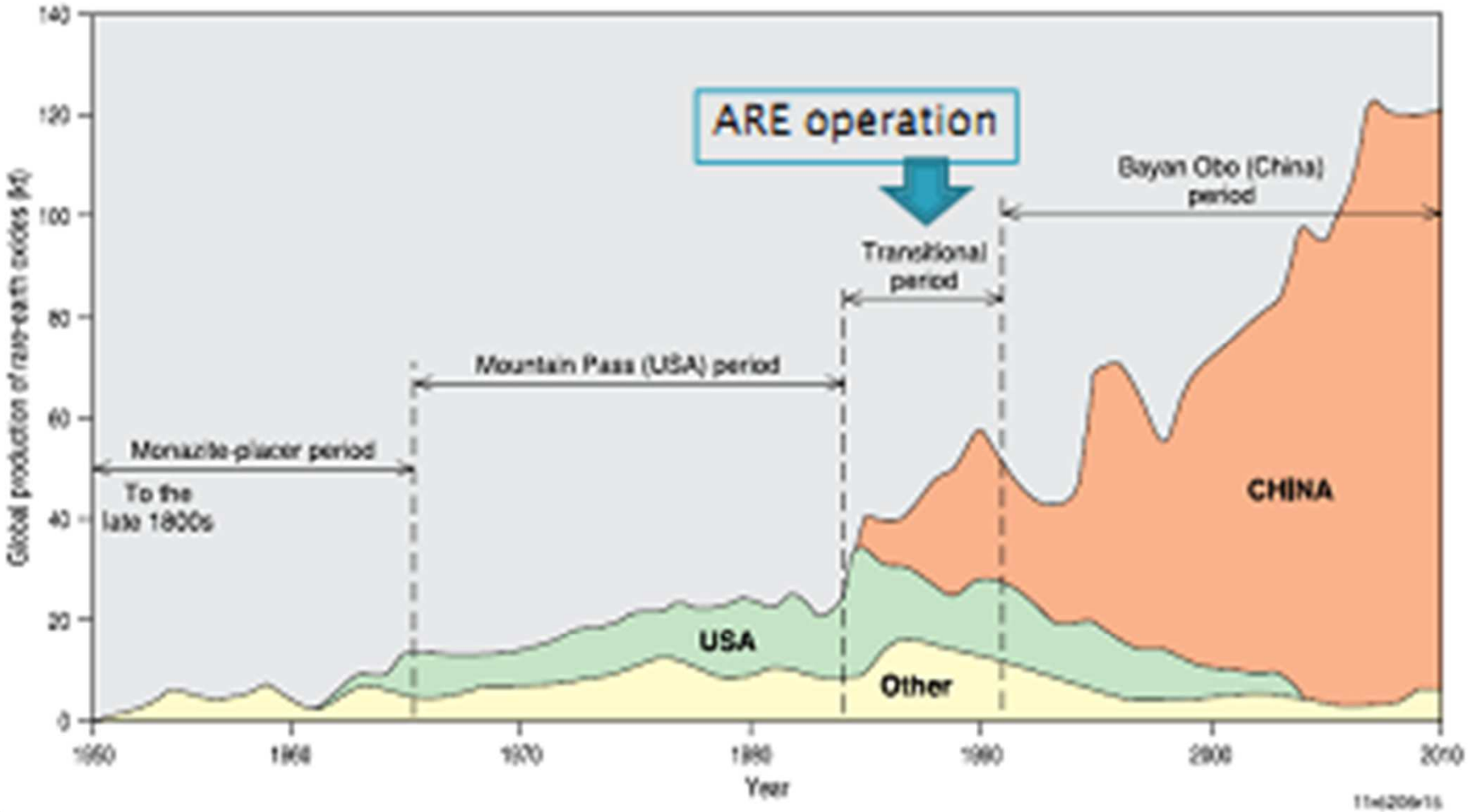
ARE: Public Protests

- 1984: residents of Papan and nearby towns sign a protest letter and send it to the Prime Minister, Perak Menteri Besar, the Minister of Health and the Minister of Science, Technology and Environment
- 1986: Representatives from seven areas (Bukit Merah, Lahat, Taman Badri Shah, Menglembu, Papan, Falim and Guntong) form the Perak Anti-radioactive Committee (PARC)
- 1987: About 10,000 people participated in a rally condemning the ARE for its operation

