

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 Malaysia needed to decide scientific and local arguments to operate if harmful

Malaysia's Prime Minister, Najib Razak, said today that the government would not allow the Lynas rare earth processing plant to operate if it was found to be harmful to the environment or the health of the local community. He made the statement during a press conference in Kuala Lumpur, where he was addressing the media about the ongoing controversy surrounding the plant. Najib emphasized that the government's decision would be based on scientific evidence and the input of the local community. He stated that the government was committed to ensuring that the plant operated safely and responsibly, but that it would not compromise the environment or the health of the people of Malaysia.

Universal Studies Package
From studies, city plan shows that Lynas plant is not in the way of the city's development. The package includes a study on the impact of the plant on the surrounding area, a plan for the city's future development, and a package of measures to ensure that the plant operates safely and responsibly.

28-4-2012 12ptg
Dari KLCC to
Dat Mer
A group of people gathered at the KLCC to protest against the Lynas plant. They were holding signs and banners, and some were wearing yellow shirts. The group was led by a man who was speaking into a microphone. He was telling the group that they were going to march to the Dat Mer area, and that they were protesting against the Lynas plant. The group then started to march, and they were followed by a large number of people. The march ended at the Dat Mer area, where the group held a press conference.

Workers: Lynas plant safe

They are convinced operators pose no risk

THE workers at the Lynas rare earth processing plant in Malaysia are convinced that their plant is safe and that they are not posing any risk to the environment or the health of the local community. They made this statement during a press conference in Kuala Lumpur, where they were addressing the media about the ongoing controversy surrounding the plant. The workers stated that they had been working at the plant for a long time, and that they had never experienced any problems. They also stated that they had been following all the safety procedures, and that they were confident that the plant was operating safely and responsibly.



Govt objects to residents' suit over Lynas

IN KUALA LUMPUR

The Malaysian government has objected to a lawsuit filed by residents of the village of Batu Gajah, who are claiming that the Lynas rare earth processing plant is causing them harm. The lawsuit was filed in the High Court in Kuala Lumpur, and it is the first time that a lawsuit has been filed against the plant. The government stated that it was not aware of the lawsuit, and that it was not involved in the case. The residents, on the other hand, stated that they were filing the lawsuit because they were concerned about the impact of the plant on their village. They claimed that the plant was causing them health problems, and that it was polluting the environment. The case is expected to be heard in the coming months.



In defence of Lynas plant

Malaysia says spin-off activities, downstream development will boost economy

Malaysia's Prime Minister, Najib Razak, said today that the Lynas rare earth processing plant was a vital part of the country's economy, and that it was doing everything it could to ensure that it operated safely and responsibly. He made the statement during a press conference in Kuala Lumpur, where he was addressing the media about the ongoing controversy surrounding the plant. Najib stated that the plant was a major source of employment for the local community, and that it was contributing to the country's economic growth. He also stated that the plant was following all the safety procedures, and that it was confident that the plant was operating safely and responsibly.

Lynas price reflects differing views

ANALYSTS

The price of Lynas shares has been fluctuating, reflecting the differing views of investors. Some investors believe that the plant is a safe and responsible operation, and that it is a good investment. Others, however, believe that the plant is a risk to the environment and the health of the local community, and that it is not a good investment. The price of the shares has been affected by these differing views, and it is expected to continue to fluctuate in the future.

Lynas to start operations

PRIME NEWS

The Lynas rare earth processing plant is set to start operations in the near future. The plant is located in the village of Batu Gajah, and it is expected to create a large number of jobs for the local community. The plant is also expected to contribute to the country's economic growth. The Lynas company has stated that it is committed to ensuring that the plant operates safely and responsibly, and that it is confident that the plant will be a success.

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Govt won't allow Lynas to operate if harmful

PM says Malaysia needed to decide scientific and local arguments to operate if harmful

Lynas price reflects differing views

ANALYSTS

Lynas to start operations

PRIME NEWS



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

TECHNICAL

FINANCIAL

POLITICAL

OPERATIONAL

**SOCIO
ECONOMICS**

INVESTMENT IN MALAYSIA



systems and procedures in place;

not as easy as several quarters claimed;

All related agencies has their own respective rules and regulations;

In LYNAS's case, it took ~ 6 years before approval was secured.

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



 Sc	 Y	 La	 Ce
 Pr	 Nd	 Sm	 Eu
 Gd	 Tb	 Dy	 Ho
 Er	 Tm	 Yb	 Lu

ABOUT RARE EARTH MINERALS

ARE NOT REALLY RARE ;

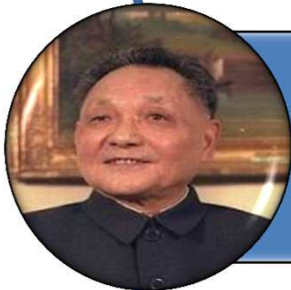
**WIDELY SPREAD THROUGH OUT THE EARTH'S
CRUST IN SMALL CONCENTRATIONS;**

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: LANTHANIDES PLUS YITTRIUM – UNIQUE PROPERTIES

Rare Earth Elements

La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71

Lanthanides

H																He		
Li	Be									B	C	N	O	F	Ne			
Na	Mg									Al	Si	P	S	Cl	Ar			
K	Ca		Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr		Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba		Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra																	

- **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



- Compact Fluorescent Lights
- Hybrid vehicle
- Weight reduction in cars

Environmental protection through lower emissions



- Wind turbine
- Auto catalytic converter
- Diesel additives

Smaller yet more powerful digital technology



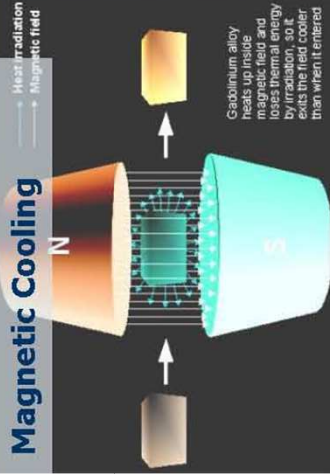
- Flat panel displays
- Disk drives
- Digital cameras

