

# ENVIRONMENTAL ASPECTS OF INNOVATION AND NEW TECHNOLOGY IMPLEMENTATION IN METALLURGY INDUSTRY

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European metallurgy industry has to invest in innovations and new technologies in order to remain competitive on the world market. Because very often this action leads to limitation of the negative impact upon the environment, that is why lots of innovations implemented by iron and steel industry bear the features of environmental innovations and eco-innovations in metallurgy industry. The analysis of the environmental innovations and eco-innovations implementation in metallurgy industry, in terms of legal regulations in the environmental protection and the strategy area of sustainable development of enterprises, is the subject matter of this article.

*Key words:* metallurgy industry, ecoinnovation, sustainable development, environmental, impact assessment,

## INTRODUCTION

Metallurgy industry is not only one of the most important branch of the processing industry but also it is closely related to the condition of major branches of production which are: automotive sector, mechanical engineering, shipbuilding and aircraft industry. The production process in metallurgy industry has a significant influence on environment through an energy intensity of production (the costs of energy constitute from 10 to 37 % of the total costs), carbon dioxide emission (reduction of carbon dioxide makes the significant ecological cost of steelworks) and limited accessibility of raw materials (European companies highly depend on import of ores and concentrates from the third countries). It is necessary to take various measures in order to hold down the environmental degradation with minimizing the negative influence of business entities [1]. For many years, industrial enterprises in these sectors have undergone changes toward improving operational efficiency and value increase [2].

The aim of this publication has been to introduce the essence of eco-investments (ecological investments) which have been implemented in iron and steel industry. This publication presents perception of the significance of subjective investments in iron and steel industry with reference to current directions of EU development.

## ECOLOGICAL INVESTMENTS IN EUROPEAN ECONOMIC POLICY

Innovativeness is the manner to deal with dynamically changing market conditions and the way to improve enterprises competitiveness. The increase of economy competitiveness requires that innovative solutions and new technologies, environmental technologies and eco-innovations will be constantly implemented by enterprises. This situation is heavily dependent on directions of EU policy. The realization of strategy Europe 2020 is bound to bring low-carbon, knowledge-based economy which promotes environmental friendly technologies, wisely manages natural resources, creates new green workplaces and at the same time takes proper care of social cohesion [3]. With reference to these directions, metallurgy industry should focus all possible efforts on improvement of innovativeness and price-cut competitive electricity supply without negligence in environment protection. These aspects might be analyzed in economic (lower production costs and growth of added value) and non-economic categories, including environmental aspects (a dynamic model of environmental protection based on ex-ante operations – foresight of negative environmental effects of business and cessation of further environmental degradation) [4], social aspects (lower health care costs) and marketing aspects (an ecological image of the company). Managers should try and promote principled cultures and behaviors, which would yield in positive and beneficial outcomes [5]. Drafting and using environmental technologies, as well as eco-innovations, which are believed to contribute to raising innovativeness, growing competitiveness and industry modernization, have become sus-

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tainable development direction of iron and steel companies in many EU countries and the third countries as well. The European Commission carries out research concerning the level of eco-innovation development and advancement level of eco-innovation implementation in EU countries (Ranking of Eco-Innovation Scoreboard). Eco-Innovation Scoreboard is the first tool, which comprehensively evaluates and compares eco-innovation results in EU Member States UE-27. This ranking presents indexes based on 14 indicators in 5 areas [6]: capital expenditures, companies activities, results, environmental effects, socio-economic effects. Taking into consideration the Ranking Eco-Innovation Scoreboard 2012 for EU countries [6], it turns out that the Nordic countries have achieved the highest level of eco-innovation index: Finland, Denmark, Sweden. As far as countries with the lowest level of eco-innovation index are concerned, there are three countries: Lithuania, Poland, Slovakia. These countries have not achieved even the half of average eco-innovation rate value for the whole EU.

