Reformed
Course Outline

General Outline

Proposed Modules (1/2)

- Life cycle thinking approach
- Environmental sustainability challenges in industrial production and bio-production systems
- Eco-efficiency: requirements throughout the product chain, i.e., from extraction of natural resources, design, manufacturing, distribution, use, collection, and reuse – recycling – recovery
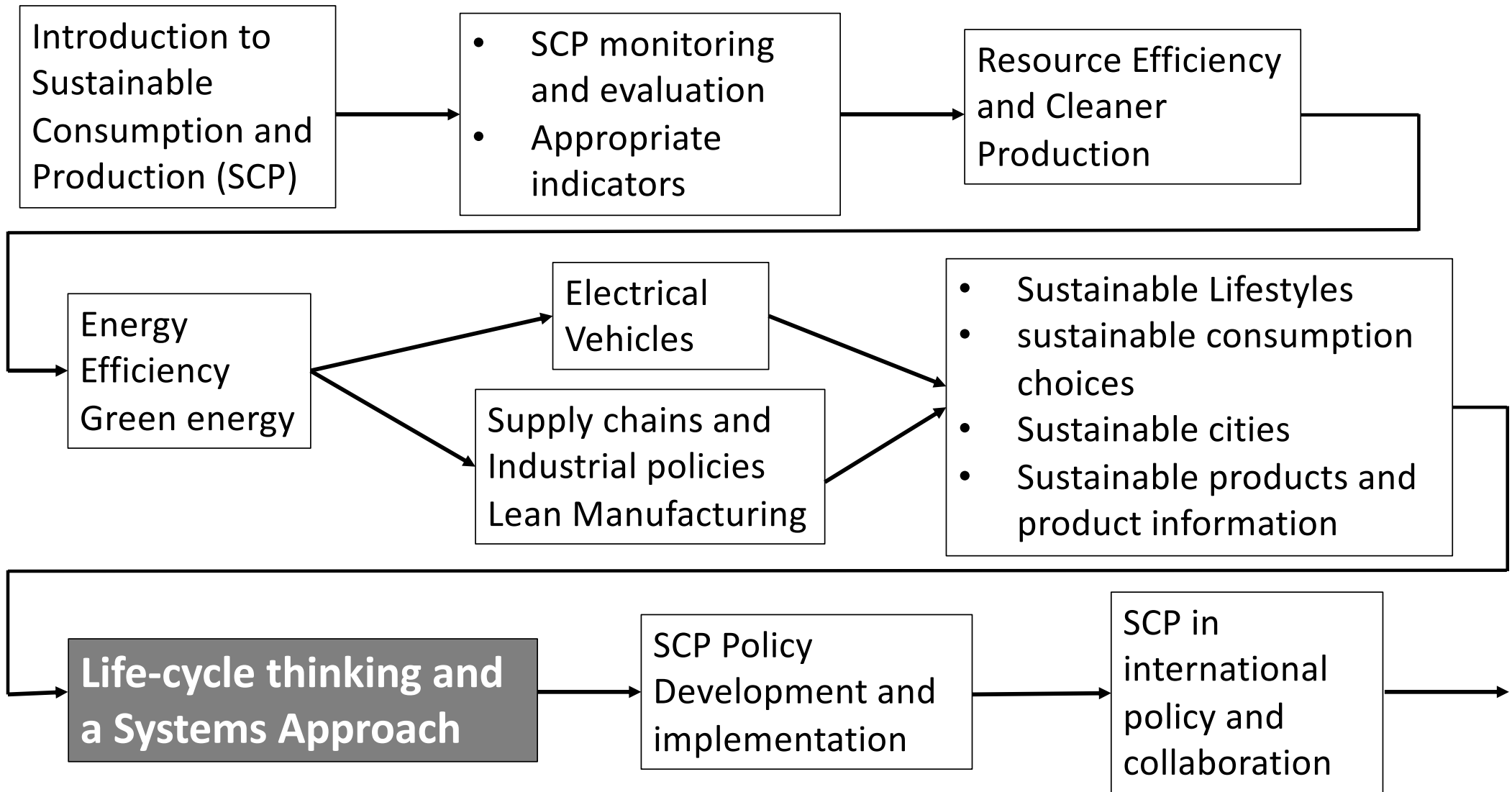- Eco-design
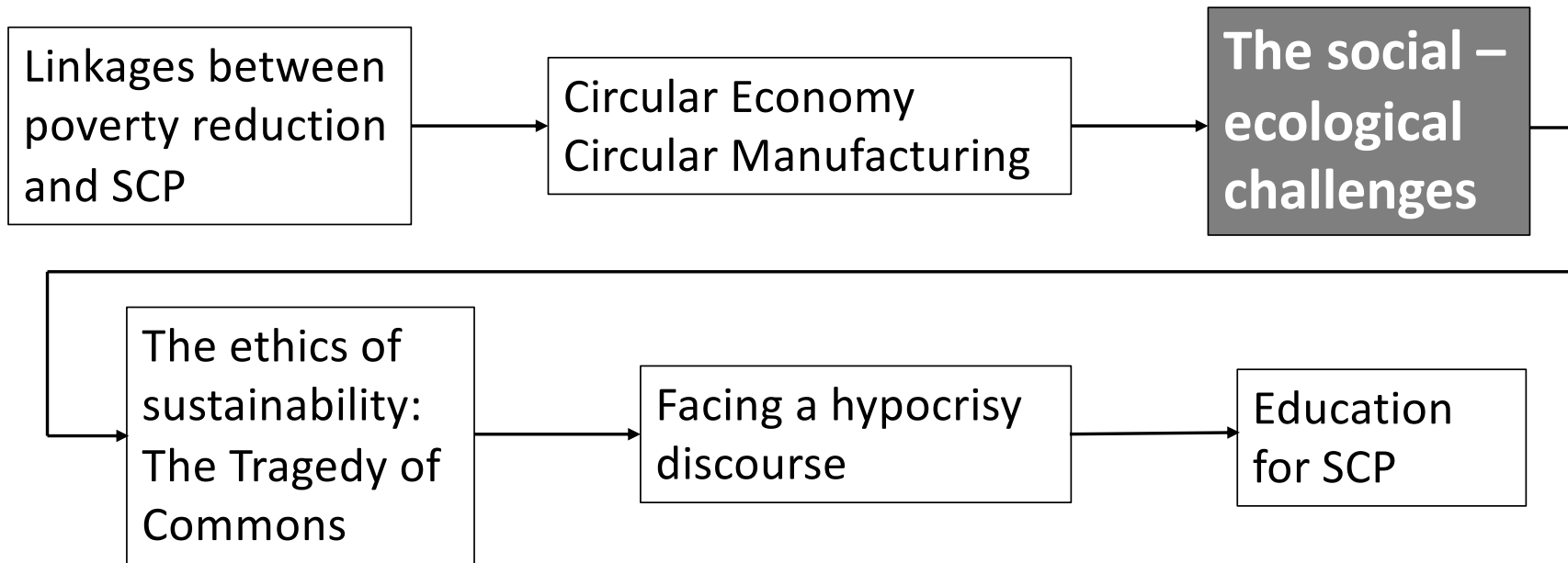
Proposed Modules (2/2)