Rare Earth Advanced Materials

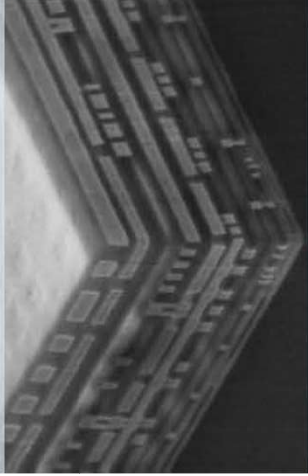
Magnets



Magnetic Cooling



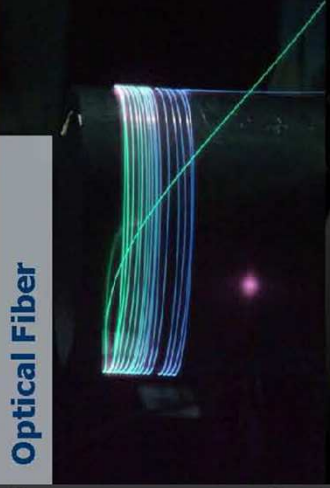
Dielectric Materials



catalysts



Optical Fiber



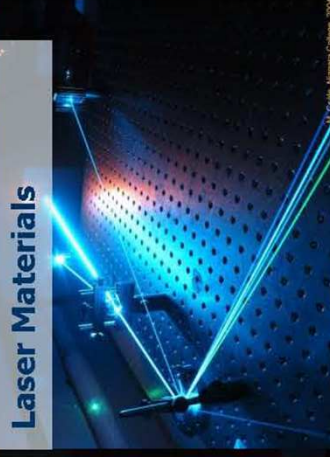
Giant (colossal) magnetoresistance



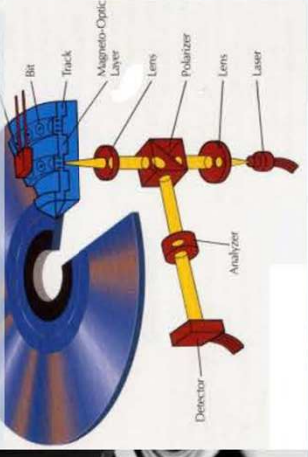
Phosphor



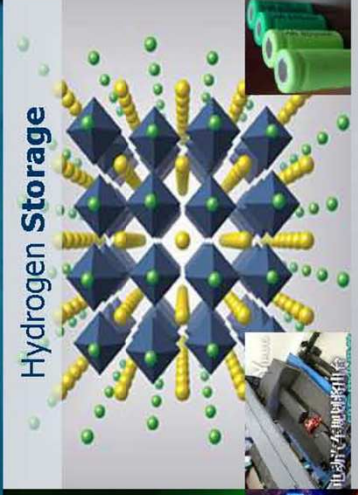
Laser Materials



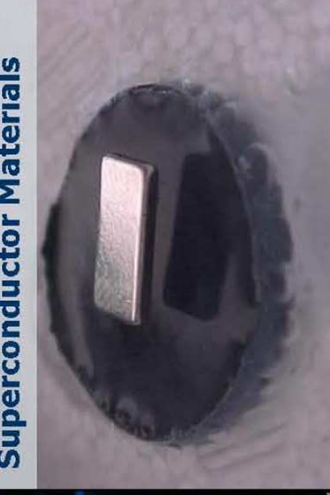
Magneto-optical storage



Hydrogen Storage



Superconductor Materials



Optical Glass&Polishing



Importance of REES to Modern Industry

aerospace industry



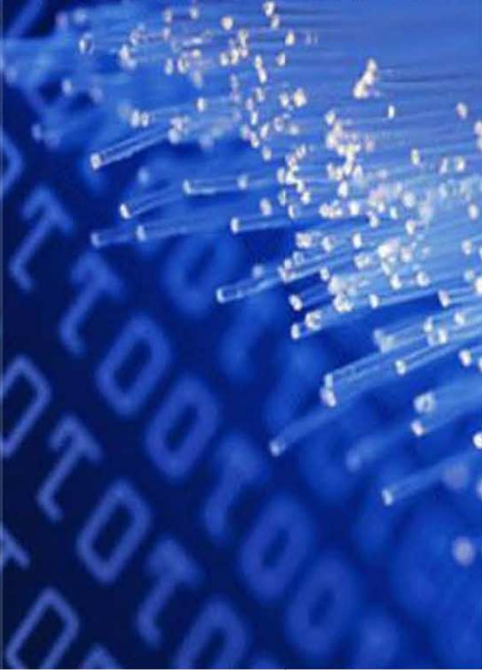
aviation industry



medical equipment



Information Technology



Electronics Industry



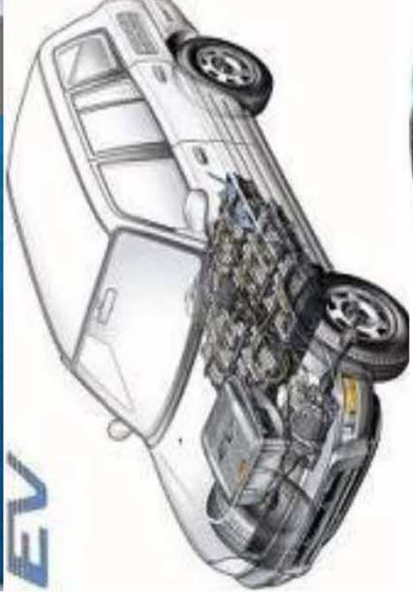
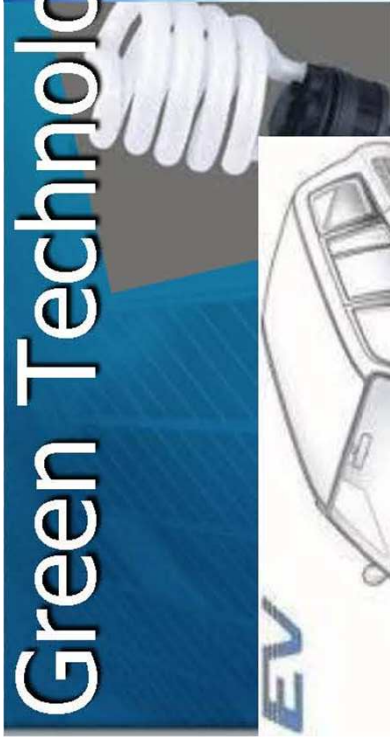
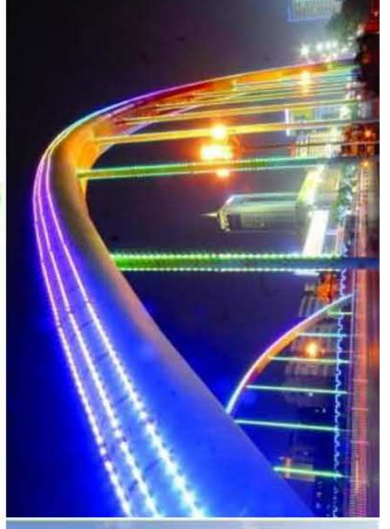
Energy and Transport



