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Energy Consumption and Environmental Impact of the Foundry Industry

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Abstract: Climate change has a negative effect on water and food production, which poses a serious problem, as both resources are necessary for human survival. Sustainable development is the basic approach to the environment in modern times. Energy consumption and environmental issues such as climate change are global problems and industries such as the foundry industry have an influence over them. Therefore, environmental awareness, eco ethics, bioethics, and social reflexivity can be the agents of change in the future.

Integrating the environment into development issues is of particular importance in the industry, so the aim of the research in this paper is to define a model for implementation and monitoring of key indicators of energy efficiency, as an instrument of effective environmental and energy management in the metal sector of Bosnia and Herzegovina. Using these environmental tools contributes to more efficient use of energy as well as reducing emissions and negative impact on the environment. The study includes

INTRODUCTION

The relatively permanent components of the Earth's atmosphere: O_2, N_2, CO_2, H_2O and other gases, are an indestructible mixture of gases. However, emissions of pollutants of anthropogenic origin may drastically change the atmosphere's properties, both locally and globally. In present-day urban and industrial areas, significant changes in the composition of the atmosphere have been registered and they have had an unfavorable impact on all aspects of the environment. The emitted anthropogenic gases cause damage to the ozone layer and we are already experiencing the adverse consequences. Damage to the ozone layer above the Earth's poles, extending to the Equator, has undesirable implications and consequences which will become more visible in the future. Large numbers of compounds, gases and different particles can be released into the atmosphere as pollutants in urban surroundings in the form of: SO_2, soot (smoke), CO_2, CO, C_xH_y, NO_x, NH_3 and hard particles.

The destruction of the ozone layer is caused by higher rates of CO_2 emission. The Kyoto and Montreal protocols push to analyze the problem of climate change because of its influence on food production, water quality, and, ultimately, poverty. [1] Therefore it is necessary to develop adequate strategies for protection of food and water supplies. Industrial corporations in B&H spend significantly more energy to make their products than similar corporations from other countries. It is particularly important to note that more than 50% of energy is consumed in the metal industry. Within the metallurgy and foundry industrial branch, cast iron and steel production in the foundry industry is a large energy consumer. Specific energy consumption for certain castings is high as well, which at the same time shows the effect of greater or lesser efficiency in energy use. When observed through the prism of energy efficiency in the economy and the metal sector, those in charge of energy consumption must bear in mind the following: (1) the economy of use, (2) safety of equipment and (3) environmental management. Integration of the environment into development issues has special importance in this work, therefore the goal of this paper is to investigate, define implementation models, and observe key indicators of efficient energy use as instruments of efficient environmental and energy management. This study included companies at the intermediate (mezzo) level (foundries). [2] [3]

FOUNDRY INDUSTRY

In addition to the reasons already mention, the interest in this subject matter also arises from the following:

- Profitability of companies can be increased by minimizing energy costs.
- Every sustainable development strategy has the aim of ensuring the availability of energy and its sustainable consumption.
- With energy indicators, it is possible to connect human activities, changes in energy, and the effects of undertaken measures.
- The metal and electrical industry sector in B&H is traditionally a leading sector.
- The foundry industry is a propulsive branch.
- The foundry industry is the key factor in ferrous and non-ferrous metal waste recycling, as the materials can be re-melted into new products and used 100 %. [4] [5]
- The foundry industry is an intensive energy consumer. [6]
- The foundry industry is also an intensive polluter: soil, air, and water. [7][8]

The foundry industry can negatively impact the environment through its use of thermal processes and mineral additives. Managing its environmental footprint is therefore related mainly to acid gases and the recycling of mineral waste. [5]

METAL AND FOUNDRY INDUSTRY IN BOSNIA AND HERZEGOVINA (B&H)

Data on B&H foundry industry production for the years 2009 and 2010 are shown in Figures 1 and 2. Production is divided into categories according to the NACE Rev. 2 classification. Each production category is denoted by its NACE code.

