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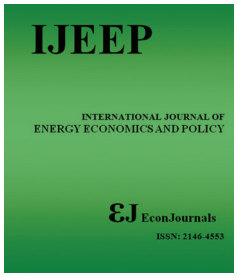

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The Harmonization of Eco-efficiency Standards: An Analysis on the Energy Enterprises of the G7 Group and the Emerging E7 Countries

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ABSTRACT

Attempts are being made to harmonize the many standards of business practice that exist outside of financial reporting, but they are limited either to a single industry or to the views of individual researchers. In this article we have harmonized international standards of eco-efficiency, compiled on the basis of multi-stakeholder approach and tested the set of indicators developed for the energy companies of the Group of Seven (G7) and the Emerging Seven (E7). We analyzed the non-financial reports of 56 companies from the global reporting initiative database for the period 2015-2016 and plotted the decoupling of value added and environmental pollution. The study found that G7 energy companies do not adhere to the concept of sustainable development, while for E7 companies there is an absolute decoupling except for greenhouse gas emissions. We come to conclusion that socially responsible companies are able to gain competitive advantages in the framework of sustainable development, provided the transparency of business.

Keywords: Standards Harmonization, Eco-efficiency, Sustainable Development, Decoupling
JEL Classifications: O13, Q01, Q52, Q56

1. INTRODUCTION

Information outside the financial statements has the status of best business practice and the problem of integrating such practices into existing accounting systems is the choice of non-financial information that would be really useful and in demand, as well as the choice of metric approaches for its evaluation - with the help of indicators, performance indicators, etc. The Mechanism of such a choice should be justified and one of such a mechanism is the harmonization of business practice standards, which set the format for voluntarily prepared non-financial reports.

Sustainability is among the most significant practices that have become integral part of firm's strategies over the past two decades. As part of the transition of companies to sustainable development, it is considered that the implementation of eco-efficient economic activity is the most appropriate component of such a transition (State of the World, 2008).

The principle of eco-efficiency is to create increased added value with sustainable use of resources. At the same time, the most important purpose of the use of eco-efficiency indicators is to assess the sustainability of enterprises with verifiable indicators.

Today, from the standpoint of active economic growth, proclaim themselves the countries outside the Group of Seven (G7) that are part of the so-called Emerging Seven (E7), which in addition to China, India, Brazil, Mexico and Indonesia, includes Turkey and Russia.

Based on the results of the 49th session of the UN, held in December 2018 in the format of the UN framework convention on climate change, a report on quantitative targets for reducing greenhouse gas (GHG) emissions in the global economy was prepared (United Nations, 2018). The report shows that Turkey is on the first line among all 43 reporting countries on GHG emissions, where from 1990 to 2016 their relative growth was 135.4%, and the absolute growth of 44.26 million tons of CO_2 (followed by Russia with an increase of 23.83 million tons of CO_2).

Turkey is also leading in terms of expected GHG emissions by 2020 in absolute terms of + 173.19 million tons of CO_2-equivalent, where the United States, Japan and Canada (the G7 countries) also occupy the top lines for expected emissions. As projected by 2030, Turkey (+501 million tons of CO_2-eq.) with a separation from Russia (+470.54 million tons of CO_2-eq.), will lead the absolute growth of GHG emissions compared to the level of 2016. The report reflects the lack of accountability of Turkey on a wide range of environmental issues. Turkey is the only country out of 43 that does not report, namely: no data was provided on GHG emissions in 2015, no stated goals to reduce such emissions until 2020, no clear figures for their reduction until 2030.

The E7 economies are expected to be larger than the G7 economies in 2030 (Hodges, 2016). The fact is that organizations around the world are moving into a new phase, accompanied by transformations of governance structures and global capitalism. The transition is characterized by the end of the Washington consensus and the rise of the world's regional centers of economic and political power, as well as a combination of geographic consolidation and concentration of supply chains, leading to a shift in bargaining power from leading firms in global supply chains to large suppliers in developing and emerging economies as key economic and political actors (Gereffi, 2014).

The largest energy companies are an integral part of the world economic pattern. Oil and gas energy has been and remains the "circulatory system" for the world economy (Simonia and Torkunov, 2016). The transition to an eco-efficient development strategy should begin with energy companies, not only because of the economic reasons described above, but also because of environmental reasons, since they significantly pollute the environment. Also within the framework of the Paris climate agreement, signed since April 22, 2016 by an overwhelming number of countries, special attention is paid to activities aimed at achieving the stated environmental goals by 2030 and beyond.

In this regard, we consider it relevant to consider the eco-efficiency of the largest energy companies of the big seven and the emerging seven from the Platts Top 250 2018 Ranking (S&P Global, 2019).

This paper is organized according to the following structure. Section 1 is the introduction that includes the importance of eco-efficiency business practices standards harmonization under sustainable development. Part 2 is the literature review on previous studies. Part 3 is the data and methodology that explains the peculiarities of data analysis. Part 4 includes the results and its discussion, and finally, part 5 is the conclusion with the interpretation of the results.