## THE TERMINOLOGY USED IN RESPECT OF THE ECOLOGICAL INNOVATIONS

In specialist literature, there is presented a great variety of semantically and essentially convergent terms, such as: environmental technologies, eco-innovations, ecological innovations, ecological technologies and sustainable innovations. The key issue which links these terms is that they all contribute to reduction of environmental degradation caused by business entities. In this article, thorough review of applied terminology has been undertaken, the examples of definitions have been presented and the terms have been put in historical order starting with the basic concept which is environmental technologies, moving on to related concepts (synonyms), up to widely understood innovations. The term environmental technologies can be defined as technologies which usage is less harmful to the environment than its' alternatives [7]. Eco-innovative solutions are commonly used in environmental technologies. The term: eco-innovations applies to innovations which are supposed to prevent and reduce environmental pollution as a result of anthropogenic activity, compensation of incurred damages as well as environmental pollution identification and monitoring [8]. According to M. Carley and P. Spapens [9] eco-innovation is: an intended behavior which is characterized by entrepreneurship and includes a product design phrase and integrated product management within the product lifecycle. This integrated management contributes to pro-ecological modernization of industrial age societies, thanks to taking into consideration ecological problems while formulating the products and processes connected with them. Ecological innovations ought to be understood as all actions taken by relevant authorities (enterprises,

politicians, associations, Churches, households), thanks to which new ideas and ways of behavior, production processes and products are initiated, applied and implemented as well as the environment is protected or an ecological dimension of sustainable development is supported. A sustainable innovations, a term which comes from a term: sustainable development, is a relatively new concept [10]. Introducing these innovations involves producing economic, environmental and social results. Undertaking an attempt to systemize mentioned terms, it is claimed that the term in the broadest meaning and elementary to carry out the concept of environmental protection as well, is environmental technologies. This term includes also the concept of ecological technologies (however, it is necessary to note that nowadays terms: environment and ecology are used alternatively due to the fact that problems connected with environmental protection have been popularized and mental leaps are in common practice). Innovations, which enable entities to reduce and/or eliminate negative company's influence on environment thanks to implementing the concept of sustainable development, are often called eco-innovations, ecological innovations, environmental or sustainable innovations. It is worth to note that, therefore, an innovation is a novelty in current production technology and/or organization and company management [11].

## LEGAL ASPECTS OF INNOVATION AND NEW TECHNOLOGY IMPLEMENTATION

In terms of European law on the environment, implementation of technological innovations is an undertaking which may require obtaining a license for completion of an investment and conducting evaluation of the environmental impact. Carrying out this assessment aims at pointing out expected consequences of planned projects, determining preventive measures or reducing negative impact on environment. European law currently in force, which regulates conducting an evaluation of influence on environment, derives from the following documents: the Council Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (called the EIA Directive); Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment (called the SEA Directive) and the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (called the Habitats Directive). From the perspective of the type of investment, the classification presented in annex I and II to the EIA Directive seems to be the most important. In accordance with the mentioned directives projects might be classified into 5 groups as follows (and there is a sixth group which is not included in directives): **Group I** – projects mentioned in annex I to the Council Directive 2011/92/

EU, which may significantly affect Nature 2000 areas and require carrying out the assessment of the impact on environment in connection with Article 4 par. 1 of the EIA Directive; **Group II** – projects mentioned in annex I to the Council Directive 2011/92/EU, which are not likely to significantly affect Nature 2000 areas and require carrying out the assessment of the impact on environment in connection with Article 4 par. 1 of the EIA Directive; **Group III** – projects mentioned in annex II to the Council Directive 2011/92/EU, which may significantly affect Nature 2000 areas and require carrying out the assessment of the impact on environment in connection with Article 6 par. 3 of the Habitats Directive and Article 4 par. 2 of the EIA Directive; **Group IV** – projects mentioned in annex II to the Council Directive 2011/92/EU, which are not likely to significantly affect Nature 2000 areas and may require carrying out the assessment of the impact on environment in connection with Article 4 par. 2 of the EIA Directive; **Group V** – projects not mentioned in annexes I and II to the Council Directive 2011/92/EU which may significantly affect Nature 2000 areas and require carrying out the assessment of the impact on environment in connection with Article 6 par. 3 of the Habitats Directive (Table 1).