- eco-labelling
- carbon footprint
- Life cycle assessment
- Burden shifting
- Production systems: manufacturing, food supply chains, energy generation, etc.

Sustainable Production and Consumption

Course Layout

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┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│ Introduction to     │      │ • SCP monitoring    │      │ Resource Efficiency │
│ Sustainable         │ ───► │   and evaluation    │ ───► │ and Cleaner         │
│ Consumption and     │      │ • Appropriate       │      │ Production          │
│ Production (SCP)     │      │   indicators        │      │                     │
└─────────────────────┘      └─────────────────────┘      └─────────────────────┘
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┌─────────────────┐        ┌─────────────────┐        ┌──────────────────────────────┐
│ Energy          │   ────►│ Electrical      │────┐   │ • Sustainable Lifestyles     │
│ Efficiency      │   │    │ Vehicles        │    │   │ • sustainable consumption    │
│ Green energy    │───┤    └─────────────────┘    ├──►│   choices                    │
└─────────────────┘   │    ┌──────────────────────┐│   │ • Sustainable cities         │
                      └───►│ Supply chains and    ││   │ • Sustainable products and   │
                           │ Industrial policies  │┘   │   product information        │
                           │ Lean Manufacturing   │    └──────────────────────────────┘
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┌─────────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│ Life-cycle thinking and │      │ SCP Policy          │      │ SCP in              │
│ a Systems Approach      │ ───► │ Development and     │ ───► │ international        │ ───►
│                         │      │ implementation      │      │ policy and          │
│                         │      │                     │      │ collaboration       │
└─────────────────────────┘      └─────────────────────┘      └─────────────────────┘
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Linkages between poverty reduction and SCP

