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In this issue Matthias Stucki of ecoinvent, Hyderabad has lucidly conjured up the beginning of life cycle inventory data collections initiatives taken by ecoinvent and CII-GBC in India. The implications and benefits of this endeavour have been made very clear in the article. A small write up on biogenic CO_2 has been compiled to give readers a concise concept of it. The measurement of it will be dealt with in some other issues.

We urge our readers to contribute to make this newsletter more effective. Mail contributions at support@SimaProindia.com

Sunil Kumar, Head, SIPL.

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Facilitating Life Cycle Assessment in India: Beginning of a New Era: Matthias Stucki, matthias.stucki@empa.ch

Environmental awareness is growing worldwide. The environmental impacts of industrialization are considered as one of the most pressing issues by experts and average citizens in both developing and industrialised countries. An increased pressure on natural resources is observed, particularly in emerging economies such as India.

Improving the environmental performance of products, processes and services is creating more business opportunities. Industries, authorities, and scientists are getting more familiar with using Life Cycle Assessment (LCA) as a tool to quantify and analyse environmental impacts of technologies, products and services. Some governments require LCA to be conducted for specific purposes. In Switzerland for example, biofuels get a tax reduction if it is proven through LCA that they have lower environmental impacts compared to conventional fuels (DETEC 2009). In France, all high volume consumer products must soon have an Environmental Product Declaration (EPD) based on LCA.

LCA enables corporations in designing products with lower environmental impacts, comparing the environmental impacts of different suppliers, and quantifying the benefit of their green products compared to conventional alternatives. More and more corporations present Environmental Product Declarations (EPDs) which are based on LCA results and inform consumers about the environmental impacts of the product in detail. For the calculation of LCAs, corporations require detailed environmental data about the entire life cycle of their product, starting from impacts due to consumption of raw materials to emissions during disposal stage of the product. Many producers world-wide have international supply chains that lead to India. In addition to the increasing environmental awareness of Indian consumers, this is another reason why the pressure on Indian manufacturers is growing to conduct LCA studies.

Despite many good reasons for carrying out LCAs, very few LCA studies have actually been implemented in India. According to Sharma & Sharma (2008) and other sources, there are manifold reasons why only few LCA studies have been carried out. Most corporations and institutions are not aware of what exactly LCA is and why it is useful. Members of sustainability divisions in corporations and environmental scientists in universities often lack of knowledge of how LCA is done. Individuals from public and private sector who are interested or involved in LCA are not organised in a network. The present status of LCA in Indian industry is still at a nascent stage and the studies conducted so far are based on international background data, since India-specific background data for creating scientifically sound Life Cycle Inventories (LCI) is currently not available. But the use of e.g.

European background data in an Indian study can lead to inadequate if not even misleading results and conclusions, since some processes differ considerably between India and other parts of the world. For example applying a dataset with European electricity mix in an Indian study underestimates the share of coal power, which is significantly higher in India (see Fig 1). Such a simplification has large consequences on the carbon footprint calculated in such an LCA study.

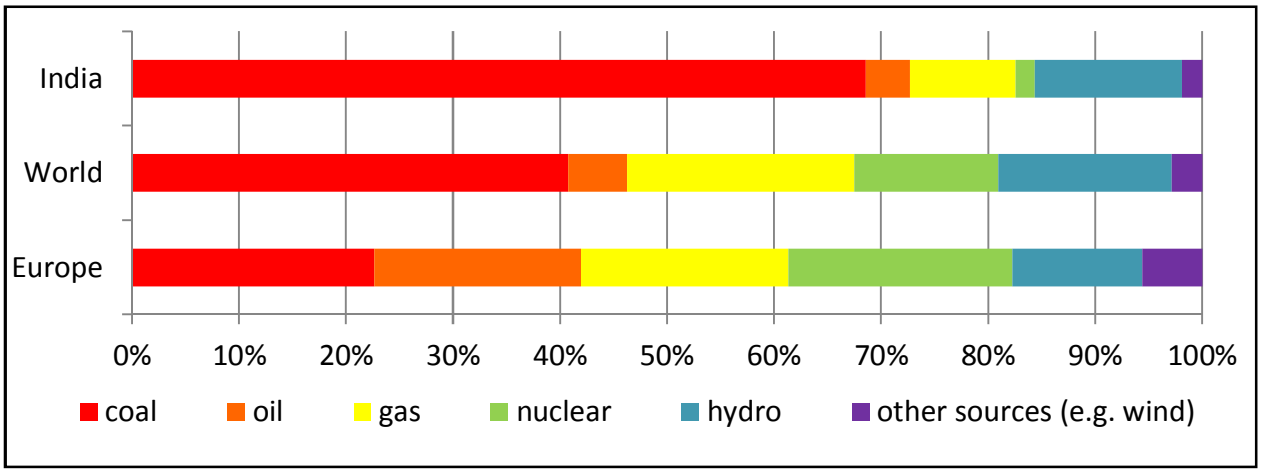

Fig. 1 Electricity production mixes in 2008 accordion to IEA (iea.org/stats)

In order to facilitate LCA in India, a unique collaboration between the ecoinvent Centre, Switzerland – the world's leading supplier of consistent and transparent LCI data – and the Confederation of Indian Industry (CII) – a non-government, not-for-profit, industry led and industry managed organisation that plays a proactive role in facilitating sustainable growth in Indian Industry – has been set up. Important partners from India like SimaPro India[1] and the Resource Optimization Initiative (ROI)[2] are involved in the new established LCI India Network where also other academic organisations and industry corporations have shown their interest in LCA. Simultaneously, similar projects are also taking place in Brazil, South Africa, Egypt, Canada and other countries.