In 2009, foundry output consisted mainly of light metal castings for land vehicles, excluding for locomotives or rolling stock and construction industry vehicles. This group makes up 45% of total production. Two categories (1) ductile iron castings for locomotives/rolling stock/parts, for uses other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery and (2) non-ferrous metal parts for other uses have the smallest production share (in both cases 2%).

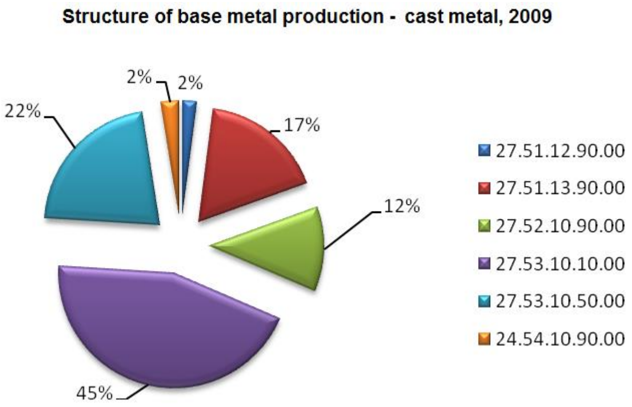

Figure 1: Foundry industry production, 2009
Source: BHAS, 2010

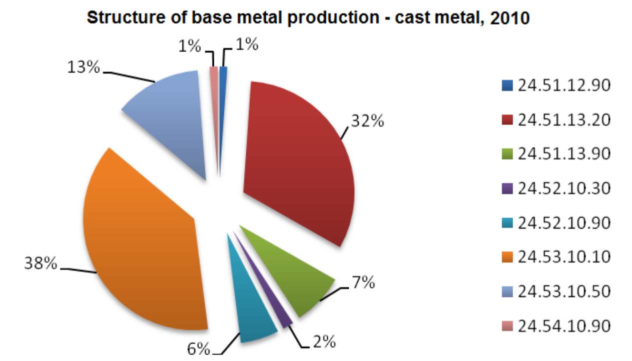

Figure 2: Foundry industry production, 2010
Source: BHAS, 2011

In 2010, the production structure was somewhat wider than the previous year, with two new product groups. While the parts for land vehicles still dominate (38% of production), second by percentage (32% of production) are grey iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding bearing housings incorporating ball or roller bearings). Steel castings for bearing housings and plain shaft bearings (excluding for bearing housings incorporating ball or roller bearings) were also a new category in relation to 2009.

PROSPECTS FOR THE FOUNDRY INDUSTRY IN B&H AND THE WORLD

Analyses of casting production in the world have shown that EU countries are first in terms of non-ferrous metal castings and second in cast steel. The EU foundry industry produces 50 % of its castings for the automobile industry, while another large portion is for machine production. In spite of the dramatic changes in 1990 and those caused by the recent recession, prospects for the EU countries in the mid-term, i.e. until 2020, are good and they are related to castings for automobiles and trucks, but especially for electrical units' castings. According to the EU development programme, casting production for the automobile industry is expected to grow in both relative and absolute terms, even with the present crisis, as a result of current expansion in global vehicle production. In that sense, we have to bear in mind that regional production and casting production structure will change continuously. The rest of the transportation sector, such as air and ship transportation, expects significant investments.

Therefore, the EU casting industry will stay stable until 2020, with very small deviations from the rule in certain regions or countries. It is estimated that the casting market in the four BRIC countries will grow by up to 60 % in 2020 (Figure 3). Availability of materials and prices that the foundry industry must pay will be of vital importance.