ARE – COURT CASES

- **Feb 1985 – Residents of Bukit Merah sued the ARE claiming its operation endangered their life. The case was heard at the Ipoh High Court.**
- **11 Jul 1992 – Ipoh High court issued order for the ARE to stop operation and transferred all wastes to the LTSF.**
- **23 Dec 1993 – The Supreme Court overturned the High Court decision on 2 grounds. The Court was of the opinion that ARE's experts were more believable in terms of the results of the tests conducted by them showing that radiation was within permissible levels. Secondly, the Supreme Court said that the residents should have gone back to the AELB to ask that it revoke ARE's licence, because AELB has the power to do so under the Atomic Energy Licensing Act.**

14 Jan 1994 : ARE announce its closure; citing the low price of rare earth as the main reason



Source: Geoscience Australia 2011

LYNAS ADVANCED MATERIALS PLANT [L.A.M.P]

LYNAS CORPORATION

- Mount Weld to Fremantle = 1000km

Gebeng, Malaysia, has exceptional infrastructure required for a Rare Earths separation facility

PROCESSING HUB WITH EXCEPTIONAL INFRASTRUCTURE

INDUSTRIAL INFRASTRUCTURE

- Energy, chemicals, water, industrial land

KNOWLEDGE INFRASTRUCTURE

- Engineering, trade skills and services

GOVERNMENT INFRASTRUCTURE

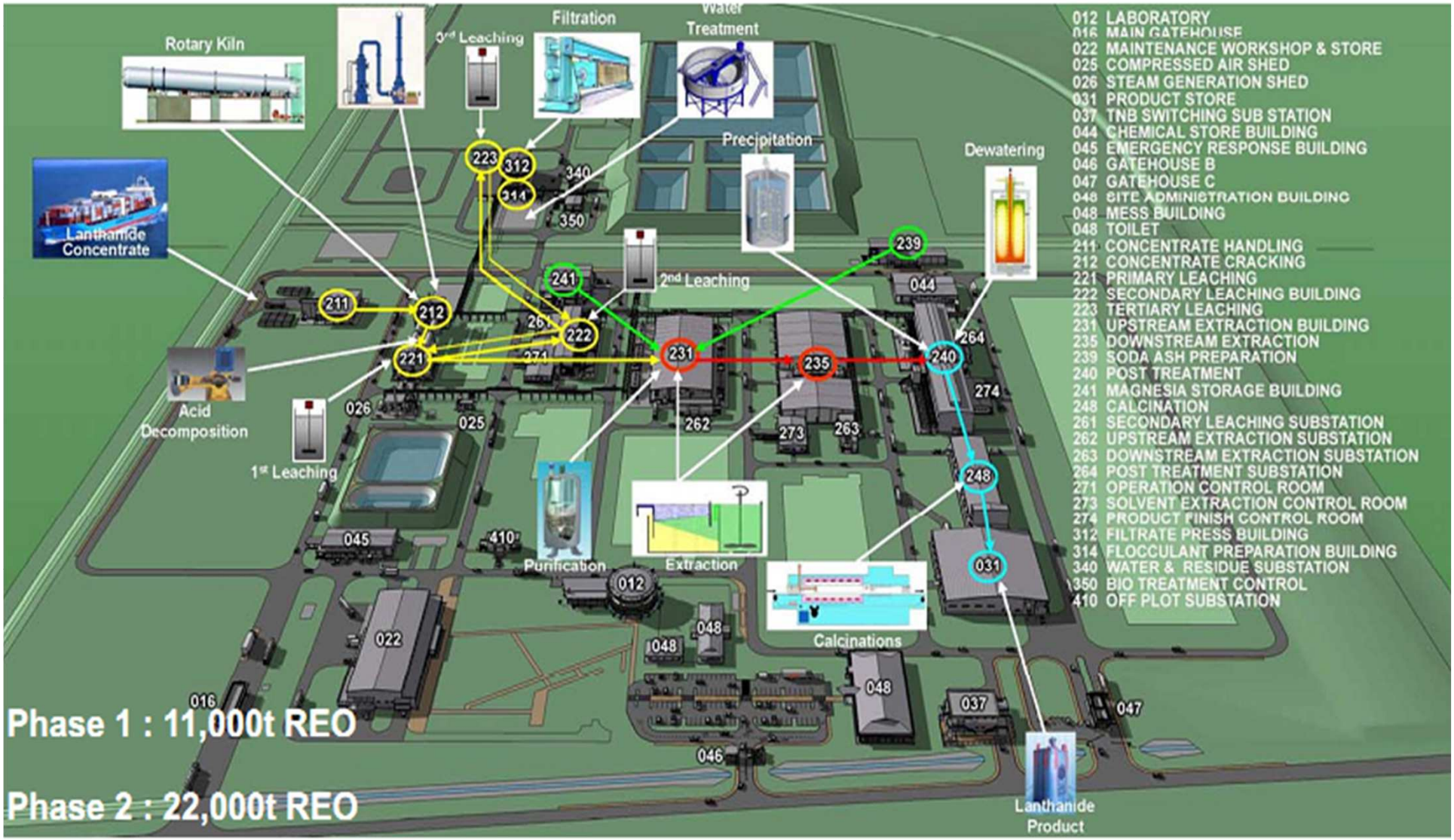
- Including FDI incentives

(12 years tax exemption for pioneer status)

The products are set for Phase 1; Lynas has product flexibility in Phase 2

PHASE 1 – 11,000t REO PRODUCTS	ANTICIPATED VOLUMES (tpa)
Ce carbonate	2,600
La carbonate	1,350
Ce / La carbonate	4,000
Nd / Pr oxide	2,700
SEG + Heavy Rare Earths	480
PHASE 2 – ADDITIONAL 11,000t REO PRODUCTS. Phase 2 will provide additional flexibility, with capacity to produce up to the following approximate volumes:	