Consumer Electronics



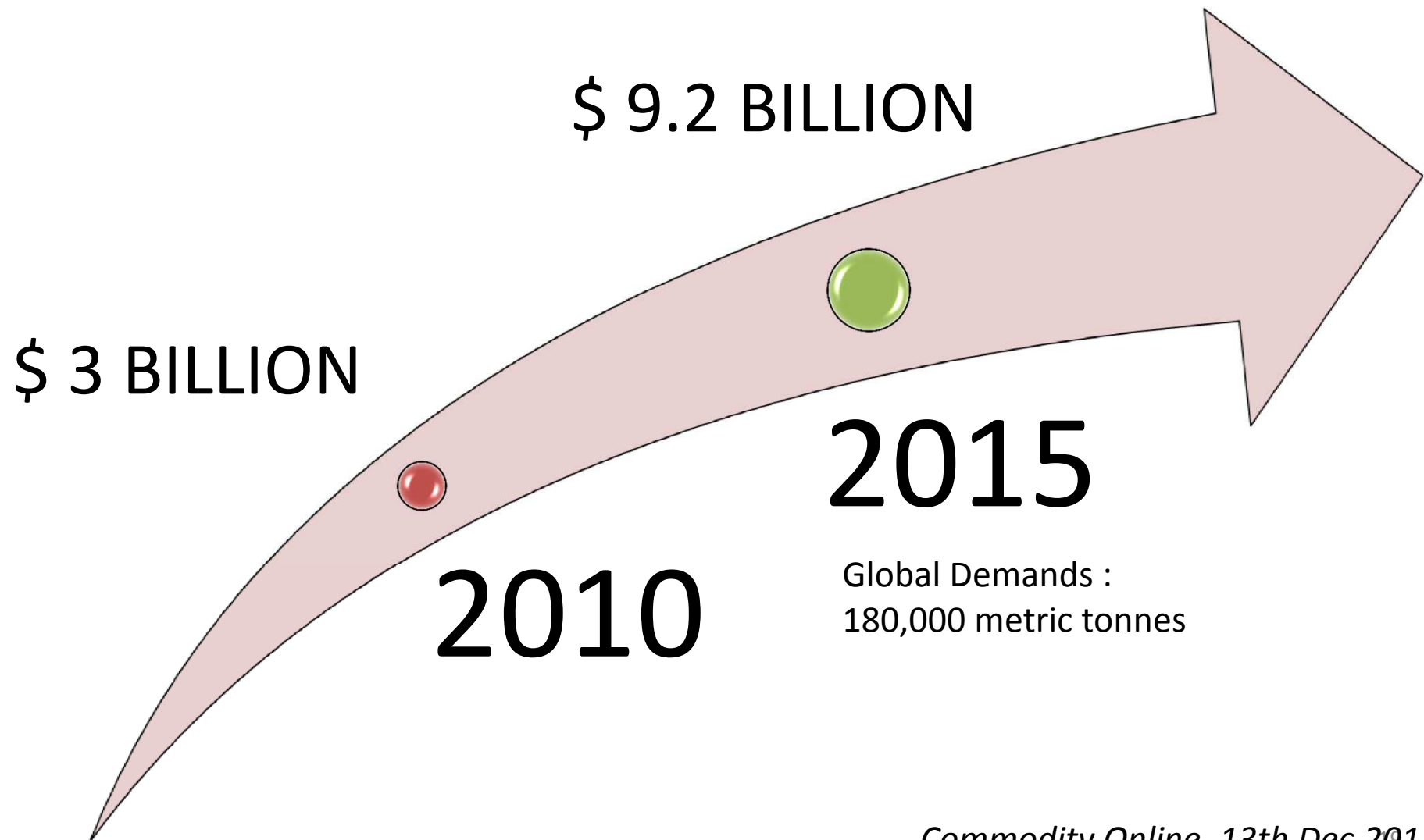
Green Technology



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



MARKET DEMAND : SALES OF RE

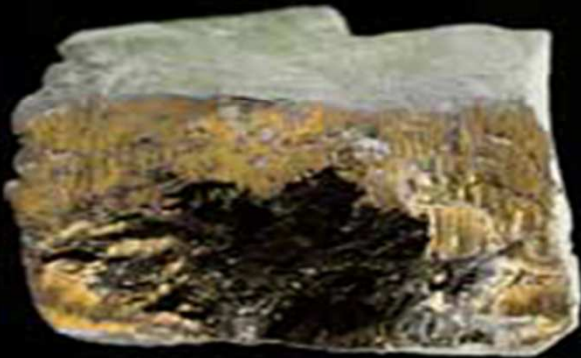


Commodity Online, 13th Dec 2011

Rare Earth Demand

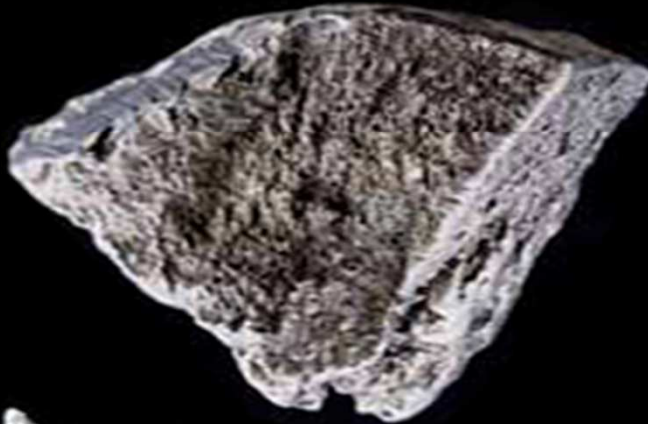
1. CERIUM

Flat-screen displays; fiber optics
Estimated 2015 demand in tons:
70,200



2. LANTHANUM

Oil refining; metal-hydride batteries
for electric vehicles
Demand: 48,500