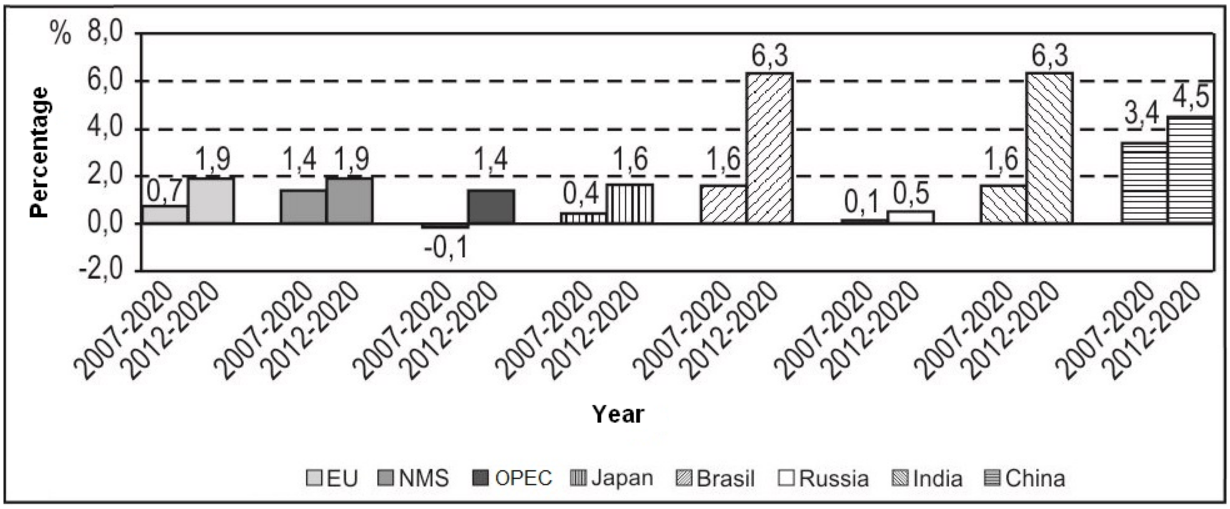

Figure 3: World casting production between 2007– 2012 and estimates until 2020

Table 1 shows an estimate of casting production by industry and metal type until the year 2020.

Table 1: Casting production estimates CAEF until 2020

	Castings by industry (%)			
Metals	**Vehicles**	**Machine construction**	**Construction**	**Other**
Steel-based	56	27	3	14
Non-ferrous	63	9	4	24

Source: The Casting Industry and Cast Production Perspectives in Bosnia and Herzegovina

All data shows the foundry industry in Bosnia and Herzegovina has great possibilities, if it is supported financially and with the proper regulation. The projected structure of foundries in B&H is based on present foundry capacities: 3 iron foundries, 5 foundries producing grey, nodular or vermicular cast iron, and 4 non-ferrous metal foundries, for which we do not have data at our disposal. The B&H foundry industry, in the period until 2015, should focus on the problems facing this branch, including: analyzing production to determine market goals for the European, EU, and other markets, entering the projected markets and finding suitable market "niches", which would be the best possible solution for certain B&H foundries. On the other hand, producing quality castings in a cost-efficient manner requires large investments in equipment as well as increased investments in R&D. [8] [9] [5]

In regulatory terms, the B&H foundry industry must be supported by adequate legal acts which should include not only environmental protection, but also the regulation of growing costs of materials and uncontrolled export or import of materials.

In the coming times, the foundry industry must undergo a reconstruction, thus showing its readiness to implement European and international norms related to technology and environmental protection.

WASTE RESOURCES AND EMISSIONS OF ACID GASES

Developing and implementing an EI indicator on the selected business systems

In order to develop and implement an EI indicator while bearing in mind the main hypothesis of this paper and the reasons mentioned above, we have selected foundries as a business system that represents a propulsive branch of the B&H metal sector and also a challenge from the point of managing the environment and energy. The foundry industry is an intensive energy consumer and polluter. Foundries and their production represent an important part of the metal sector, particularly in terms of the casting-based mechanical industry including the automobile industry, where almost 50% of each automobile is made from castings.

Gathering and categorization of collected data

The general questionnaire used in this study was based on the ESCO Company questionnaire. In some companies, a limited preliminary audit, interviews and meetings with management were carried out. In order to gain insight on energy intensity, data on output (expressed both in physical and monetary units) and use of energy were collected. Out of 10 examined foundries, 9 filled out the questionnaire. Additional data was obtained through interviews in certain companies, while BAT and BREF were used as sources of comparative data.

Table 2 shows electricity consumption in kWh in the surveyed foundries, categorized by its different uses.

