

# Scale-Up of Chemical Engineering Process

## Chapter 7: Industrial Case study

by  
Nurul Sa'aadah Sulaiman

Faculty of Chemical and Natural Resources Engineering  
[saaadah@ump.edu.my](mailto:saaadah@ump.edu.my)



Chapter 7 by Nurul Sa'aadah

# Example Case Study

## RARE EARTH PROCESSING PILOT PLANT



Chapter 7 by Nurul Sa'adah



# Developing Rare Earth Project

(Source: Dudley J. Kingsnorth, 2013)

Establish resource

Develop understanding  
of the mineralogy

Scoping study

Processing – beneficiation,  
extraction & separation

Environmental  
approach

Letters of intent

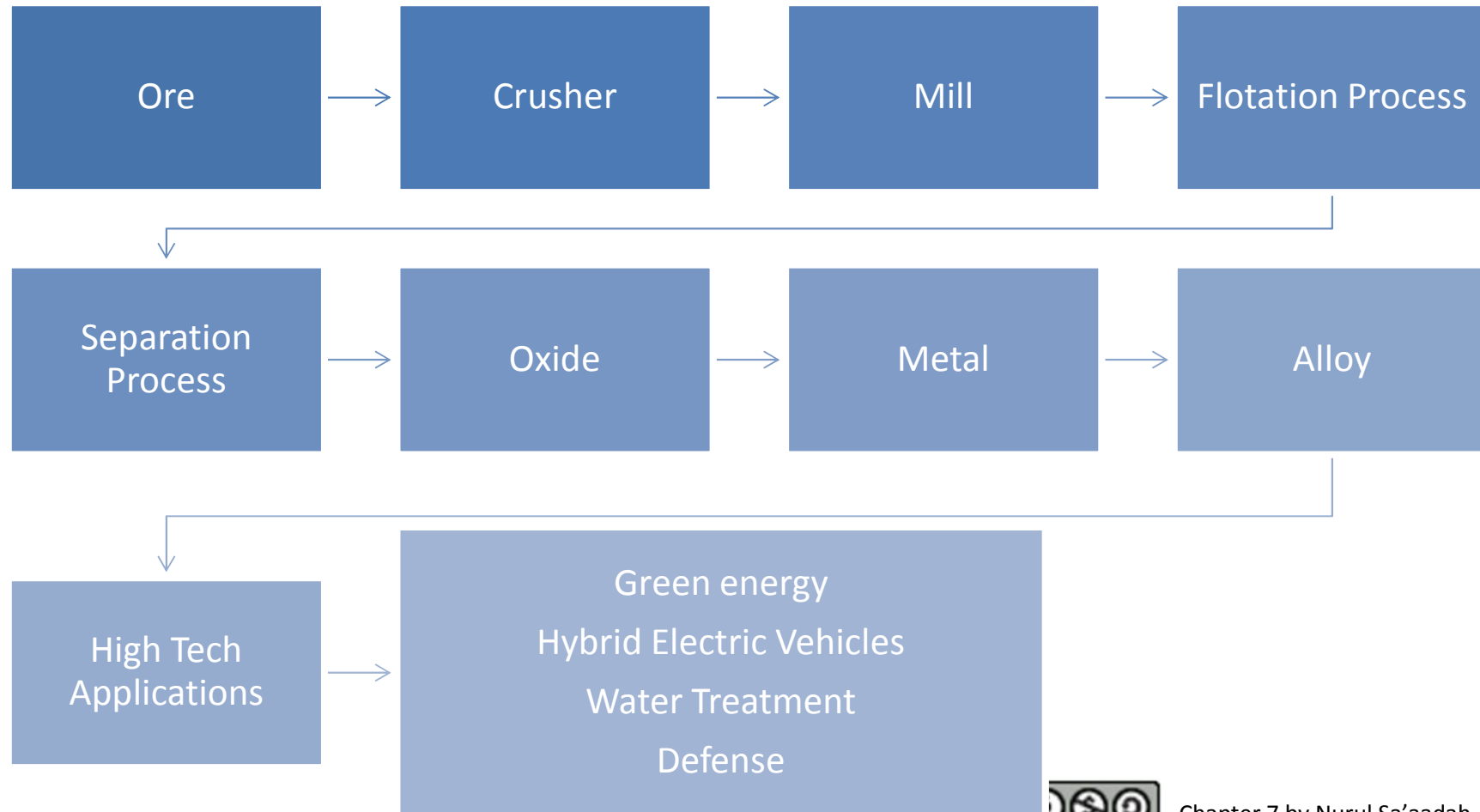
Definitive feasibility study &  
funding