Circular Economy
Circular Manufacturing

The social – ecological challenges

The ethics of sustainability:
The Tragedy of Commons
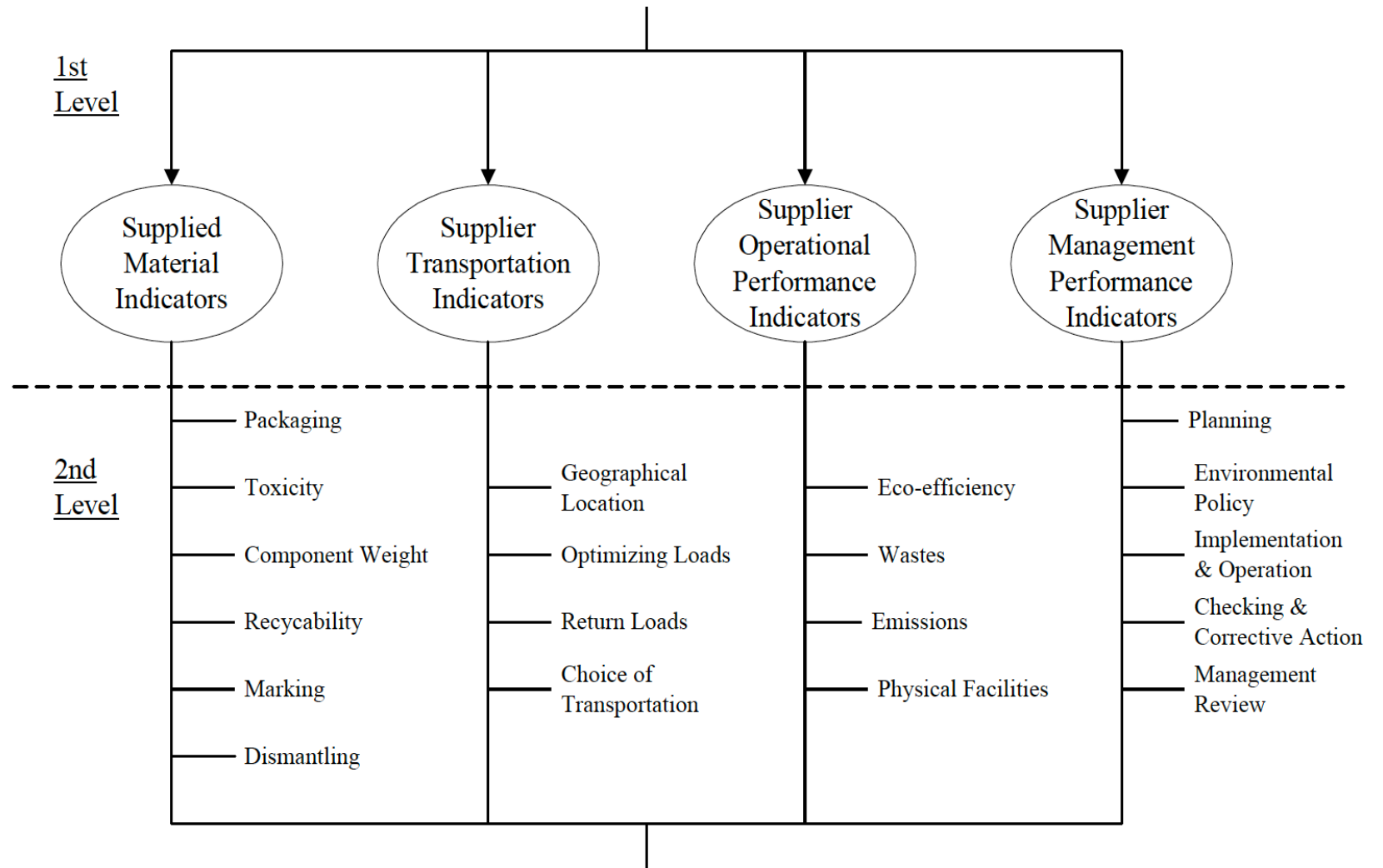
Facing a hypocrisy discourse