Table 2: Consumption of electricity in surveyed foundries during the year (kWh)

Uses	Foundries						
	CIMOS TMD Casting doo	Zenica P.J. Novi zivot	Bosnia Vales Tuzla	Foundry Visoko d.d.	Jelšingrad d.d.	Foundry Turbe d.d.	Iron and Steel Works Ilijaš d.d.
	F1	F2	F3	F4	F5	F6	F7
Shop	18.524.147	4.000.000	2.400.000	86.000	13.440.000	93.676	
Technology		100.000	100.000				3.500.000
Heating		600.000	800.000		960.000		
Lighting	4.705.853	300.000	300.000		1.600.000		36.000
Total	23.230.000	5.000.000	3.600.000	86.000	16.000.000	93.676	3.536.000
Shop + Technology	18.524.147	4.100.000	2.500.000	86.000	13.440.000	93.676	3.500.000
Percentage (%)	79,74	82,00	69,44	100,00	84,00	100,00	98,98

Environmental, production and energy characteristics of the selected business systems

In the contemporary market, casting is a well-known, very competitive and efficient production process. In addition, metal casting is a very complex process and can, at times, lead to unsatisfactory outputs, as the process involves the compounding of a great number of variables which must be controlled, including above all: quality of molds, melting process, metallurgic state of melting, temperature and speed of casting, etc. The technological process of casting must also be placed within the context of protecting the environment as the process is a significant polluter. Therefore, the demands placed on foundries are very complex. Table 3 shows the basic characteristics and emission levels of steel melting by furnace type.

Table 3: Basic characteristics and emission levels of steel melting by furnace type

Process	Steel		
Type	ELECTRIC ARC FURNACE		INDUCTION F.
Subtype	Acid lined	Basic lined	Coreless
Energy source	Electricity	Electricity	Electricity
Thermal efficiency[1] (%)	60 – 70	60 – 70	50 – 60
Primary thermal efficiency[2] (%)	21 – 25	21 – 25	15 – 20
kWh/tonne metal charge	500 – 700	500 – 700	520 – 800
Batch/continuous	Batch	Batch	Batch
Production rate[4] (tonnes/h)			
Furnace capacity[5] (tonnes)	2 – 50	2 – 50	0.01 – 30
Meltdown time (h)	1 – 4	1 – 4	1 – 2
Refining ability	Possible	Possible	No
Capital cost	High	High	High
Slag production (kg/tonne metal charge)	10 – 40	20 – 80	10 – 20
Dust production[6] (kg/tonne metal charge)	5 – 8		0.06 – 1

Waste gas[7] emission (kg/tonne metal charge)

Process	Steel		
Type	ELECTRIC ARC FURNACE		INDUCTION F.
Subtype	Acid lined	Basic lined	Coreless
CO_2[8]	Depending on power generation		Depending on power generation
CO	7.5 – 25 (decarburisation)		n.a.
SO_2	<1		Minor
NO_x	n.a.		n.a.

1 Indicated values give an order of magnitude but largely depend on exploitation conditions, such as metal temperature, furnace capacity and production rate
2 Efficiency of electrical power generation assumed to be 35 %
3 Taking into account energy consumption for oxygen production and the raw materials, such as graphite and FeSi, to substitute the oxidised elements during melting
4 For continuous processes only
5 For batch processes only
6 Indicated values are general values found in literature
7 Indicated values are general values found in literature
8 Assuming complete combustion
9 Depending on local exploitation conditions and construction.

Source: Metalcasting Industry Energy Best Practices Guidebook, 2011 [10] [4]

Table 4 contains data on characteristics and emission levels for the production of cast iron.