3. NEODYMIUM

Hybrid/electric vehicles; wind
turbines
Demand: 36,900



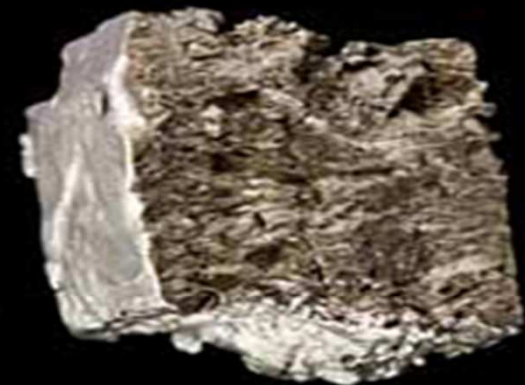
4. YTTRIUM

Smartphones; flat-screen displays
Demand: 14,050



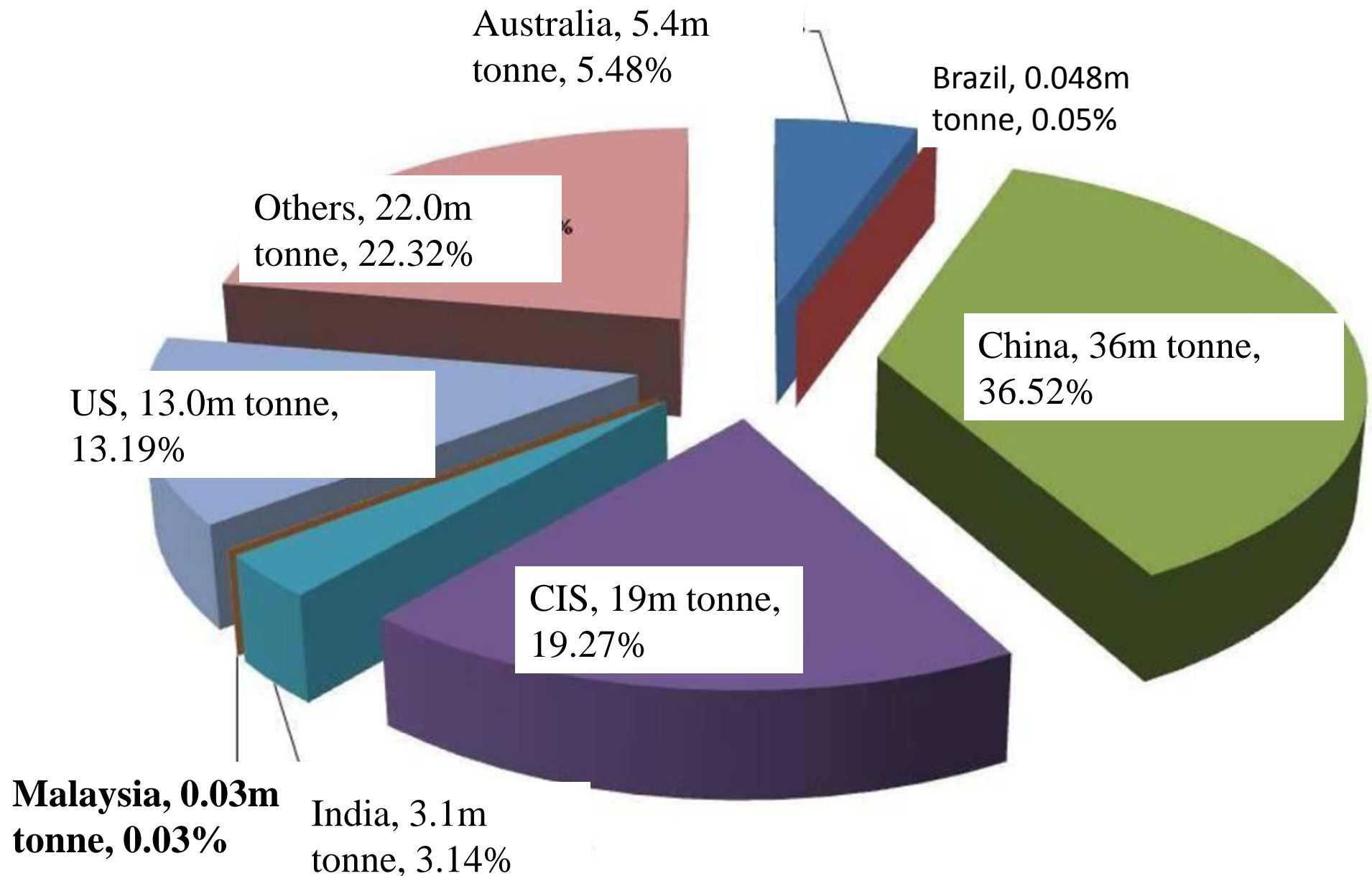
5. DYSPROSIUM

Magnetic resonance imaging;
smartphones
Demand: 2,200

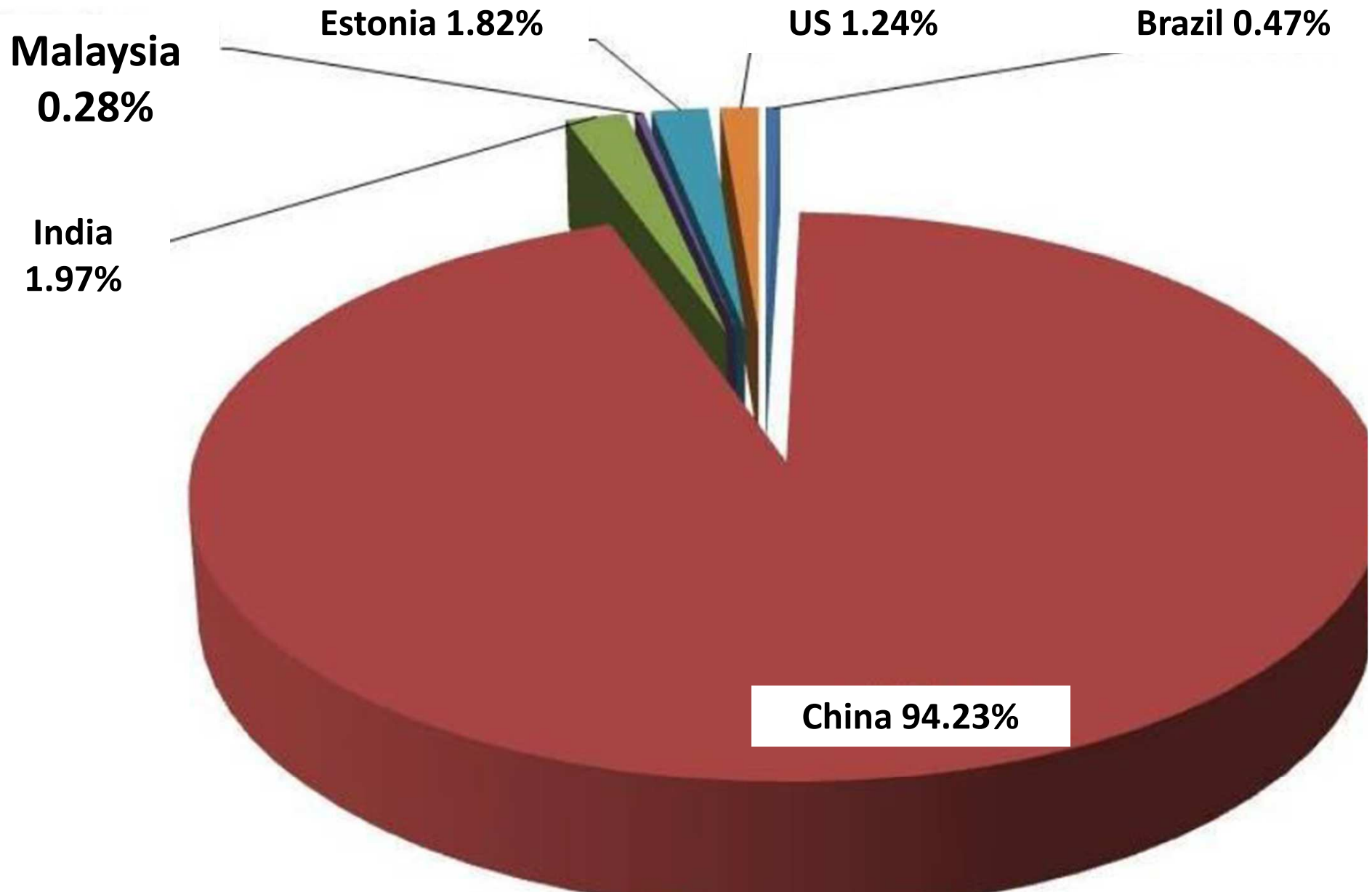


6. TERBIUM

Hybrid/electric vehicles; smart-
phones; flat-screen displays
Demand: 550



The world rare earth resource distribution (USGS 2010)