Education for SCP

*Covid 19 and SPC
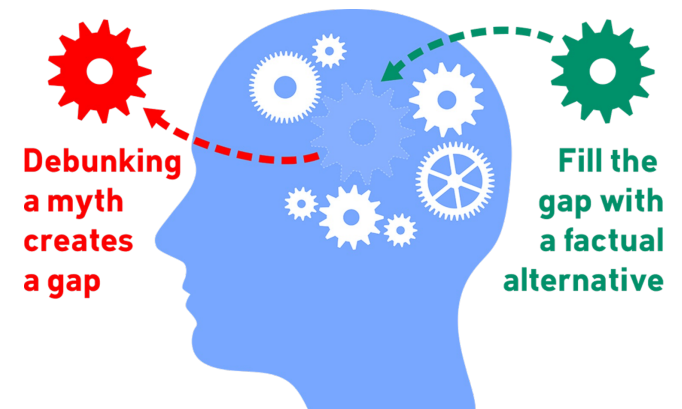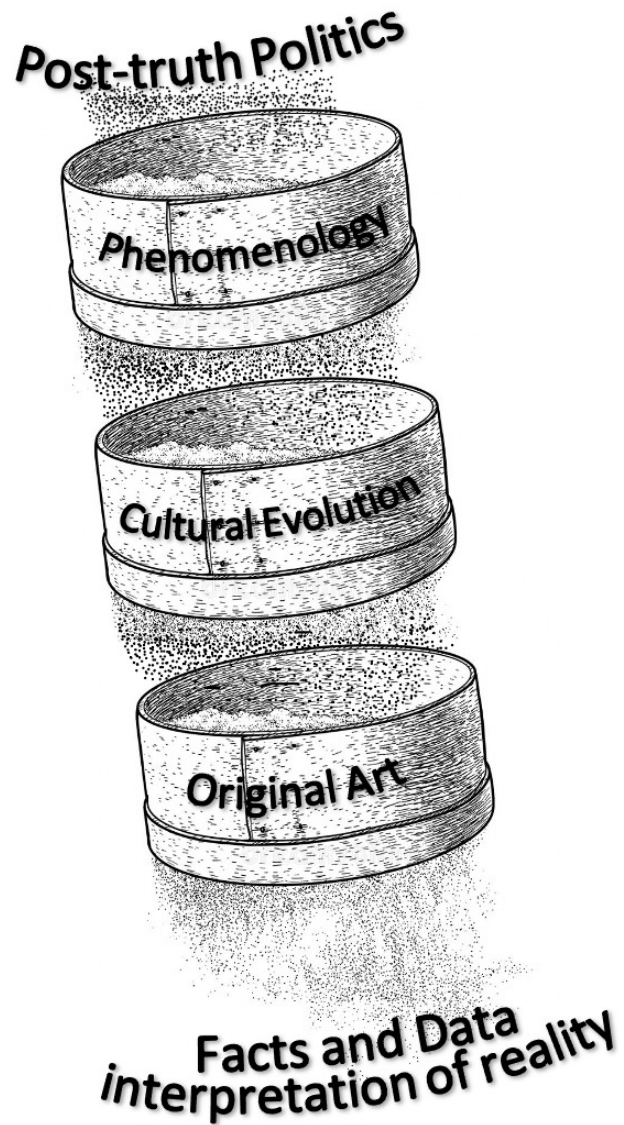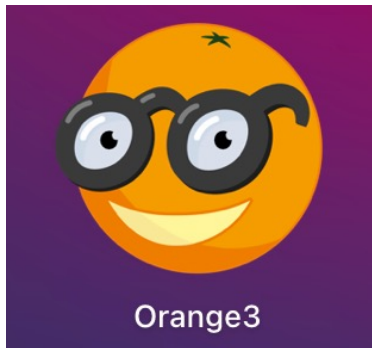Risk Society
Linkages to be explored*

