Integrating sustainability into engineering education

Rim ZAHMOUL

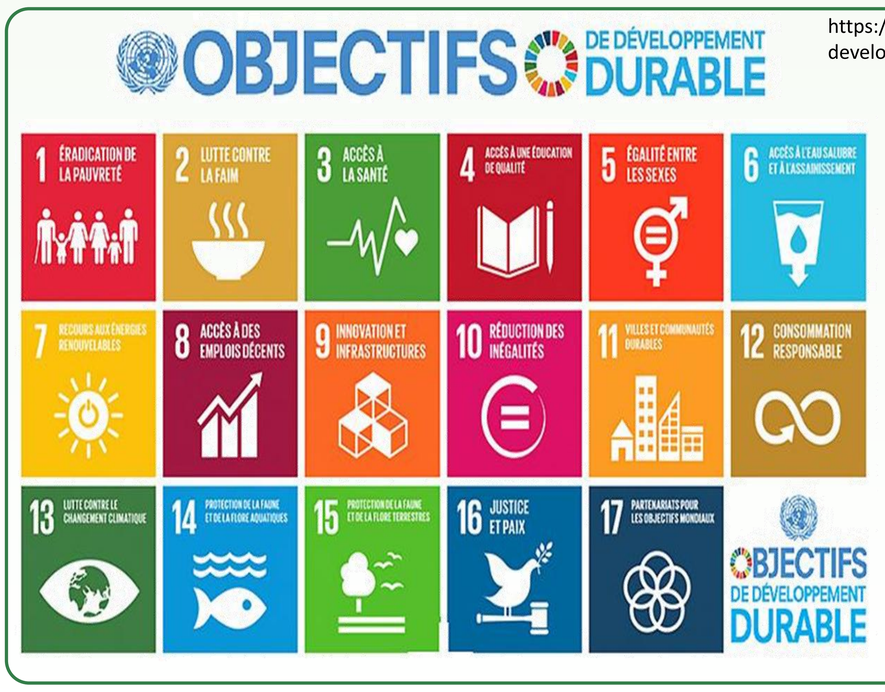
Enseignante-chercheuse en électronique,
IETR, ESIR, Université de Rennes

Objectifs

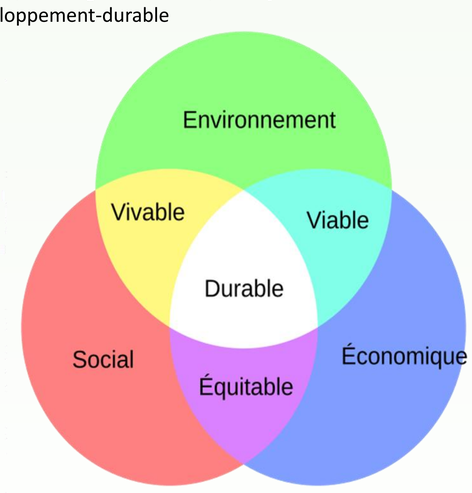
Integrate sustainability principles into electronic engineering education,
Train students in Life Cycle Assessment (LCA) of electronic systems
Develop applied skills in sustainable electronics

Course 1 – Sustainability

- Introduction to sustainability and sustainable development
- Definitions of sustainability (Brundtland, UN, UNESCO, ADEME)
- Environmental, social, and economic dimensions of sustainability
- Weak vs. strong sustainability
- Actors of sustainable development
- Sustainable Development Goals (SDGs) – Agenda2030
- Planetary boundaries (climate, biodiversity, water, resources



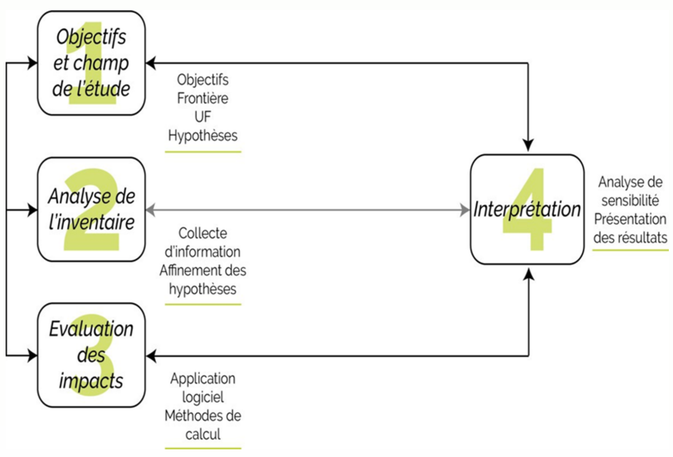
https://www.agenda-2030.fr/17-objectifs-de-developpement-durable

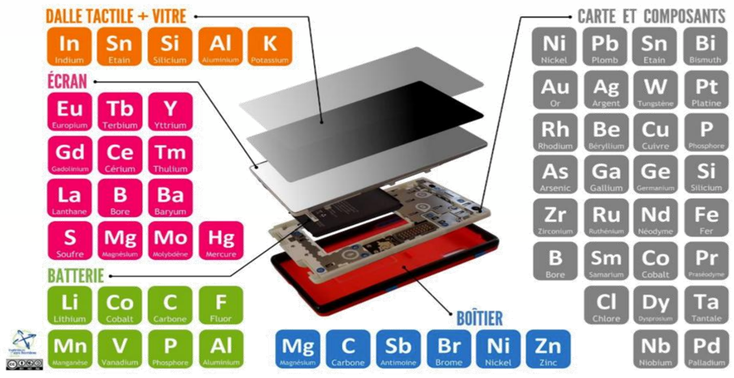


Venn diagram of sustainable development

Course 2 – Life Cycle Assessment (LCA) in Electronics

- Introduction to environmental impacts of electronic systems
- Electronic products and components:
  PCBs, integrated circuits, batteries, displays, sensors
- Electronic waste (WEEE / DEEE):
- Recycling limits and material losses
- Definition of Life Cycle Assessment (LCA):ISO 14040 and ISO 14044 standards
- Multi-criteria environmental assessment
- Life cycle stages of electronic systems
- LCA methodology:
  Goal and scope definition
  Functional unit
  System boundaries (cradle-to-gate, cradle-to-grave, cradle-to-cradle)





Liste des métaux présents dans un smartphone - Source : Ingénieurs Sans Frontières

Life Cycle Inventory (LCI)
  Life Cycle Impact Assessment (LCIA)
  Interpretation of results
- Environmental impact categories:
- LCA tools and databases:
  EIME software
  LCI databases
- Interpretation and eco-design

Practical sessions (6 hours – 2 sessions of 3 hours):
- Hands-on Life Cycle Assessment of an electronic system
- Modeling and impact assessment using EIME software
- Results analysis and interpretation
- Identification of eco-design improvement levers