**The world rare earth supply in 2009
(USGS 2010)**

REE Process

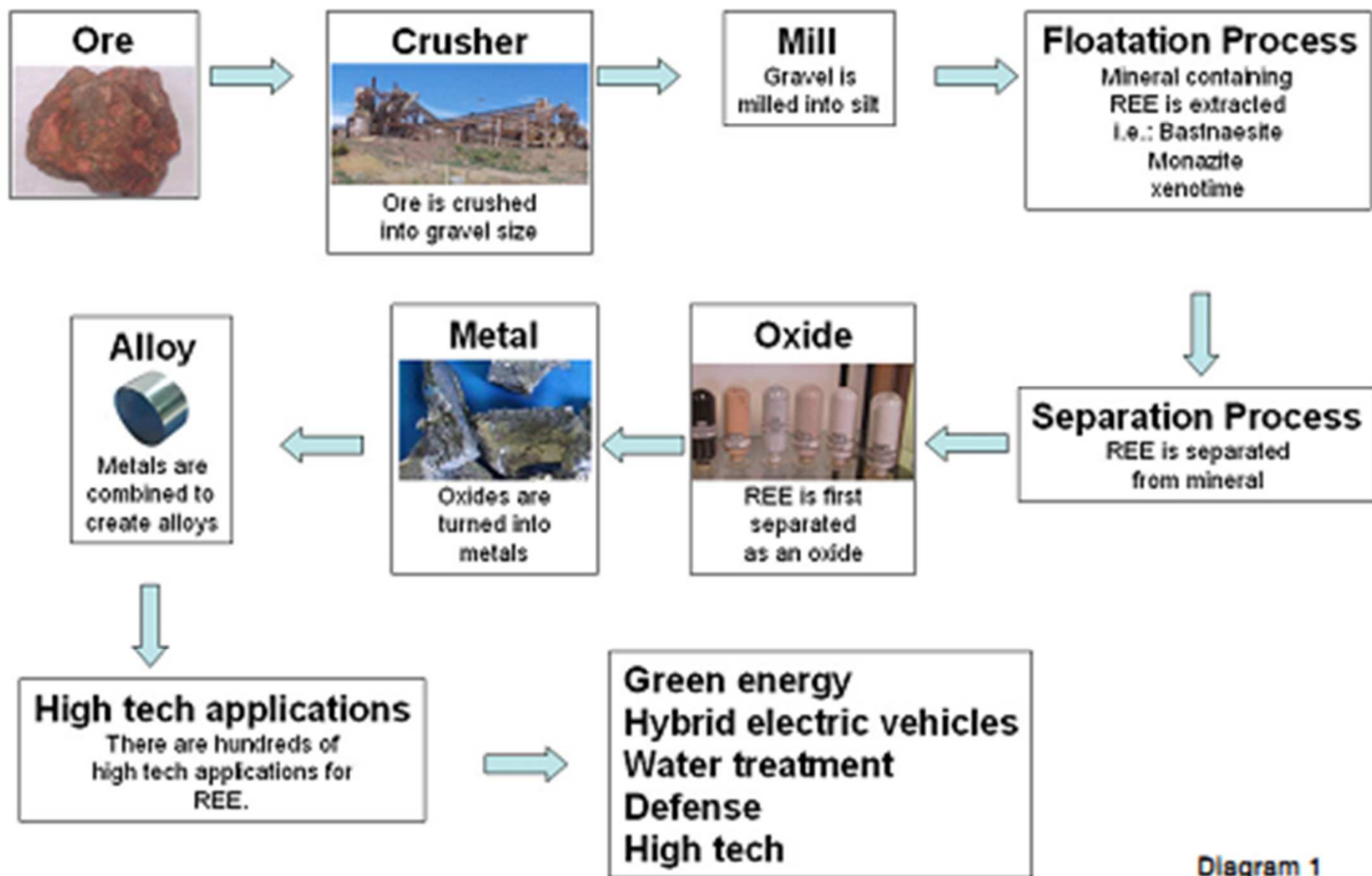


Diagram 1

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

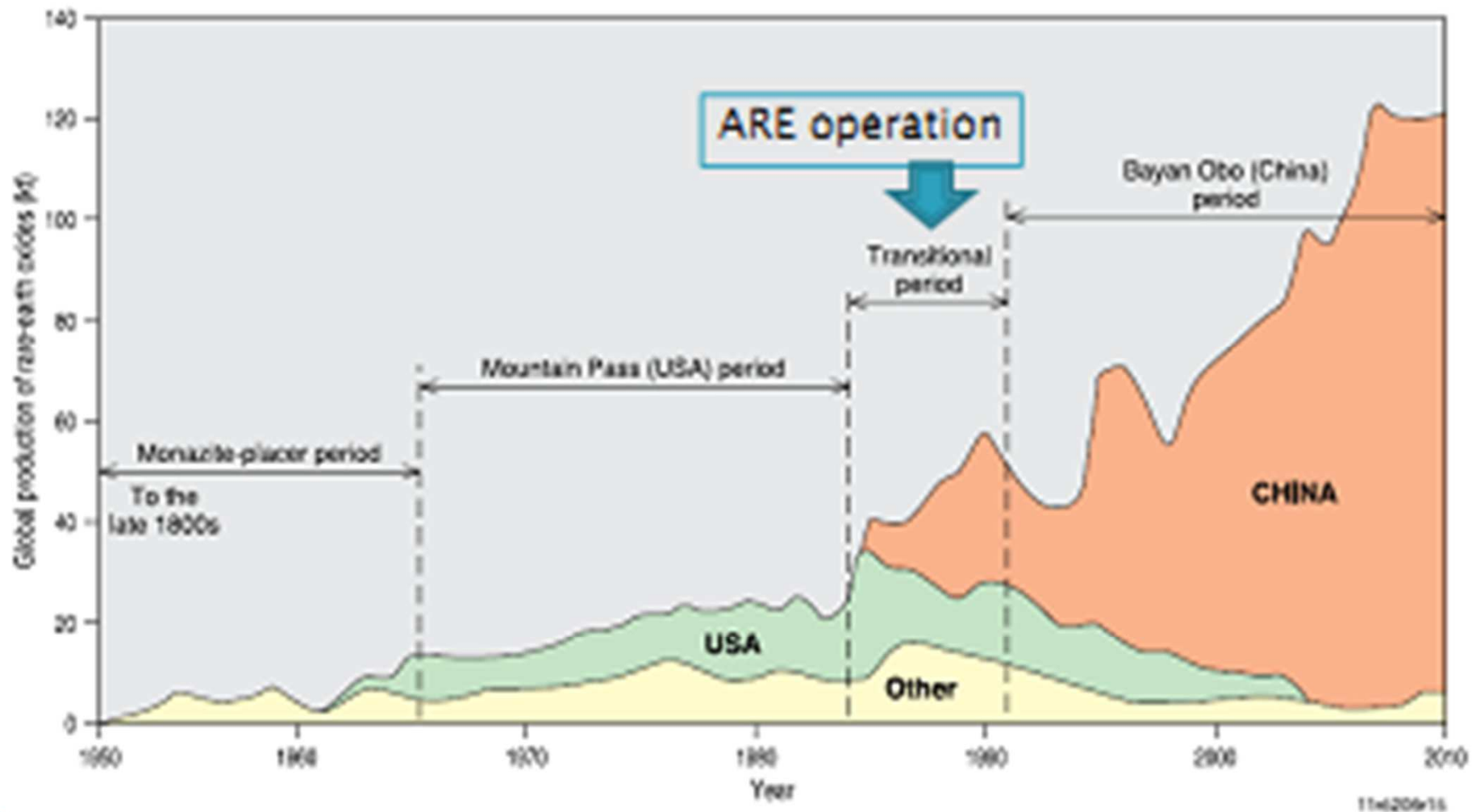
- ▶ 1984: residents of Papan and nearby towns sign a protest letter and send it to the Prime Minister, Perak Menteri Besar, the Minister of Health and the Minister of Science, Technology and Environment
- ▶ 1986: Representatives from seven areas (Bukit Merah, Lahat, Taman Badri Shah, Menglembu, Papan, 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

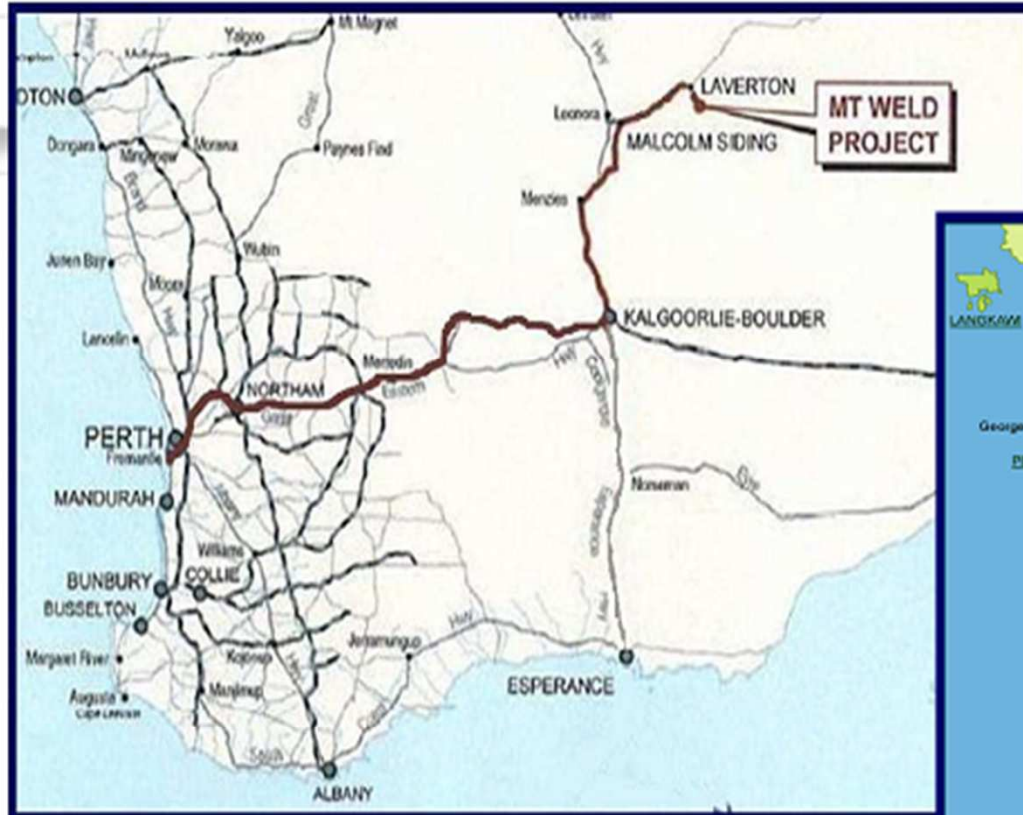


Source: Geoscience Australia 2011



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)