Workshops proposed for the courses

Workshop 1 Multicriteria evaluation

1st Level

- Supplied Material Indicators
- Supplier Transportation Indicators
- Supplier Operational Performance Indicators
- Supplier Management Performance Indicators

2nd Level

Supplied Material Indicators:
- Packaging
- Toxicity
- Component Weight
- Recycability
- Marking
- Dismantling

Supplier Transportation Indicators:
- Geographical Location
- Optimizing Loads
- Return Loads
- Choice of Transportation

Supplier Operational Performance Indicators:
- Eco-efficiency
- Wastes
- Emissions
- Physical Facilities

Supplier Management Performance Indicators:
- Planning
- Environmental Policy
- Implementation & Operation
- Checking & Corrective Action
- Management Review

Workshop 2
Environmental
Post-truth
Politics

Post-truth Politics

Phenomenology

Cultural Evolution

Original Art

Facts and Data
interpretation of reality

Debunking
a myth
creates
a gap

Fill the
gap with
a factual
alternative

Orange3

Workshop 3
Data mining and
Machine learning
in SCP

Constant	CN2 Rule Induction	Calibrated Learner	kNN
Tree	Random Forest	Gradient Boosting	SVM
Linear Regression	Logistic Regression	Naive Bayes	AdaBoost
Curve Fit	Neural Network	Stochastic Gradient D…	Stacking

Lower Emissions

Case Study
Electrical Vehicles

Average Lifetime Emissions*

Lifetime greenhouse emissions (tonnes CO2-e)

Legend:
- End of life
- Use phase, petrol
- Electricity production
- Petrol production
- Bioethanol production
- Vehicle assembly
- Component production

Conventional petrol — GAS
Hybrid — HEV
Plug-in hybrid — PHEV
Battery electric — EV
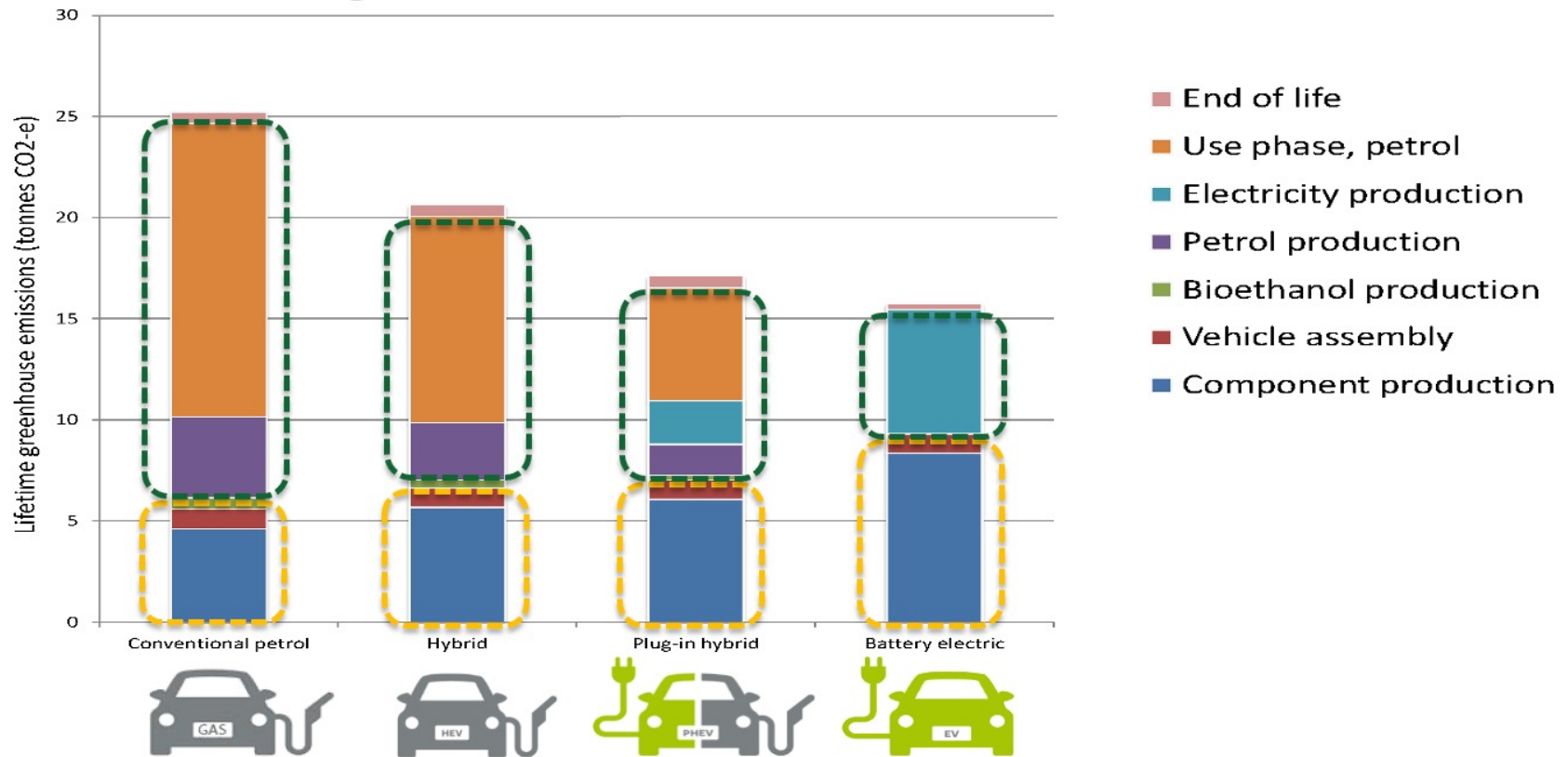
*Typical scenario from bravenewclimate.com