Table 4: Basic characteristics and emission levels of iron melting by furnace type

Process	Cast Iron					
Type	INDUCTION F.	CUPOLA FURNACE				ROTARY F.
Subtype	Coreless	Cold blast	Hot blast	Hot blast – long campaign	Cokeless - duplex	
Energy source	Electricity	Coke	Coke	Coke	Gas/fuel	Gas/fuel
Thermal efficiency[1] (%)	50 – 60	30 – 40	40 – 45	35 – 45	50 – 60	50 – 60
Primary thermal efficiency[2] (%)	15 – 20	30 – 40	40 – 45	35 – 45	45 – 50	35 – 45[3]
kWh/tonne metal charge	520 – 800	950 – 1200	800 – 900	810 – 1100	700 – 800	600 – 800
Batch/continuous	Batch	Continuous	Continuous	Continuous	Continuous	Batch
Production rate[4] (tonnes/h)		2 - 10	8 - 70	8 - 70	>5	
Furnace capacity[5] (tonnes)	0.01 – 30					1 – 20
Meltdown time (h)	1 – 2					2 – 4
Refining ability	No	Yes	Yes	Yes	No	No
Capital cost	High	Medium	High	High	Medium	Low
Slag production (kg/tonne metal charge)	10 – 20	40 – 80	40 – 80		40 – 80	20 – 60
Dust production[6] (kg/tonne metal charge)	0.06 – 1	5 – 13	4 – 12		0.8	0.3 – 2.9

Table 4: Continuous.

Waste gas[7] emission (kg/tonne metal charge)					
CO_2[8]	Depending on power generation	400 – 500	350 – 480	100 – 120	120
CO	n.a.	Possible[9]	0.5 – 2.5	<10	1.0 – 1.5
SO_2	Minor	1 – 2	<1	Fuel dependent	2.5 – 3.0
NO_x	n.a.	<1	<1	0.5	0.3 – 0.4

1 Indicated values give an order of magnitude but largely depend on exploitation conditions, such as metal temperature, furnace capacity and production rate
2 Efficiency of electrical power generation assumed to be 35 %
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8 Assuming complete combustion
9 Depending on local exploitation conditions and construction.

Source: Metalcasting Industry Energy Best Practices Guidebook, 2011 [10] [4]

Data on average emissions from induction furnaces in the process of melting steel and iron is provided in Table 5.

Table 5: Average emissions from melting iron and steel in an induction furnace

	Capacity No. oven x tona/module	**Off- gas collection**	**Flux** m^3/sat	**Equipment for cleaning the gases**	**Dust** mg/m^3	**SO_2** mg/m^3	**CO** mg/m^3	**NO_x** mg/m^3	**HF** mg/m^3	**O_2** vol %
IP	(2 x 10) + (3 x 3)	Side-draught	54000	Bag-like filter	5	No data available	No data available	No data available	No data available	21

Source: [9] [4]

Measurements of CO and SO_2 emissions in foundries F1 and F2 taken by the ”Kemal Kapetanović” Institute University of Zenica are presented in Tables 6 and 7.

The average values for all gases measured in foundry F1 were obtained by taking three measurements of waste gases in one hour. The results are shown in Table 7. In this case, data for CO_2 (%), CO_2-IR (%), NO (ppm), NO_2 (ppm), EffN (%), EffG (%), ΔP (mbar), T1 and T2 (^oC), speed (m/s) and volume flow (m^3/s), dewpoint (^oC), as well as mass flow of CO, SO_2 and NO_x (kg/h) have been measured, but have not been recorded.

Table 6: Average values for all gases measured in foundry F1

Measured characteristics	Units	Values
O_2	%	20,95 ± 0,02
CO	Ppm	3,67 ± 1,15
Temp. fluida	^oC	29,03 ± 0,47
NO_x	Ppm	0,00 ± 0,00
SO_2	Ppm	0,00 ± 0,00
H_2	Ppm	0,00 ± 0,00
Amb, temp.	^oC	18,73 ± 0,21
Device temp.	^oC	21,67 ± 0,06
Oild		0,00 ± 0,00
Pump flow	l/m	0,82 ± 0,25
O_2 ref	%	5,10 ± 1,82
CO_2 max	%	11,9 ± 0,00

The average values for all gases measured in foundry F2 were obtained by taking four measurements from the foundry’s boiler room in one hour. These averages are presented in Table 6. Data for ΔP (mbar), T1 and T2 (^oC), speed (m/s) and volume flow (m^3/s), dewpoint (^oC), as well as mass flow of CO, SO_2 and NO_x (kg/h) have been measured, but have not been recorded.