Ce carbonate, oxide	5,200
La carbonate, oxide	2,700
Nd oxide and Pr oxide	2,700
Separated SEG + Heavy Rare Earths	480

The Lynas Advanced Materials Plant (LAMP) is built to international environmental performance standards – gas, water and solids manangement



BASIC FACTS vs MYTHS

Chemical plant vs nuclear power plant;

LYNAS, Gebeng is not the same as Asian Rare Earth, Bukit Merah;

Radioactivity of Raw Material (Mount Weld vs Bukit Merah) ~ 30 – 40 x

COMPARISON ON RAW MATERIAL AND RESIDUES ASIAN RARE EAERTH [ARE] VS LYNAS PLANT

Plant	ARE		Lynas	
Mineral	Monazite		Carbonatites	
Radioactive content	Uranium ppm	Thorium ppm	Uranium ppm	Thorium ppm
	5,000	80,000	29	1,600
Residue	Thoria		Synthetic Gypsum	
Radioactive content	Uranium ppm	Thorium ppm	Uranium ppm	Thorium ppm
	7,000	360,000	22.5	1,614

BASIC FACTS vs MYTHS

Low socio economy benefits (~ 350 employees vs thousands employees)

Tax incentive (12 years vs typical 10 years)

Raw material and WLP (classified as low level NORM)

BASIC FACTS vs MYTHS

Avoid building the plant in Australia and came to Malaysia (feasibility);

Chased out from China & Terengganu (market control & time);

WLP commercialization (6 Bq/g to 1 Bq/g → UK's Health Protection Agency : road construction)

BASIC FACTS vs MYTHS

- Radioactivity of Residue (Lynas vs ARE : 60x);
- Radioactivity Rain from Stack (0.002 mSv/yr vs permissible 1 mSv/yr);
- Traveling of Radon and Thoron gases (very short half life);

REPORT BY PARLIAMENT SELECT COMMITTEE ON LYNAS ADVANCED MATERIALS PLANT (LAMP)

12TH PARLIAMENT SESSION, 5TH TERM

The PSC Conclusion

L.A.M.P is a chemical plant; not a nuclear power plant or a mine.