A new course: Approaches to Education for Sustainable Development

Definition

Sustainable development strives to meet the needs of the present without compromising the ability of future generations to meet their own needs. Education for sustainable development is an approach to learning that fosters students' knowledge, skills, and values as they prepare for the transition to a sustainable and just society.

Syllabus

- Introduction to Education for Sustainable Development: An interdisciplinary and holistic approach.

- Educational perspectives to the Environment, nature and sustainable development: Sharing values and principles underpinning sustainability.

- The transition to a sustainable future as envisioned by the UN Sustainable Development Goals (SDGs) and other international organizations.

- Citizenship and environmental stewardship.

- Social justice, ethics and wellbeing in relation to ecological factors: Sustainable communities, Participatory decision making and local relevance.

- Economy, Industry and Global Inequality: Corporate social responsibility and the role of consumerism and trade.

- Critical thinking and problem-solving: developing creative skills to address the dilemmas and challenges of sustainability.

- Research Methods in Sustainable development.

- Advances in technology and the role of big data and artificial intelligence in sustainable development.

- Future-facing outlook; consequences of actions and appropriate adaptation to ensure sustainable futures.

- Project-based learning through case studies in sustainable development involving:

  - (1) methods and techniques for identifying problems, visualization, making personal meaning and discovering new values;

  - (2) pedagogical conditions such as collaboration, conflict resolution, compromise and cooperation during practical classes and introducing cross-curricular integration with the rest of the M.Sc. courses.

Learning outcomes

Each student will be able to:

- Define sustainability and explain how it relates to their lives and their values, and how their actions impact issues of sustainability.

- Utilize their knowledge of sustainability to change their daily habits and consumer mentality.

- Explain how systems are interrelated.

- Apply concepts of sustainability to their campus and community by engaging in the challenges and solutions of sustainability on their campus.

- Apply concepts of sustainability globally by engaging in the challenges and the solutions of sustainability in a world context.