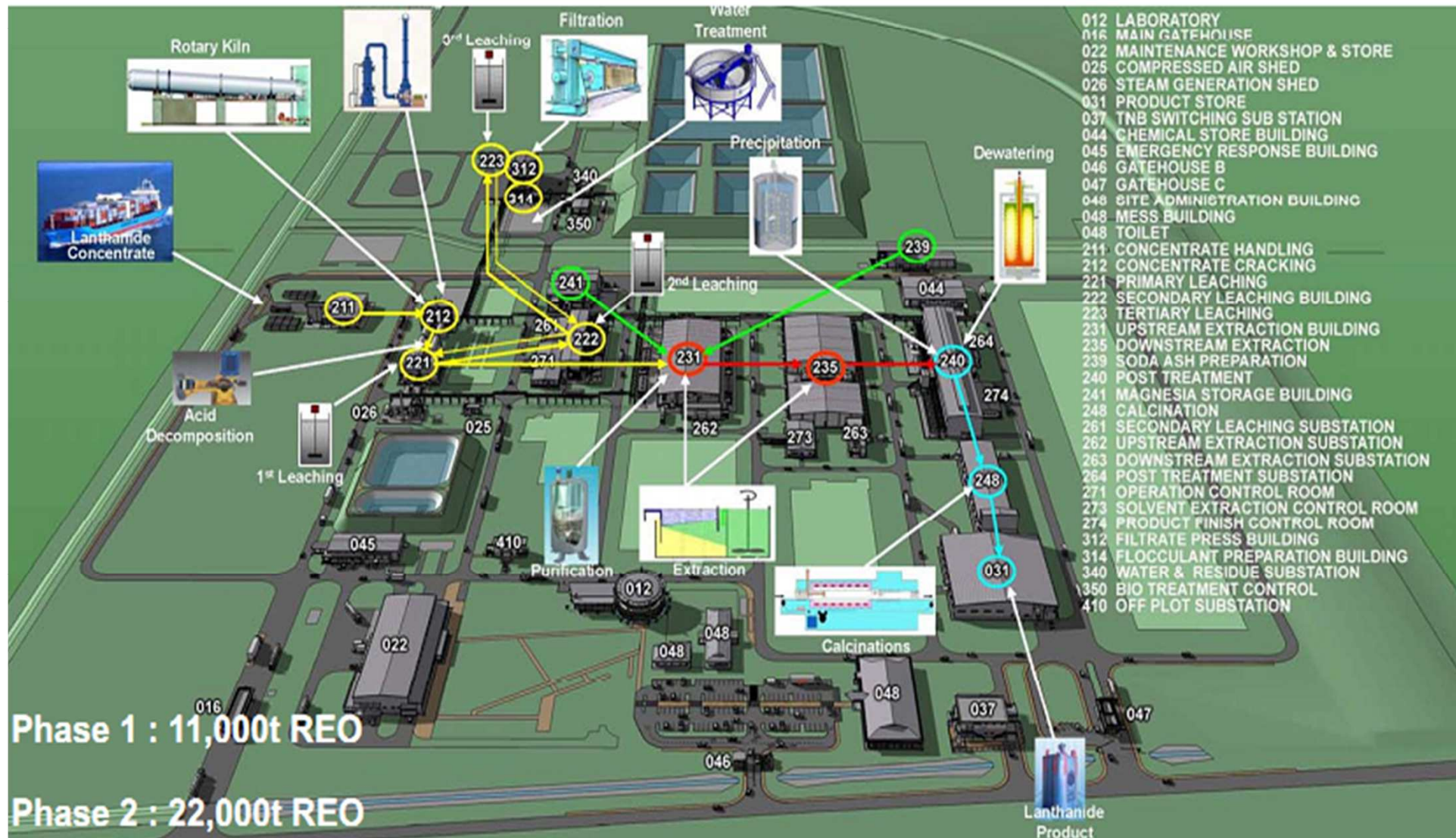


The products are set for Phase 1; Lynas has product flexibility in Phase 2



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 management



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 EARTH [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.