Engineering,  
procurement &  
construction

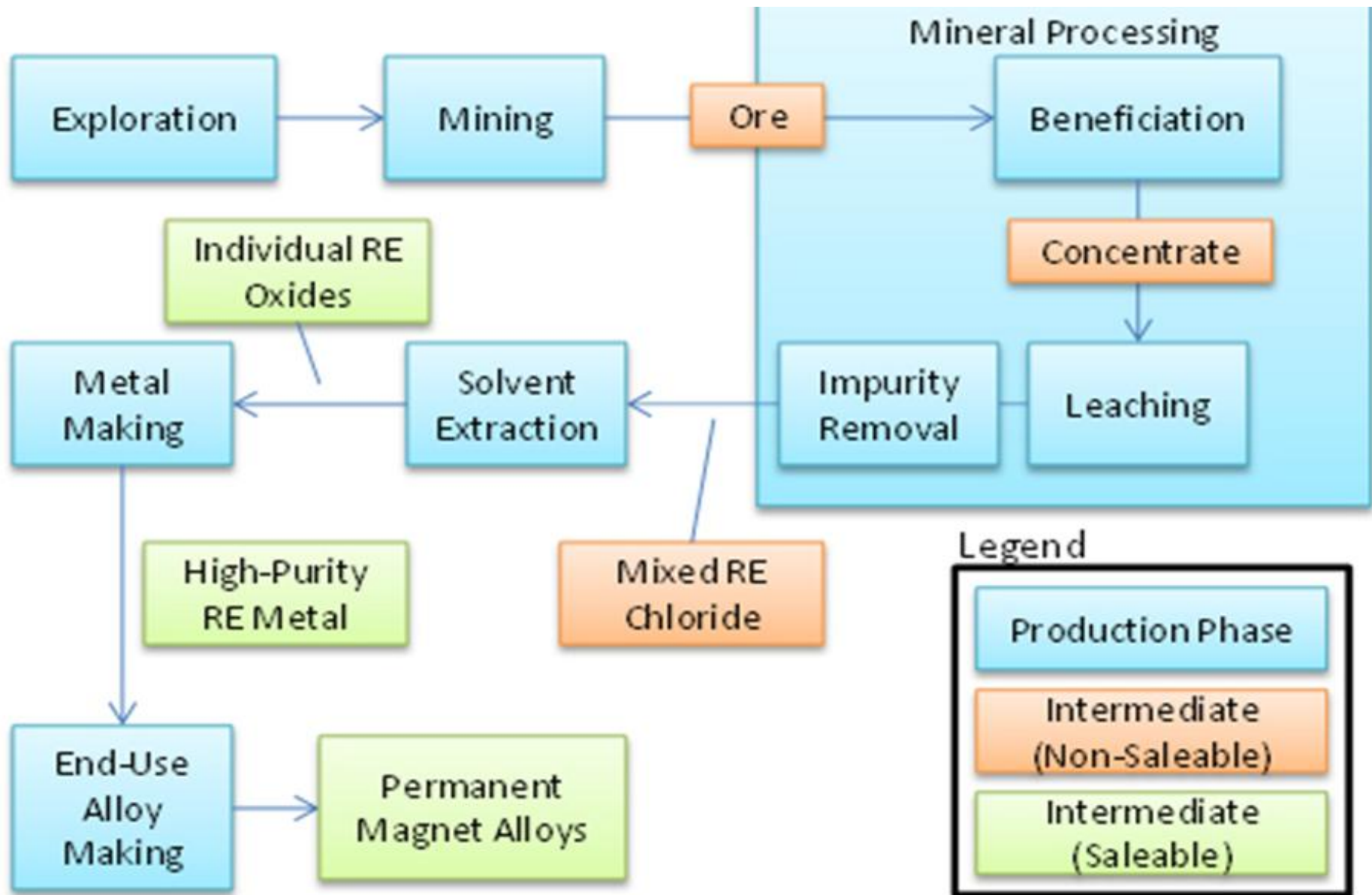
Commissioning &  
startup



# Rare Earth Processing & Supply Chain

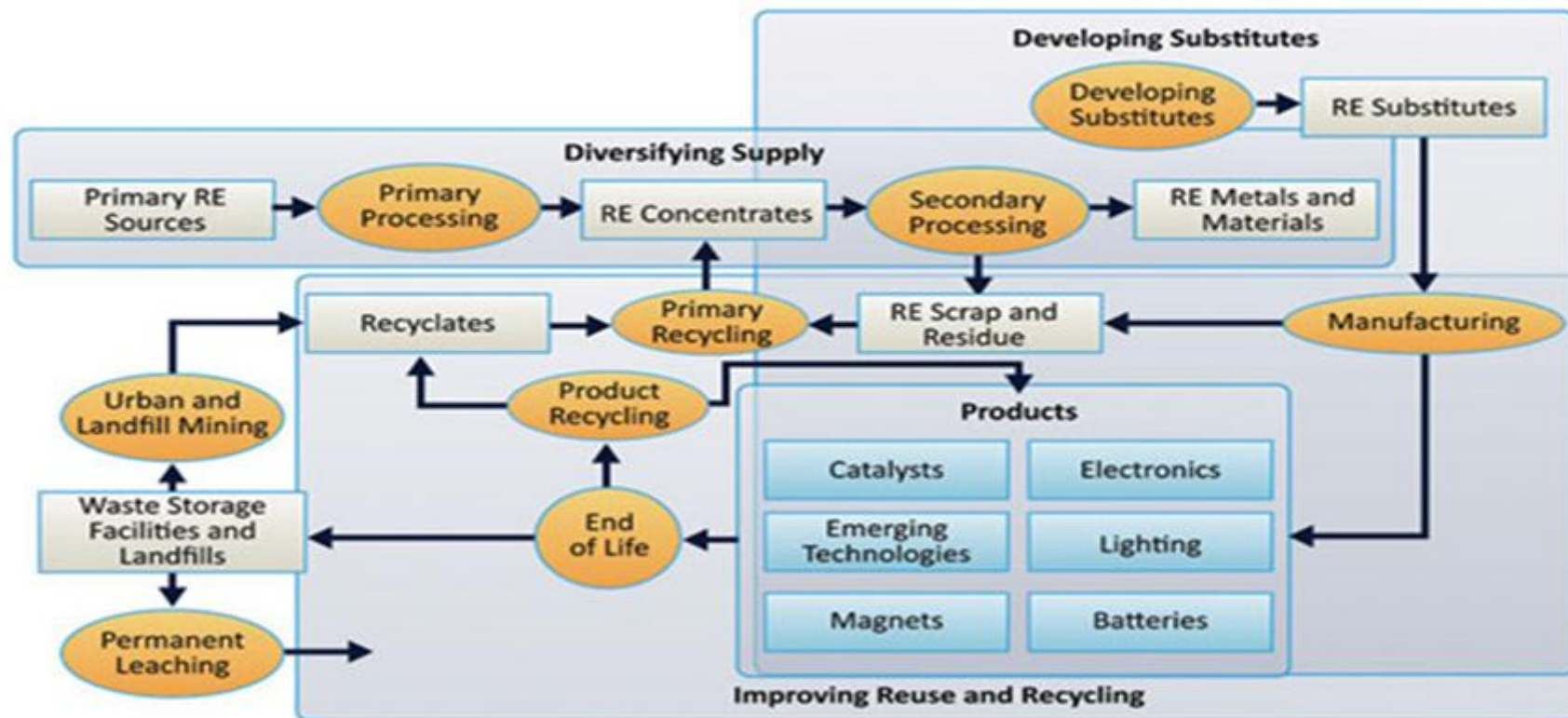


Chapter 7 by Nurul Sa'adah



# Rare Earth Supply Chain Analysis (Source: Ames Laboratory, Iowa, USA)

## Supply Chain and Economic Analysis



Chapter 7 by Nurul Sa'adah

# Future Trends in Process Development

- **Increased use of miniplant + mathematical modeling and simulation**
- **Miniaturization of research equipment**
- **Development and use of expert system**
- **Multipurposed, multiproducts plants**
- **Gaining increased insight in the relation between variability of process conditions and variability in product quality**
- **Finding novel routes in bulk chemicals production**
- **Process intensification**
- **'Pipeless' batch plants**



Chapter 7 by Nurul Sa'adah



# Author Information

**Credit to the author:**

**Prof Ir Dr Badhrulhisham Abdul Aziz**



Chapter 7 by Nurul Sa'adah