Table 7: Average values for all gases measured in foundry F2

Measured characteristics	Units	Values
O_2	%	5,77 ± 0,03
CO	Ppm	3,25 ± 0,50
CO_2	%	11,24 ± 0,03
CO_2 – IR	%	10,43 ± 0,01
NO	Ppm	89,74 ± 1,15
NO_2	Ppm	-0,30 ± 0,35
Temp. fluida	^oC	242,65 ± 5,45
NO_x	Ppm	89,00 ± 1,15
SO_2	Ppm	41,25 ± 33,63
H_2	Ppm	3,25 ± 2,22
EffN	%	88,23 ± 0,17
EffG	%	83,08 ± 0,22
Rati		0,00 ± 0,00
Amb, temp.	^oC	21,98 ± 1,49
Device temp.	^oC	21,18 ± 0,96
Oild		0,00 ± 0,00
Dewpoint	^oC	47,83 ± 0,05
Pump flow	l/m	0,77 ± 0,02
O_2 ref	%	3,0 ± 0,00
CO_2 max	%	15,5 ± 0,00

The experiments and observations presented here show that emissions can cause serious damage to the air, soil, and environment.

EXPLANATION

- Harmful emissions caused by the production of castings are related mainly to the use of additives and fuels, as well as to pollutants. The use of coke or other natural fuels can cause emissions related to combustion. The use of additives can generate reaction products. The presence of pollutants in waste materials which are melted can cause the formation of incomplete combustion products and dust. Dust from the process may contain metals and oxides. During melting, elements evaporate and dust particles are liberated. Metal particles also appear during finishing [10].

- Emission of pollutants from cast iron foundries [11]
- A study involving 20 foundries showed that the total annual emission of dust-like pollutants into the atmosphere was between 0.1 and 94 kg or approximately 4.7 kg/t. Annual emissions of waste gases consisted mainly of SO_2, NO_x and CO. Quantities of castings from 0.1 to 108 kg/t amount to approximately 5.4 kg gases/t. In addition to the above-mentioned compounds, the following chemical components were also present: xylene, butanols, terpenes, benzo(a)pyrene, and esters.
- Emission of pollutants from cast steel foundries [11]
- Experiments have shown that the total amount of dust produced in the casting of steel is between 6.65 and 35.55 kg/t, while Si dust varies from 3.46 to 21.09 kg/t. The annual emissions of SO_2, NO_x, and CO from production vary from 0.01 to 20 kg. The biggest source of NO_x emissions are electric furnaces, with up to 90% of emissions, while the remainder comes from induction furnaces, etc. Emissions of CO from production amount to up to 18 kg/t. This gas is emitted primarily from electric and induction furnaces, while emissions of SO_2 originate from different sources and furnaces, etc. [11]

STATISTICAL DATA PROCESSING

Statistical methods were used to turn the data collected through surveys into information on trends in energy intensity, which can serve as a basis for decision-making and undertaking necessary measures to improve the production process. Statistical methods are important in that they make it possible to define mass processes, establish their tendencies and the laws governing them.

For the surveyed foundries, the following method was used to develop an energy intensity indicator and estimate its value.

- The energy intensity [EI] of the surveyed foundries was calculated with the following formula:

$$EI = \frac{K_e}{Y} \quad \textbf{(1)}$$

where:
EI – energy intensity of foundry
K_e – electricity use in MWh
Y – Total output of foundry in physical units

- For processing of numerical data, values were summed up to calculate average values and the percent share of main elements in certain values were estimated. In estimating these values, special consideration was given to compounding values in total sums, while determining the participation of different categories of compounding elements depended of accessible data.
- Different types of diagrams were used to graphically illustrate the data: spherical, linear, etc. The diagram type is chosen based on what was the best way to present the given data and compare complementary values, etc.
- In certain cases, trend lines are marked for changes in data, as lines of aberration, etc.
- Foundry CIMOS Casting Zenica submitted complete data, followed by the best analyses, a regression model, and practical experiences for the measurement of certain performances.
- Comparison of data for the region.

