

**SUSTAINABLE DEVELOPMENT AND GLOBAL CHANGE:  
A CHALLENGE AND OPPORTUNITY FOR THE POLYMER INDUSTRY AND  
FOR POLYMER SCIENCE, RESEARCH & EDUCATION**

***“FROM BEING PERCEIVED AS A PROBLEM TO BECOMING PART OF THE SOLUTION”  
OR “A PERSPECTIVE BEYOND INDUSTRY 4.0”***

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To identify some of the key technological challenges from a global perspective, reference is made to the *Sustainable Development Goals 2030 (SDGs)*, adopted by the UN General Assembly in September 2015. Endeavoring a *Sustainable Development* path according to these goals implies eradicating the global welfare disparity and meeting the desire of the growing world population for prosperity by radical changes in production (and consumption) patterns, which in turn require adequate technologies along with proper choices of materials. Indeed, among the total of 17 SDGs, numerous are linked directly to technologies and materials, others perhaps more indirectly. In a broad and more general sense, and as technologies and materials essentially pervade all aspects of human life, they may even be considered to touch upon all SDGs, at least to some extent.

In his lecture, Professor Lang will argue that the accelerated deployment of advanced sustainable technologies will hinge upon two main features: (A) a new perspective on the energy and production system according to the methodological principle of *“Inversion – Integration – Innovation”*; (B) substantial contributions from materials technologies and science, and in particular from polymer engineering and science and the polymer industry. This will be exemplified for the transformation of the energy system from the current fossil fuel (and nuclear) based energy system to an energy system substantially-to-fully based on renewable resources (i.e. SDGs 7 & 9). It will also be reasoned that this energy transition may ultimately disembogue in an integrated and all-circular regenerative hydrocarbon feedstock system as a future raw material resource base for plastics (i.e. SDGs 9 & 12).

Moreover, as to innovation and to accelerate the penetration of polymers in advanced sustainable technologies on a broad scale, at least five innovation goals must be met: (1) improved systems integrated functionality and performance, (2) enhanced LCA/PEF performance, (3) competitive total cost effectiveness, (4) guaranteed quality and durability, and (5) robust/multifunctional and attractive design. By exemplifying these innovation goals with case studies, the presentation will explore the status and prospects of such technologies based on plastics. Considering these perspectives, some consequences and implications for academic education and research in engineering sciences will be deduced. These will be addressed also in context with SDG 17 (“Partnership for the Goals”) in specific relation to Africa/Europe partnerships.