The environmental impact assessment is a multi-stage process. The essence of this process is to support the planned innovation implementation permit issued by the authority. This assessment is supposed to prevent ecological and social conflicts and to make amends for negative impact on environment. It is worth to remember that the process ought to expose a holistic influence of project on the environment. Hence, as far as technologically related projects are concerned, it is unacceptable to divide them into smaller units and to prepare partial reports for particular elements of undertaking.

Table 1 **Metallurgy project types classification in Directive 2011/92/EU**

ANNEX I
a) Integrated works for the initial smelting of cast iron and steel; b) Installations for the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes.
ANNEX II
a) Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting; b) Installations for the processing of ferrous metals: hot-rolling mills; smitheries with hammers; application of protective fused metal coats; c) Ferrous metal foundries; d) Installations for the smelting, including the alloyage, of non-ferrous metals, excluding precious metals, including e) recovered products (refining, foundry casting, etc.); f) Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process; g) Manufacture and assembly of motor vehicles and manufacture of motor-vehicle engines; h) Shipyards; i) Installations for the construction and repair of aircraft; j) Manufacture of railway equipment; k) Swaging by explosives; l) Installations for the roasting and sintering of metallic ores.

The procedures of environmental impact assessment, which exist in different countries, differ. However generally, it takes 11 steps to go through this procedure [12]: **Step 1** – The preparation of an undertaking (voluntary procedure). In some European countries, at this stage of undertaking, investor does not have to consult with the authority responsible for an issuance of a permit. **Step 2** – A competent body is notified (voluntary procedure) in advance by the enterprise, which has planned an investment, of future filing of application for an issuance of a investment permit. **Step 3** – The stage of qualification- SCREENING (mandatory in all EU Member States). This stage may occur as soon as the authority receives a notice that the enterprise intends to file an application for an completion of an investment or an application for receiving qualifying opinion. The decision at the stage of qualification is registered and publicly announced. **Step 4** – The selection of evaluated issues – SCOPING (mandatory in all EU Member States). The enterprise may submit an application for an opinion within the framework of scoping. In this opinion issues connected with information on environment shall be specified. The authorities are obliged to consult with bodies responsible for the environment while preparing the opinion. **Step 5** – The environmental research (voluntary procedure). The investor carries out environmental research in order to obtain and prepare detailed information on environment. **Step 6** – The information on environment is shown to relevant authorities (mandatory in all EU Member States). The investor presents the information on impact of the undertaking on environment to the competent bodies. **Step 7** – The review of obtained information on environment in terms of sufficiency (voluntary procedure). **Step 8** – The consultation with all interested parties (mandatory in all EU Member States). Whereas significant cross-border effects are possible to occur, other countries, which are likely to be effected, shall be obligatorily consulted. **Step 9** – The examination of information within the framework of a decision by responsible authority (mandatory in all EU Member States). **Step 10** – An issuance of the decision (mandatory in all EU Member States). **Step 11** – The monitoring of the project completion effects (voluntary procedure).

## CONCLUSIONS

Factors which influence innovations have different scope of actions depending on industry or sector. In particular industries, ecological innovations are introduced more often than in others. The support policy should play a role in the intensification of ecological innovations implementation in enterprises. This support policy by means of various instruments may result in a bigger amount of ecological innovations in a whole sector and, thus it may bring benefits not only to ecological, but also to economic and social dimension. Legal regula-

tions and directives concerning the environment are often the main cause of eco-innovation implementation.

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**Note:** The responsible translator for English language is A. Piwko, Katowice, Poland.