Table 8 shows the energy intensity of each surveyed foundry, as well as their average intensity.

Of the observed foundries, F2 has the highest energy intensity, while F5 uses the least electricity in its production. On average, the foundries need around 2 MWh of electricity to produce one ton of castings.

Table 8: Energy intensity of surveyed foundries

Foundry	**Electricity use (K_e)**		**Output (Y)**		**Energy intensity (EI)**	
F1	21.485	MWh	7.873	t	2,728947	MWh/t
F2	5.000	MWh	1.000	t	5,000000	MWh/t
F3	3.600	MWh	970	t	3,711340	MWh/t
F4	86	MWh	1.333	t	0,064516	MWh/t
F5	16	MWh	2.420	t	0,006612	MWh/t
F6	93,676	MWh	60	t	1,561267	MWh/t
F7	3.500	MWh	2.000	t	1,750000	MWh/t
Total	**33.781**	**MWh**	**15.656**	**t**	**2,157703**	**MWh/t**

CLIMATE CHANGE

The negative consequences of climate change affect human life as a whole. The greenhouse effect and higher emissions of gases and pollutants cause global warming and thinning of the ozone layer. The reason for writing a paper on this topic is that combining different disciplines can offer the best possible solution for energy efficiency and environmental management.

GIDDENS PARADOX REGARDING CLIMATE CHANGE

Cars are a main source of benzene emissions to the environment. Apart from food, benzenes enter the human organism through the air. The environment has high concentrations of benzenes which vary from 3 to 160 $\mu g/m^3$ (urban or rural). Benzene is a hematological poison [7]. The behavior of NO_x in the atmosphere has been the subject of several experiments, which have shown that its high chemical reactivity has an important role. NO_x and C(OH) (aliphatic and aromatic) accumulate in the atmosphere during the night and, during the day, NO_x transforms into NO_2 through photolytic cycles (Figure 3).

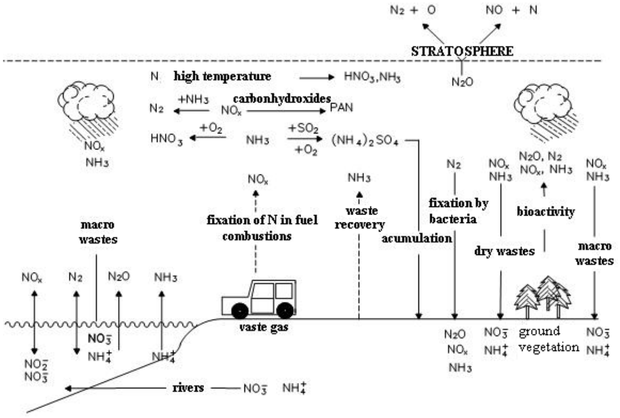

Figure 4: Circulation of nitrogen in nature
Source: Perina, I., Mihanović, B.: Ispitivanje onečišćenja zraka, SKHT/Kemija u industriji, Zagreb, 1988.

There is wide-spread knowledge about a possible apocalyptic scenario and the uncertain future of global climate change [12] [13] [14].

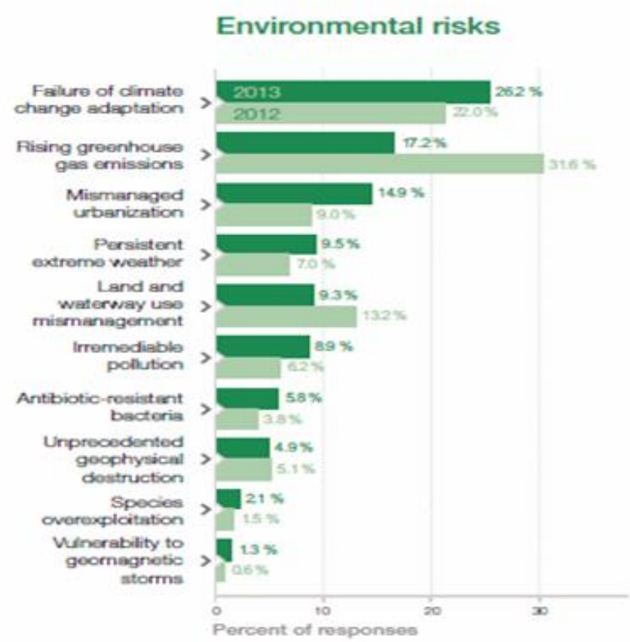

Figure 5: Environmental risks, 2012 and 2013
Source: Global risks report 2013:54-56