Has fulfilled all the standards and regulation in Malaysia.

Has put in place the necessary control system.

The PSC Conclusion

Operation licenses issued for Lynas to operate in stages and at certain limit.

A continuous monitoring committee will be established.

All 31 recommendations should be implemented.

31 PSC Recommendations

18

HEALTH, SAFETY & ENVIRONMENT; RESIDUAL

1

LICENSE AND PERMITTING PROCESS

4

STRENGTHENING ENFORCEMENT AGENCIES

5

INVESTMENT AND SOCIO-ECONOMY

3

COMMUNICATION AND INFORMATION DISSEMINATION

GENERAL LESSONS LEARNT

- High level of awareness of public on HS&E;
- Risks are real, need to be understood and can be managed;
- Scientific-based facts vs. emotions / perceptions;
- The synergy of science and politics – maturity & complementary;

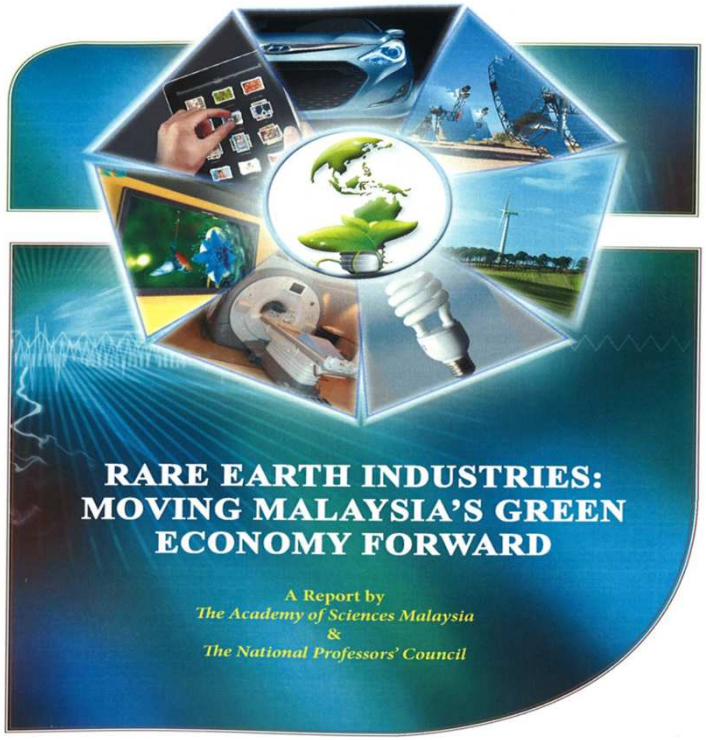
GENERAL LESSONS LEARNT

- Community engagement is very important;
- Malaysia HS&E standards comparable to the world standard;
- Can be a model country where risks can be managed efficiently, reliably and with integrity.