The project partners aim to fulfil the following tasks in India:

- Create awareness on LCA among industries, students, private and public institutions through workshops and presentations
- Capacity building and establishment of an Indian LCI-Network for exchange of LCI data and LCA knowledge
- Leveraging Knowledge and experiences of European through interaction and intensive trainings
- Create India-specific LCI datasets for various industrial sectors in the international ecoinvent database.

The Indian LCI datasets created in this project will be part of future releases of the ecoinvent database and available to users of SimaPro and other LCA software as reliable background data for site-specific LCA studies. In order to focus on the creation of high priority LCI datasets for India, the most important sectors were identified based on their:

1. http://www.simaproindia.com; 2. http://www.roi-online.org

- contribution to India's GDP
- share in India's exports
- share in India's total environmental impacts
- linkage with other LCI datasets

For the first project phase, the following sectors were identified for creation of LCA datasets:

- Mining of coal, iron, bauxite, and limestone
- Electricity generation with different technologies (e.g. coal power, renewable energy, etc.)
- Electricity mix, transformation, and distribution
- Production of clinker, cement, and concrete
- Production of steel and aluminium
- Freight and passenger transportation by rail and on roads
- Cultivation of sugar cane and production of sugar and bagasse
- Forestry
- Small scale water pumping using diesel
- Manufacturing of silk and cotton textiles

The Indian LCI datasets are developed based on statistical reports published by government , institutions and organisations, questionnaires sent to industries, and a large inventory collection by Kumar & Manda (2011). All datasets will be reviewed according to the ecoinvent quality guidelines.

The availability of such a wide range of India-specific inventory data will be the beginning of a new era of LCA in India. It is aimed at making LCA a widely-accepted and applied tool for including environmental aspects in decision-making processes as well as for communication of environmentally quantified data of products and services.

Literature Reference:

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BIOGENIC CO_2 – A study

Biogenic CO2 emissions are defined as emissions of CO2 from a stationary source directly resulting from the combustion or decomposition of biologically-based materials other than fossil fuels. Some of the examples of biogenic CO2 are:

- CO2 generated from the biological decomposition of waste in landfills, wastewater
- treatment or manure management processes;
- CO2 from the combustion of biogas collected from biological decomposition of waste in landfills, wastewater treatment or manure management processes;
- CO2 from fermentation during ethanol production;
- CO2 from combustion of the biological fraction of municipal solid waste or bio-solids;
- CO2 from combustion of the biological fraction of tire-derived fuel; and
- CO2 derived from combustion of biological material, including all types of wood and wood waste, forest residue, and agricultural material.

Biogenic CO2 is that CO2 which has recently come from a biological origin. The CO2 which has been emitted by plant matter or animal matter of recent biological origin was taken out of the air initially, which means that when the CO2 is re-emitted, it is only a putting back of what was consumed not very long ago. In contrast, when CO2 is emitted from a fossil source (coal, gasoline, natural gas, etc.) it is coming from plants and animals that lived millions of years ago, accumulating over millions of years duration. That means that we are putting the CO2 from millions of years worth of plants and animals back into the air very rapidly compared to how fast the CO2 was taken out of the air in the first place. This fills the earth with CO2 much faster than it can be reabsorbed/reused, throwing the atmospheric concentration off balance. .

Plants, trees, and algae etc. absorb CO2 from the air through photosynthesis. In photosynthesis, sunlight is used as input energy to convert CO2 and water into glucose and oxygen. This reaction is endothermic which means it requires energy input for reaction to occur. The sugar can then be used as an energy source by the plant for other reactions, and as a building block for structural materials of the plant such as starch and cellulose.

Plant and animal bodies are almost all carbon-based compounds i.e. organic compounds. These molecules are generally made up of atoms of carbon, hydrogen, and oxygen. When plants or animals decompose, the eventual outputs include carbon dioxide and water. There are all kinds of carbon compounds along the way. For example, there is carbon in sugars or proteins or starches which are eaten by bacteria, yeast, fungi, other animals, etc. These still result in end products of CO2 and water. Major carbon compounds emitted by decomposing biomass (plant/animal matter) are carbon dioxide and methane. Methane eventually (decades) reacts with oxygen in the atmosphere to form CO2 and water vapour.

Bio based energy/product production reduces atmospheric greenhouse-gas levels by enhancing long-term forest-carbon sequestration and by reducing the greenhouse-gas potency of the carbon gases associated with the return of biomass carbon to the atmosphere that is an intrinsic part of the global carbon cycle. These greenhouse-gas benefits are provided in addition to the benefit common to all renewable energy/product production of avoiding the use of fossil fuels. The value of the greenhouse-gas offsets that are expected to become available in the next several years should improve the competitiveness of energy production from biomass and biogas resources in the marketplace of the future.