The eco-pathological sociology of this is the fact that it is dealing with "abstract and elusive dangers, however potentially devastating they might be". This is called Giddens paradox.

ECO ACTIVISM

When pollutants (CO_2, SO_2, NO_x) are in the atmosphere, their existence very much depends on physical processes such as dispersion, transport, deposition as well as the very complex chemical processes that are developing all the time, from the moment of emission to precipitation onto the Earth's surface. It is not simple to find the correlation between emissions and the acidity of the layers of the atmosphere. The numerous variables related to the origin of pollutants, their types and conversions, their transmission through the atmosphere and their precipitation are a complex system to which the response is not simple. They also require a complex system of modeling. The implementation of legislation on air pollution would bring many changes in the regulation of climate change and protect the environment from its negative consequences. [15] [14]

CONCLUSIONS

Through its present technology, the electrical, metal, and foundry industries pollute the air, water, and soil to some degree, which in turn affects the climate. Although moderate polluters, foundries in B&H also contribute to the process of climate change through the use of outdated equipment and the resulting emissions of gases such as CO_2 and SO_2 and air pollutants. Minimal production of castings in B&H is associated with a minimal consumption of energy in melting furnaces and production processes. The existing casting production amounts to several tens of thousands of tons and is at least six times lower than it was before the war. By increasing the total production and fuel consumption, no drastic contamination is anticipated, but only an increase in environmental pollution. It is expected that increased production and fuel consumption will result in increased environmental pollution. From the above considerations and available literature, it is possible to calculate energy intensity. At the same time, it is also possible to mitigate higher pollution resulting from higher production by modernizing foundries in order to create the so-called "ideal foundry".

Recent studies of energy efficiency in the B&H metal sector offered the following recommendations: special methodology must be involved in the legislative and pre-legislative act, formation of the Energy Efficiency Agency (which is foreseen in the draft Law on Energy Efficiency in the Federation of B&H), formation of the Industrial Energy Efficiency Network of B&H (MEEIBH), etc.

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Summary/Sažetak

Analiza potrošnje u industrijskom sektoru BiH pokazuje da više od 50% energijske potrošnje otpada na metaluršku industriju. Industrija lijevanja željeznih proizvoda veliki je potrošač energije unutar široke grane metalurgije.

Interes za obradom ovakve teme, koja iziskuje pluriperspektivni pristup**,** proistekao je, i iz slijedećeg:

U centru svake Strategije održivog razvoja je vizija poboljšanja obezbjeđenja i potrošnje energije na održiv način. Dakle, potrebno je da se upravlja energijom i sa stanovišta ekonomije i ekologije, a da bi se nečim upravljalo moraju se poznavati i odrediti mjerila, odnosno, indikatori. Stoga je bez energijskih indikatora, nezamislivo energijsko i okolinsko upravljanje iz razloga što oni upravo daju vezu između ljudskih aktivnosti, energijskih promjena i efekata mjera.

Sektor metalske i elektro industrije BiH, odabran je i zbog tog što je to tradicionalno vodeći sektor , u ukupnom izvozu BiH, u kojem pojedine kompanije izvoze i do 100% proizvodnje (npr. automobilske dijelove za „prvu ugradnju"). Livnice, odnosno livarski proizvodi, su značajan dio ovog sektora, naročito u mašinskoj industriji koja se bazira na ljevarstvu, uključujući automobilsku industriju, uz spoznaju da je u svaki automobil ugrađeno do 50 % odljevaka.

Livnice su, međutim, intenzivni potrošači energije i intenzivni zagađivači okoline, a što je i predstavljeno radom.