



INVESTIGATIONS OF HYDROGEN AS AN ALTERNATIVE MARINE FUEL



BACKGROUND

Recollecting that the Initial IMO Strategy on Reduction of GHG emissions from ships is vital for the work of organization and that of member states.

The Strategy serves as a vital link to progress the aspirational values to promote global climate change initiatives.

Malaysia is keen to draw your attention to the initiatives on the key concepts – of alternative fuels.

The Presentation we will talk about 2 key areas

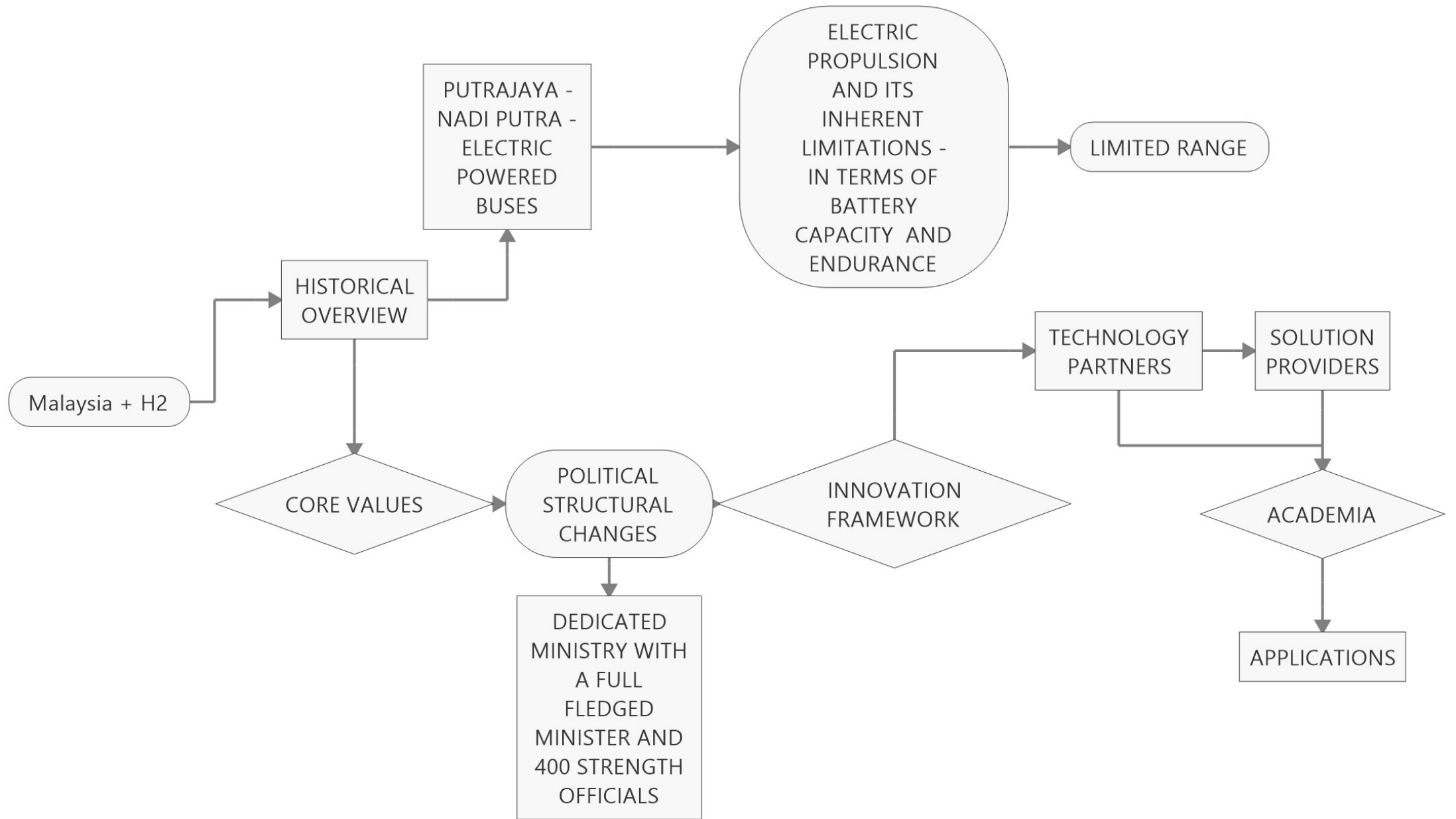
UPSTREAM – PRODUCTION & DISTRIBUTION – CRYOGENIC & NON CRYOGENIC

DOWNSTREAM – APPLICATIONS – MARINE AND NON MARINE

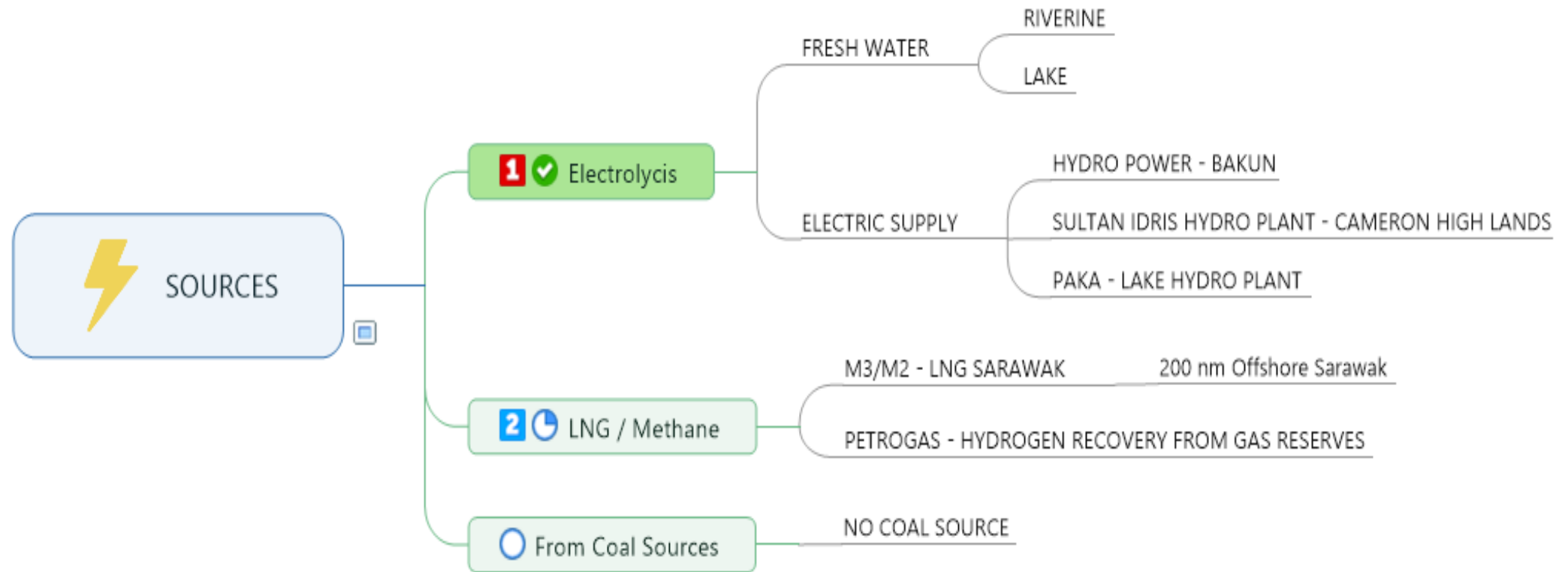
IN MARINE APPLICATIONS – BOTH ARE PREVALENT ON BOARD