UMP'S ROLES

PARLIAMENT SELECT COMMITTEE L.A.M.P

ASM COMMITTEE ON RARE EARTH



AWARENESS SESSIONS FOR IPT'S STUDENTS

UMP'S ROLES

PROFESSORIAL TALK WITH COMMUNITY

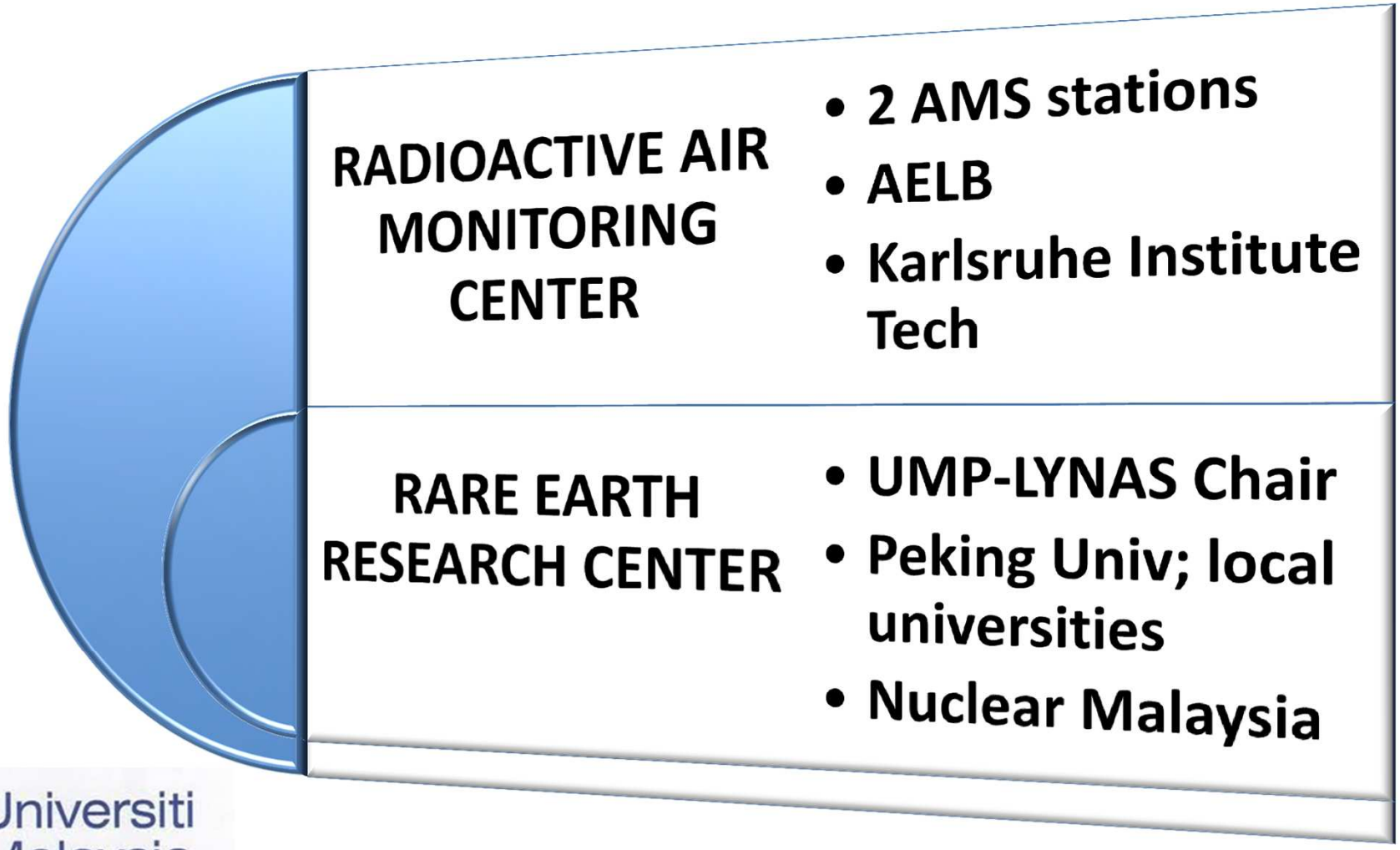

ASM, UMP anjur Seminar Antarabangsa Nadir Bumi

MEDIA ENGAGEMENT

INTELLECTUAL DISCOURSE

UMP'S ROLES

RARE EARTH RESEARCH CENTERS, UMP



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RARE EARTH R&D AREAS AT UMP

Universiti Malaysia PAHANG
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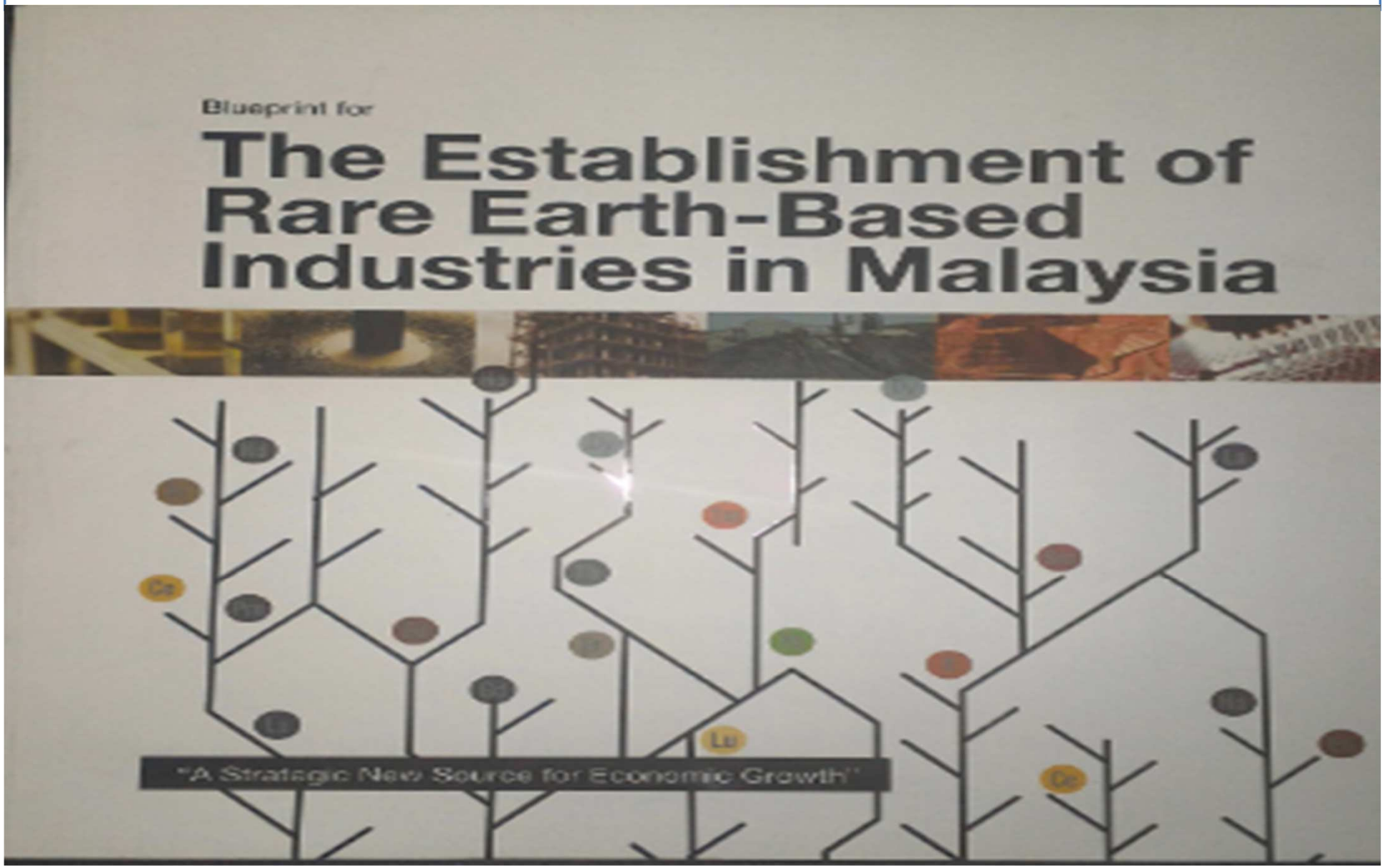
Rare Earth Processing	Rare Earth Process Plant Scale up and Design	Rare Earth Application in Petrochemical, Manufacturing and Automotive Industry
Rare Earth Metallurgy and Science	Safety and Environmental Management on Rare Earth Processes/Plants	Responsible and Sustainable Mineral Mining and Production

BLUEPRINT OF MALAYSIAN RARE EARTH INDUSTRIES [2015]



MALAYSIAN RARE EARTH BLUEPRINT

Main Objective:

to provide the necessary information for the policy makers or investors to make an informed decision on establishing industries in mining, in processing or in downstream industries using rare earths metals.

What Next?

All relevant parties need to work closely and put the national agenda above all interests in investment decision;

Public understanding, awareness and engagement are vital in minimizing conflicts;

Higher education institution can play significant roles in educating the public research and dissemination of knowledge, without fear or favour.

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4) Abdul Aziz, B. (2014) “Future Direction of Malaysian Rare Earth Industry: From Establishing R&D to Human Capital Development”, Keynote Speaker, *The 5th International Workshop on Industrial Technology of Rare Metals*, Incheon, Korea.
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