Guido Sonnemann is a full professor of sustainable chemistry and material management at the University of Bordeaux. He is the director of the CyVi group, an interdisciplinary group of scientists working on research methods of and applications to sustainable chemistry and Life-Cycle Assessment (LCA). Before joining the University of Bordeaux in 2012, he worked as a United Nations Environmental Program Officer for Innovation and Life Cycle Management. In this function, he also served as the Science Focal Point for the UNEP's Resource Efficiency/Sustainable Consumption and Production (SCP) subprogram.

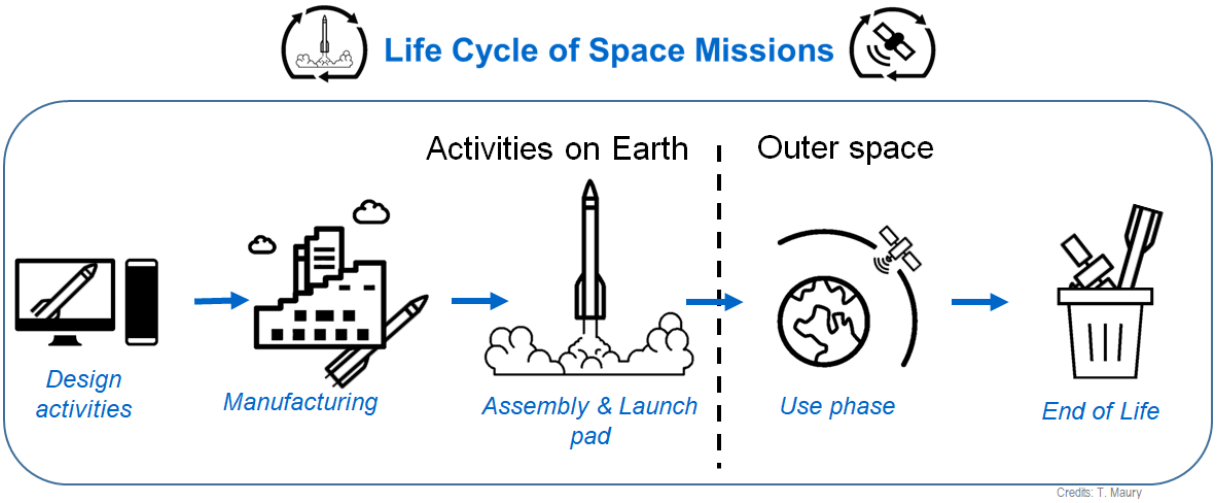
He holds a PhD in Chemical Engineering from the University Rovira & Virgili, Spain (2002), M.Sc. in water biology and chemistry from the University of Poitiers, France (1996), and graduated as engineer from the Technical University of Berlin, Germany (1995) with a specialisation in environmental engineering.

He has written many articles and books on the methodologies and applications of life-cycle assessment, environmental impact assessment and risk assessment used to evaluate and promote sustainable economies.

Thibaut Maury joined the CyVi group at the University of Bordeaux in 2016 as a PhD student. He is also a member of the Design for Environment team of ArianeGroup which is funding his thesis (French Industrial PhD program).

His research focuses on adapting and developing the Life Cycle Assessment methodology for addressing the environmental impacts of aerospace activities. More particularly, he is currently developing an environmental indicator considering orbital use relative impact due to the presence of space objects and debris. The aim is to better characterise environmental impacts of space systems during on-orbit stages which can differ depending on the end-of-life scenario of the spacecraft and satellites.

Picture for the website



Abstract of the seminar

CONSIDERING ENVIRONMENTAL IMPACTS OF SPACE MISSIONS THANKS TO THE LIFE CYCLE ASSESSMENT (LCA) METHODOLOGY

Life Cycle Assessment (LCA) has been identified by ESA Clean Space initiative, ArianeGroup and others actors of the space industry as the most appropriate methodology to measure and minimise their environmental impact. To demonstrate the value of life cycle thinking at complete space mission level and during the design stage of the new European Heavy Launcher, a life cycle assessment (LCA) study of Ariane 6 in exploitation phase is currently performed by the Design for Environment team of ArianeGroup.

While the space industry produces a much smaller amount of products in comparison to other industries, it is necessary to study its environmental impacts since very specific materials and processes are used combined with very long development cycles. In addition, rocket launches are the only human activity that crosses all segments of the atmosphere and stays 'out' of the natural environment and ecosystems.

Nevertheless, the current scope of the studies adopts a "cradle to launch pad" approach and does not take into account the end-of-life disposal of the spacecraft. With an expected growth of satellites launches associated with an increasing space debris population for the next decades, End-of-life management will be a central issue.

Via the internal R&T project « Eco-space » dealing with eco-design and Life Cycle Assessment, ArianeGroup is carrying out a large study in partnership with the CyVi group of the University of Bordeaux. Their common work attempts to improve the consideration of End-of-Life environmental concerns into the traditional LCA methods aiming at covering the overall life-cycle.

The priority has been given to the integration of space debris related impacts during on-orbit life and End-of-Life disposal within the LCA framework. Indeed, LCA studies of space missions should indicate trade-offs not only between typical impact categories (e.g. toxicity, climate change, resource depletion), but also with regard to space debris related impacts, as it is an important issue for the sustainability of space activities. The main goal is the development of a new Life Cycle Impact Assessment (LCIA) indicator regarding the potential creation of debris during the orbital lifetime of a spacecraft.

Guido Sonnemann and Thibaut Maury

Considering environmental impacts of Space Missions thanks to the Life Cycle Assessment (LCA) Methodology