MALAYSIA -

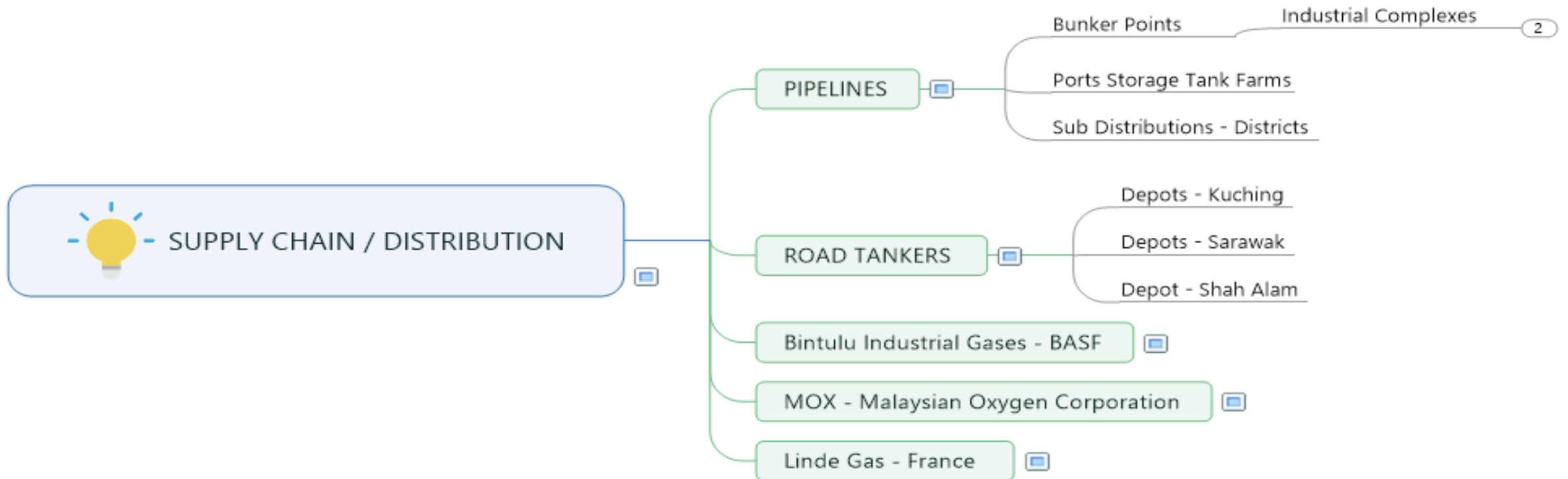
Malaysia responded to the globally anticipated energy security crisis and climate change by diversifying fuel-resources to include renewable and alternative energy, and developing green-energy technologies for the future. Fuel cell, using hydrogen energy, is an advanced green energy technology that has the potential to bring a clean, zero emission energy technology for a sustainable nation. *The Blueprint for Fuel Cell and Hydrogen Industries in Malaysia* released in 2017 by the Academy of Sciences Malaysia (ASM) is the result of collaborative discussions regarding the future of fuel cells and hydrogen energy with various stakeholders, including government agencies, industrial players, researchers and academia.



