

THE EUROPEAN STEEL TECHNOLOGY PLATFORM'S STRATEGIC RESEARCH AGENDA VISION FOR THE SUSTAINABLE STEEL PRODUCTION 2030s

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Overview

Steel has an enormous variety of applications, although not always visible due to the presence of a decorative, protective or functional layers of other materials. This is due to the fact that steel is directly linked to many human activities which characterize modern life quality and standards nowadays. In fact, the consumption intensity per capita in 2012 has been 217 kg/cap in the world and 278 in the EU. and its importance grows with population.. The European steel industry is thus committed to organize the recovery of iron from natural or anthropogenic resources, in order to build and maintain the structure of the anthroposphere (technosphere) and of its artifacts. This implies the management, treatment and handling in complex and professional ways of large amounts of raw materials, primary and secondary (32/68 % BOF/EAF routes, close to the virgin iron/scrap ratio), of energy (18.5 GJ/t steel) and of logistics (more than 2 t of raw materials per ton produced in an integrated steel mill) at the global scale of the planet (60% of the iron ore consumption and 80% of the coal are traded internationally). This ambitious objective also requires the contribution of millions of people (2 million jobs, worldwide) and creates a GDP footprint that extends far beyond that of the steel sector (2%), along the value chain and the life cycle of steel (20%).

Method

The European Steel Technology Platform (ESTEP) represents the Steel sector and its value chain, up-stream and downstream of its core activities, as well as the research and academic communities related to steel plus some other stakeholders. ESTEP is the think tank, generating a foresight vision of what Steel is to become in the middle and long term and of how it can get there. This work is presented in ESTEP's revised its Strategic Research Agenda (SRA), a revised version of which was published in 2013.

ESTEP's SRA vision is to manage a smooth cooperation between the anthroposphere and the bio/ecosphere, with the mutual respect of the different players, and the challenges that the steel sector faces in terms of R&I in relation to SUSTAINABLE steel production. The focus is on reducing the environmental footprint of steel production and steel solutions by reducing resource consumption, fostering the use of secondary raw materials and thus accelerating the move towards a more closed-loop economy, by implementing energy efficiency, saving exergy, implementing process integration and eco-design approaches. It also means reducing emissions and addressing complex issues such as climate change with ambitious targets or the preservation of biodiversity by internalizing the value of ecosystem services in business models.

Results

Steel is thus deeply and subtly interwoven with the environment, the whole planet and society. The natural and the economic worlds, the ecosphere of the planet and the anthroposphere of human society, are intersecting. This happens at a very deep level and the former descriptions of industry as having simply to comply with environmental regulations does not tell the whole story any longer: what is taking place is no longer a collision between antagonistic worlds, but rather a cooperation that can be described as a kind of metabolism, the emergence of which has been induced by the size of the world population and the extent of urbanization.

ESTEP's SRA explores how to manage this cooperation as smoothly as possible in its section devoted to environmental issues. Adapting to changes in environmental regulations involves incremental change that is handled by incremental research. But it is also necessary to prepare for the larger evolution that will take the sector in this direction further than ever before: the present paper focuses in these.

The issues tackled in the Planet Group are thus more holistic, prospective and longer term:

- LIFE CYCLE ASSESSMENT (LCA) AND LIFE CYCLE THINKING (LCT)

- RESOURCE ISSUES DUE TO ENERGY AND RAW MATERIALS SUPPLY
- STEEL & NEW ENERGY FRONTIERS
- CARBON-LEAN STEELMAKING
- STEEL & SYNERGIES WITH NEIGHBORING COMMUNITIES
- STEEL & SYNERGIES WITH NATURE
- MOVING SMOOTHLY INTO A CLOSE-LOOPED ECONOMY
- GLOBAL THREATS AND FUTURE EN-VIRONMENTAL DEMANDS

Conclusions

The Iron and Steel industry produces a material which has been essential in the history and technological evolution of the human society and has proven its resilience in remaining at the core of the technological episteme evolving and shifting regularly: in today's world, steel is a KET (Key Enabling Technology), part of the Advanced Materials KET. Moreover, it is actually ubiquitous and most artifacts are either made of steel, in part or in all, or are manufactured from machines and tools made of steel! It is thus deeply embedded in the anthroposphere, it serves as its backbone, but its production requires large amounts of resources, energy, raw materials and logistics, generates emissions to air, soil and water, and thus interacts with the geosphere and the biosphere in an intimate way. Environmental topics, constraints and commitments, long considered as externalities in the economy, business and metallurgy, are not simply boundary conditions expressed by bothersome regulation any more, but an integral part of an holistic system, where nature and society, geo-, bio and anthropospheres interact at a complex level.

The future of the Steel sector is thus deeply related to the environment. In ESTEP, the working group that analyzes them is purposely called "Planet". Therefore holistic, transverse, cross-cultural and cross-sector approaches are the standard vial to move forward. Steel is not starting from a clean slate, as these issues have been embedded in its practice and culture for a long time (recycling, energy efficiency, zero waste, carbon-lean steel production processes, steel as an enabler of a leaner economy, etc.), but the pace of change should not slacken and it might even have to accelerate, because the world is become more populated, more compact and more demanding.

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