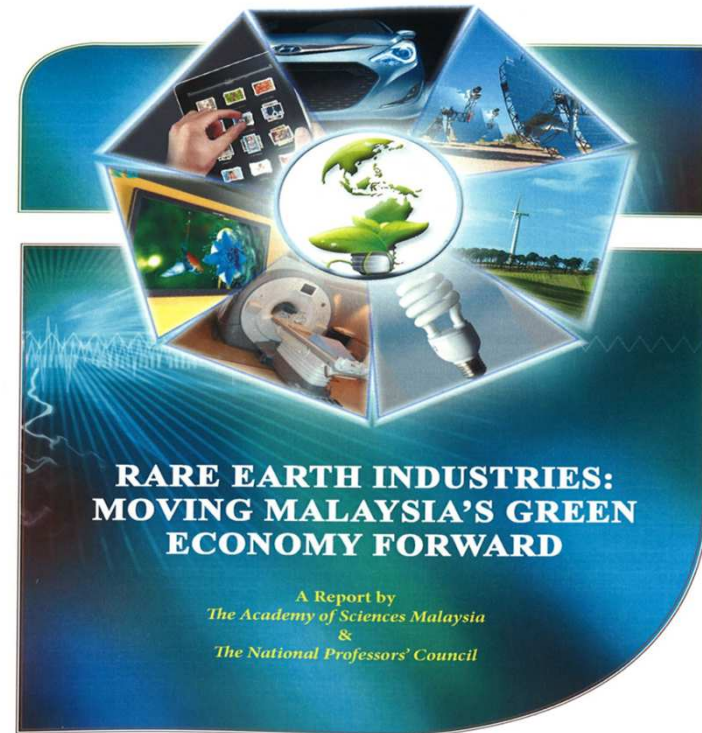
UMP'S ROLES



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**



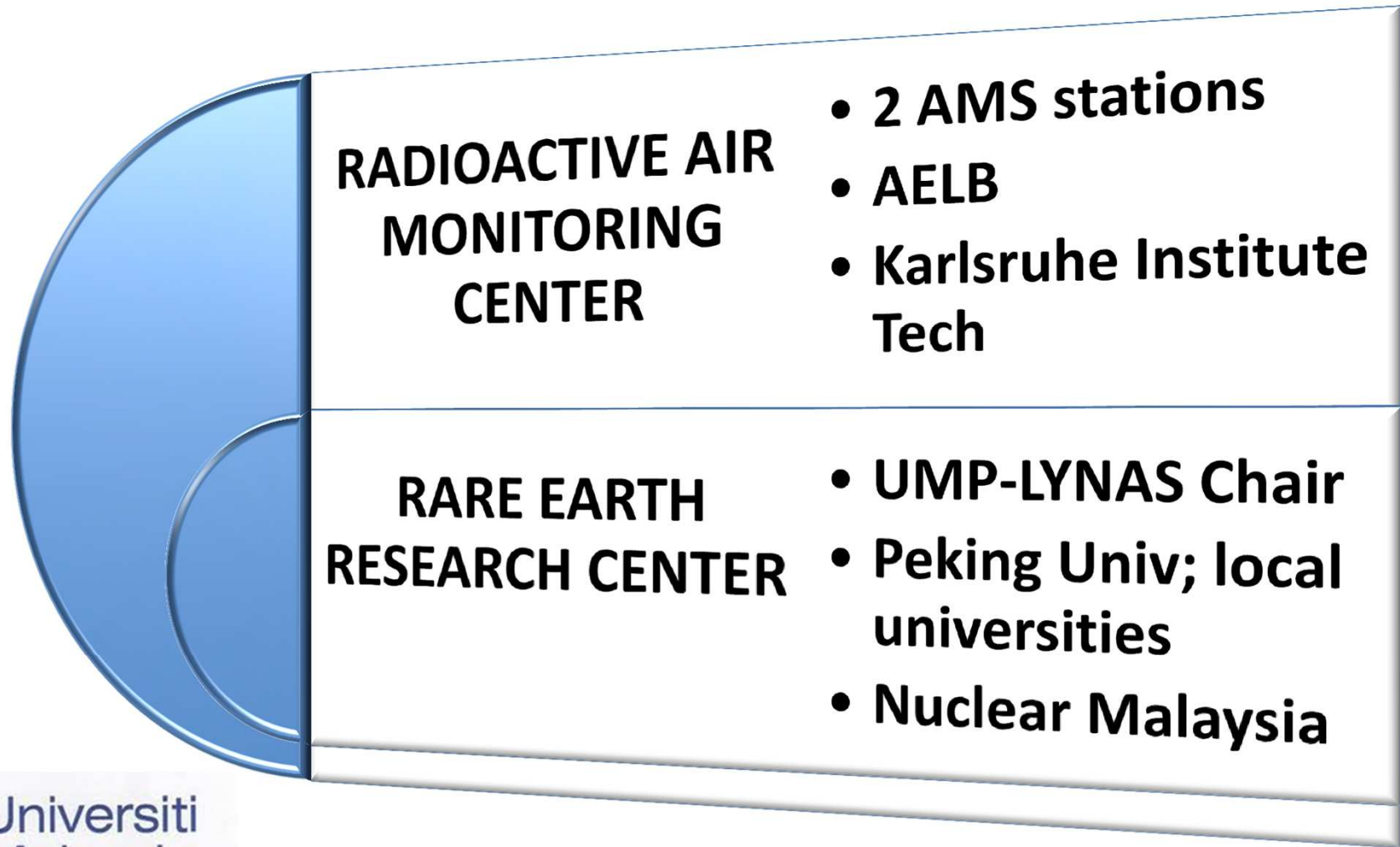
MEDIA ENGAGEMENT



INTELLECTUAL DISCOURSE

UMP'S ROLES

RARE EARTH RESEARCH CENTERS, UMP



RARE EARTH R&D AREAS AT UMP

**Rare Earth
Processing**

**Rare Earth Process
Plant Scale up and
Design**

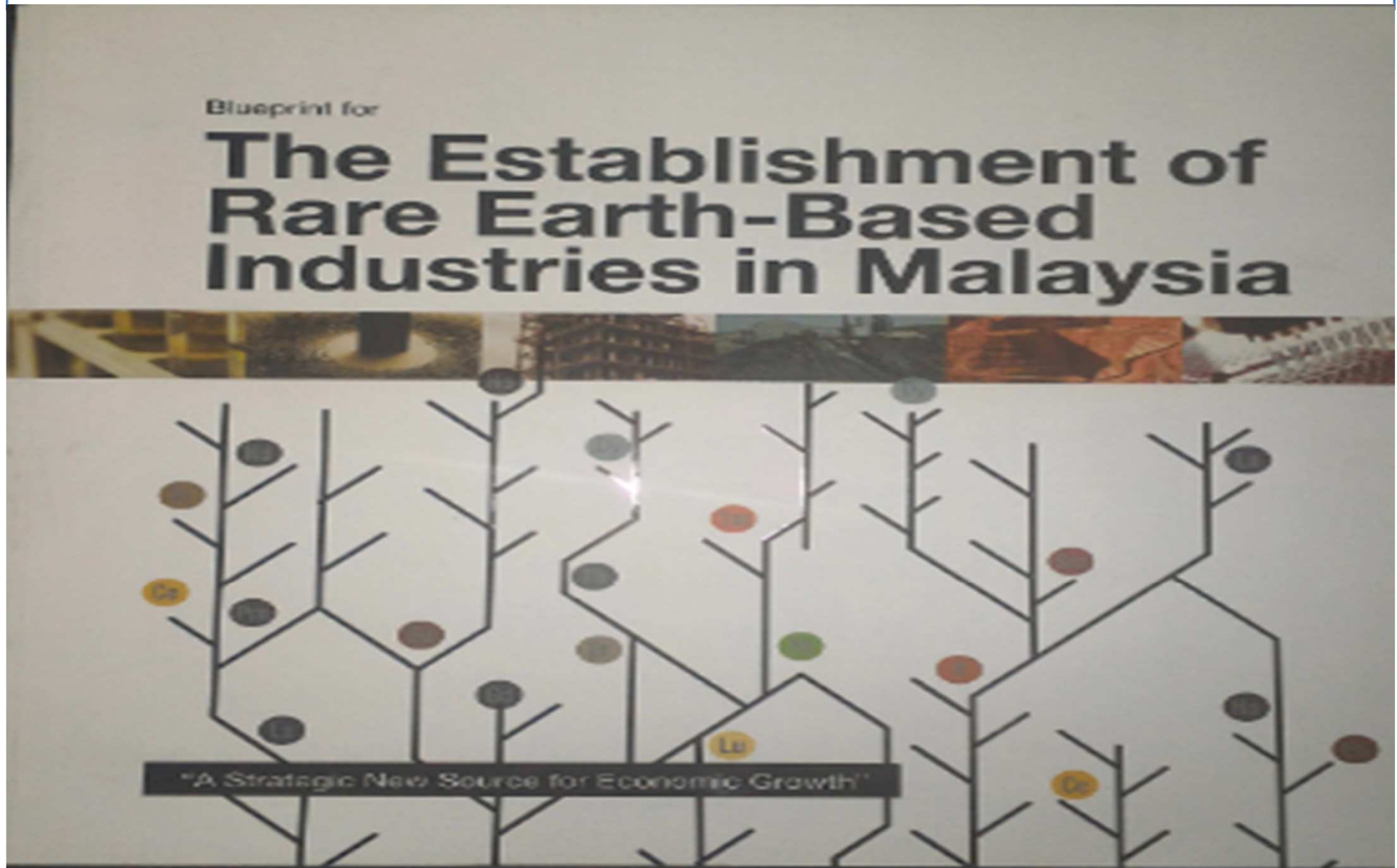
**Rare Earth
Application in
Petrochemical,
Manufacturing and
Automotive Industry**

**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.



REFERENCES

- 1) Drew Faust (2010) “The Role of the University in a Changing World” Speech at the Royal Irish Academy, Trinity College, Dublin.
- 2) Hiroshi Matsumoto (2012) “The Roles of Universities for the 21st Century” STS Forum 2012, Session 204A.
- 3) Abdul Aziz, B. (2013) “Integrity, Science and Perception : Lessons Learnt from Lynas Issue” Professorial Talk, UMP, Kuantan.
- 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.
- 5) Abdul Aziz, B. (2015) “A Perspective on Rare Earth Research and Development in Malaysia”, Keynote Speaker, *National Conference on Malaysian Rare Earth Technology 2015*, Kuantan, Pahang.

REFERENCES

- 6) Laporan Jawatankuasa Pilihan Khas Mengenai Projek Lynas Advanced Materials Plant (LAMP); Dewan Rakyat, Ke 12, Penggal ke 5, 2012.
- 7) Proceedings International Symposium on Rare Earth; Akademi Sains Malaysia & National Professors' Council, 2012.
- 8) ASM Report on Rare Earth Industries : Moving Malaysia's Green Economy Forward, August 2011.
- 9) Malaysian Parliament Hansard, 2012.
- 10) LYNAS Investor Presentation; May 2011.
- 11) StarBizWeek, The STAR, 2nd March, 2013.
- 12) USA Today, 5th August 2007.
- 13) The Guardian, 4th May 2012.
- 14) ProEdgeWire Online, 16th October, 2012.