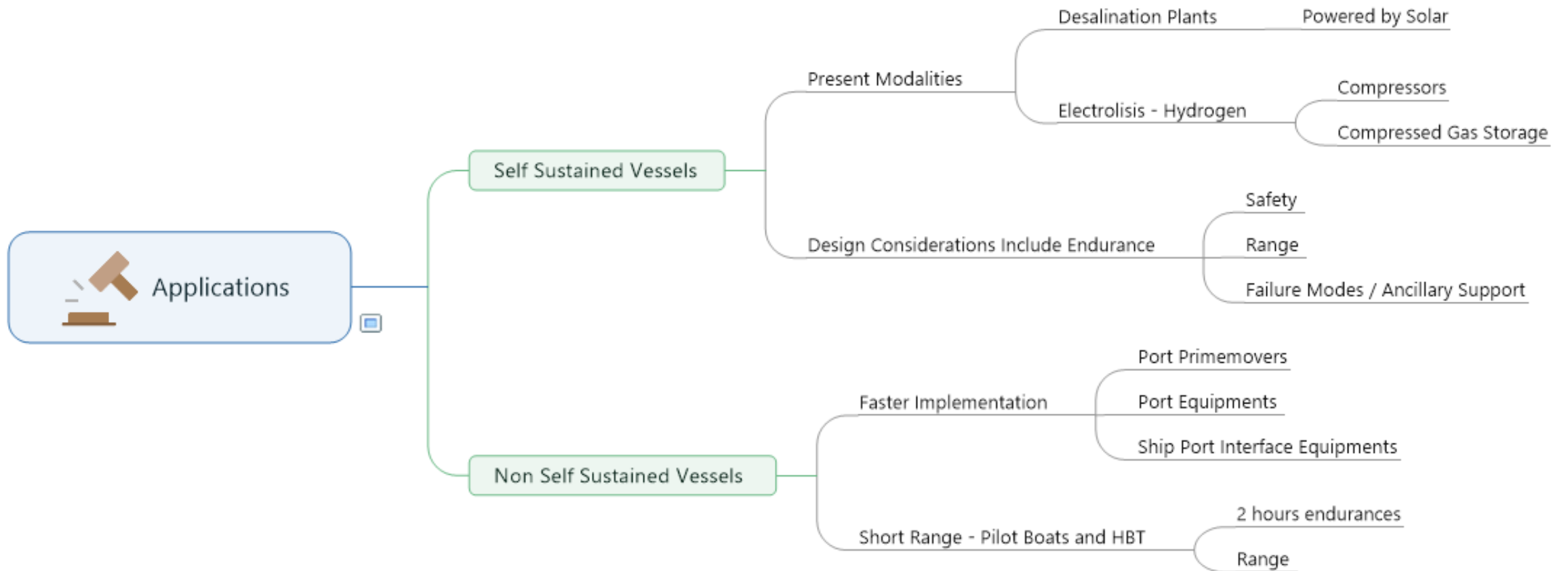
SOURCES



SUPPLY CHAIN DISTRIBUTION



APPLICATIONS



STEPS TAKEN

Hydrogen energy & solar energy at a smaller extent identified as most viable long term renewable alternative to fossil fuel

Fuel cell as most viable energy conversion device for hydrogen especially in transportation

Malaysia taking steps to prepare itself for eventual diffusion of solar, hydrogen energy & fuel cells technologies to developing countries

Solar, hydrogen energy and fuel cells identified as priority research by Ministry of Science Technology and Innovation

2019 – Sarawak - RM10 million has been allocated for R&D in hydrogen development in the state

RM50 million for R&D projects that would include a study on hydrogen development so as to incubate developing technologies

SCORE — SARAWAK'S RENEWAL ENERGY CORRIDOR

80% Malaysia's Energy Reform

Green Technology Powerhouse

Bakun — SEA — Largest Dam — with a catchment and containment area the size of 70,000sq km and 2nd Highest Vertical Face in the region. The project features a 205 m high concrete faced rockfill dam (the third highest dam of its type in the world) with a twin chute spillway of 15,000 m³/s total capacity. The power station comprises eight 300 MW nominal capacity generating units in a surface power station structure located at the base of the dam among the major 3.