Proposed Case studies

Case study 1: LCA for lactic acid production process in Thailand
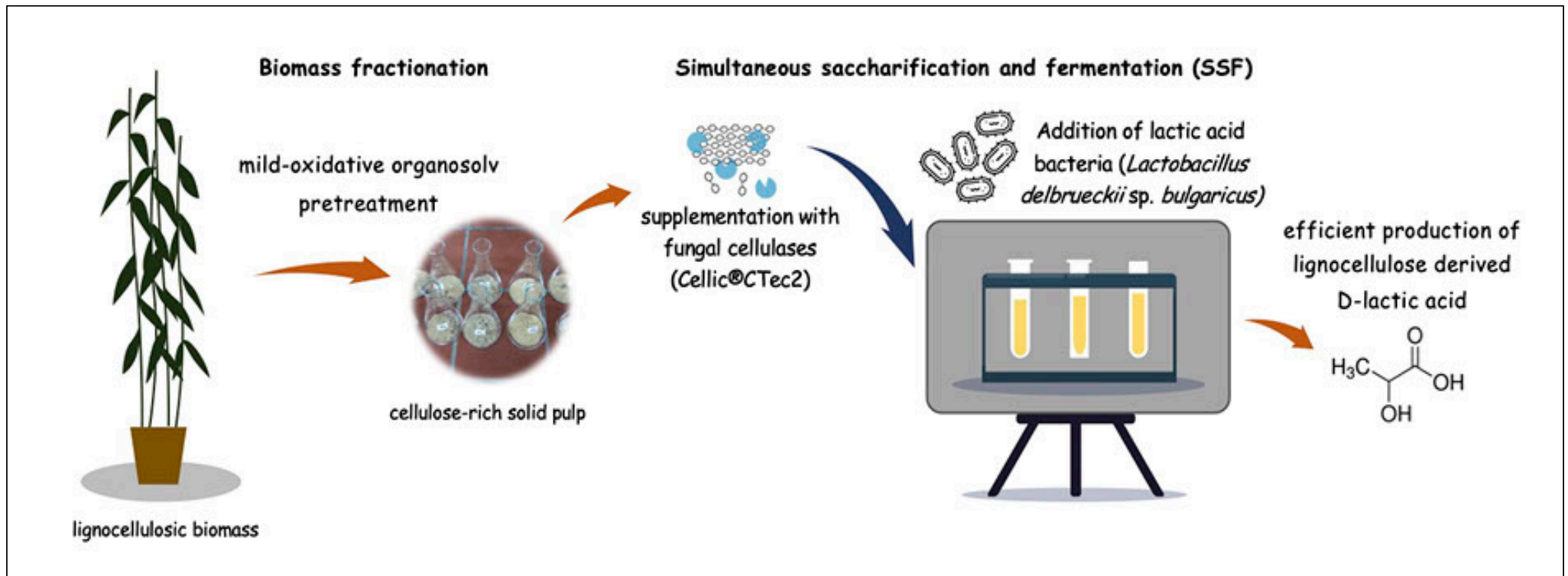
* Environmental footprint of Lactic acid and Lactide from Thailand, Corbion 2017

LCA approach for Corbion's product portfolio: Lactic acid derivative plants, Corbion 2017

http://www.corbion.com/about-corbion/sustainability/life-cycle-assessment

Case study 2:
Life cycle assessment of a Woman's Polo-neck Sweater

Case study 3: A Comparative LCA Analysis of a Passenger Car and a Municipal Bus using Different Simplified Methods

References

1. UNESCO (2020), *'Education for sustainable development: A roadmap'*, ISBN: 978-92-3-100394-3.

2. Radhika Iyengar and Ozge Karadag Caman, (2022), *'Rethinking Education for Sustainable Development: Research, Policy and Practice'*, Bloomsbury Academic, ISBN 9781350256125.

3. Roger Firth, Maggie Smith (eds.), (2017), *'Education for Sustainable Development: What was achieved in the DESD?'*, Routledge, ISBN 9780367220044.

4. Paula Jones, David Selby, and Stephen Sterling, (2010), *'Sustainability Education: Perspectives and Practice Across Higher Education'*, Earthscan Ltd, ISBN: 9781844078783.

5. Matthias Barth, Gerd Michelsen, Marco Rieckmann, Ian Thomas (editors), (2016), *'Routledge Handbook of Sustainable Development in Higher Education'*, Taylor & Francis Online, ISBN: 978-0415-727303.

6. A. Leicht, J. Heiss and W. J. Byun (eds), (2018), *'Issues and trends in Education for Sustainable Development'*, UNESCO Education 2030, ISBN 978-92-3-100244-1.