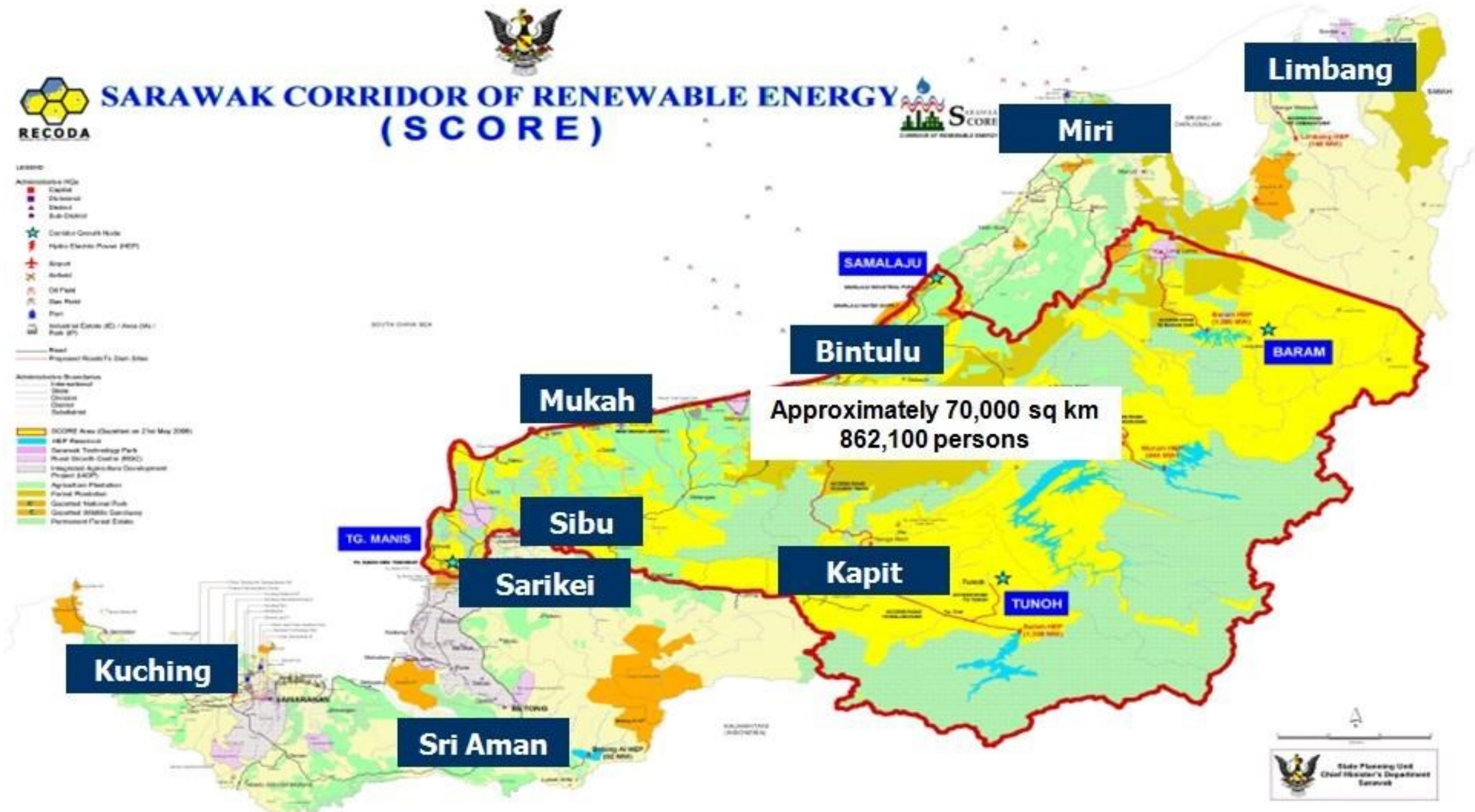
Houses 2 Major Gateway Ports — Bintulu and Similajau — PART of BIMP EAGA Network East Asia Growth Area (Brunei, Malaysia, Indonesia and Philippines)



SARAWAK CORRIDOR OF RENEWABLE ENERGY (SCORE)



- LEGEND**
- Administrative HQ
 - Capital
 - Division
 - Sub-Division
 - Central Government Node
 - Hydro Electric Power (HEP)
 - Spout
 - Waterfall
 - Oil Field
 - Gas Field
 - Port
 - Islands of Control (IC) / Area (IA) / Park (IP)
 - Road
 - Proposed Road/Fc. Dam Area
 - Administrative Boundary
 - Subdivision
 - State
 - Division
 - Class
 - Subclass
 - SCORE Area (Declared on 21st May 2006)
 - HEP Reservoir
 - Sarawak Technology Park
 - Rural Growth Centre (RGC)
 - Integrated Agriculture Development Project (IADP)
 - Agriculture Plantation
 - Forest Plantation
 - Geopark National Park
 - Geopark Wildlife Sanctuary
 - Permanent Forest Estate



INCUBATIONS STRATEGY TO PROMOTE HYDROGEN AS PREFERRED FUEL SOURCE

1. Research Development – Fuel Cell Research – 3 universities

A. National Malaysian University – Bangi

B. Malaysian Technology University – Johor Bahru

2. National – Hydrogen and Fuel Cell Symposium Malaysia April 2019 –looking at

- - Bipolar Plate (Graphite Plates)
- Membrane Electrode Assembly (MEA)
- PEM Fuel Cell Stack

3. SELFUEL – NATIONAL FUEL CELL INSTITUTE -

4. MALAYSIAN ASSOCIATION OF HYDROGEN ENERGY



MS MADADH MCLAINE

Talking about Zero Emission Technology Innovations