2. LITERATURE REVIEW

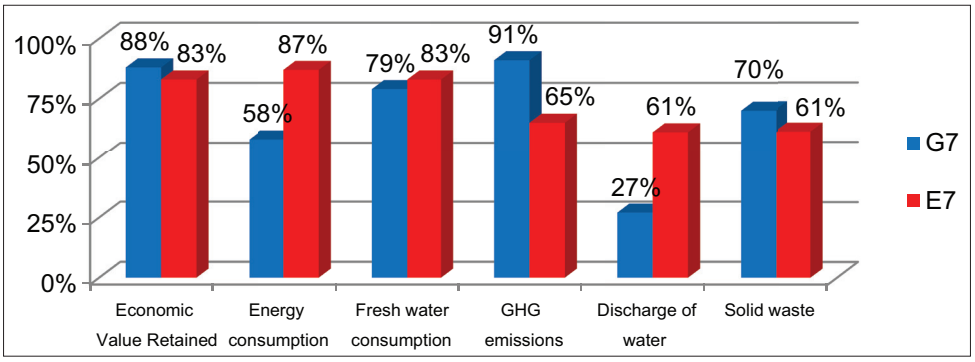
One of the most recent studies on the harmonization of business practice standards and views on eco-efficiency was carried out by Canadian researchers (Benoit et al., 2019). In their work, they call for a careful quantification of the effects of eco-efficient activities. The authors reviewed many existing voluntary accountability standards, as well as many academic papers on the topic.

However, the authors have researched just purely technological aspects of production of dairy products and found existing standards purely for this industry. They also has not allocated discharge of water as a separate indicator, pointing only on a proportion of reused water and didn't agreed the units of measurement of each indicator, respectively, not reflecting them.

Chinese researchers (Hu et al., 2016) recognize the absence of a single standard governing the components of eco-efficiency indicators, as well as their sustainable sets. The authors presented their own set of indicators through the analysis of environmental performance indicator systems proposed by a number of Chinese scientists and other foreign scientists.

However, we consider that it is more reasonable to rely on multi-stakeholder approach, which is applied in the preparation of business practice standards. Such approach to the consideration of views is not limited by the scientific community, but takes into account the information requests of investors, managers and the economically active business community. The analyzed

Figure 1: Representation of parameters of energy companies of the G7 and E7 countries



representation of parameters of considered energy companies can be seen in Figure 1. Therefore, there is subjectivity in the set of indicators proposed by the authors. Also there is no explanation of the economic component of eco-efficiency, whether it is value added, revenue or otherwise.

From the standpoint of the scientific literature, environmental efficiency is considered as a ratio of economic value added and environmental load (Koskela and Vehmas, 2012; Wang et al., 2012). There is also a need for a more comprehensive assessment of actions to reduce resource consumption. For example, in today's circular economy among such principles as reduction of use, reuse and recycling, reduction is the most important goal (Akenji et al., 2016).

Eco-efficiency is an organization-wide framework and is applicable across a country or region (UNESCAP, 2009). The problem of compiling a certain set of eco-efficiency indicators is the inconsistency between the rules and standards of their recognition, measurement and disclosure of environmental information within one industry or industries, and different countries. The concept of eco-efficiency was one of the first to be introduced by the World Business Council for sustainable development and was immediately widely adopted (WBCSD, 2000). WBCSD approbated its own eco-efficiency indicators on 22 firms in more than 10 industries from 15 countries.

We have identified three more business practice standards, one international and two national, respectively, that encourage businesses and stakeholders to use eco-performance indicators, namely: Guidance on corporate responsibility indicators in annual reports of the intergovernmental panel on international accounting standards of the United Nations (UNCTAD, 2008), A workbook on calculating eco-efficiency indicators of The National Round Table on the Environment and the Economy of Canada (NRTEE, 2001), and the standard for eco-industrial parks HJ/T274-2015 issued by Ministry of Environmental Protection of the People's Republic of China (MEP, 2015; Huang et al., 2019).

UNCTAD relies on its own view of eco-efficiency, namely: the eco-efficiency indicator represents the ratio of the environmental and financial variables, where environmental performance reports describe the environmental and financial impacts of activities by grouping these impacts into large classes according to their environmental and financial characteristics. The grouped elements are areas of financial and environmental issues of concern to stakeholders (e.g., contribution to global warming, energy consumption, waste, assets, liabilities, capital, income, etc.). In turn, the Canadian NRTEE standard cites the definition of eco-efficiency from WBCSD.

It should be noted that the HJ/T274-2015 standard has entered into force in China in 2016, and it applies to eco-industrial parks of China from January 01, 2019.

An in-depth analysis (Huang et al., 2019) of the HJ/T274-2015 standard indicates that in addition to positive changes, there are still shortcomings. According to the authors, the standard should include more environmental indicators that take into account both resource consumption and emissions of pollutants, namely into the atmosphere, and also consider economic growth. The authors showed that such indicators as energy and water consumption in relation to value added is not enough. They point out that there is a need to monitor the reduction in resource consumption, including more systematic monitoring of material consumption.

3. METHODOLOGY AND DATA

The concept of eco-efficiency has become a strategic element of the European Union's sustainable development policy. The Europe 2020 strategy explicitly recognizes the need for synergies between economic and environmental objectives and calls for a transition to a green economy. In pursuance of directive 2014/95/EU, the guidelines on non-financial reporting (methodology for reporting non-financial information) have been published (EC, 2017).

However, the mechanism for the development of indicators in those guidelines remains nontransparent. It is indicated that the European Commission just reviewed many standards of business practice.

Management proposes to include the following indicators in the management report (EC, 2017. p. 15):

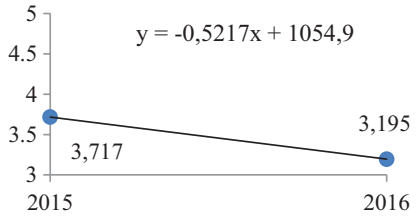
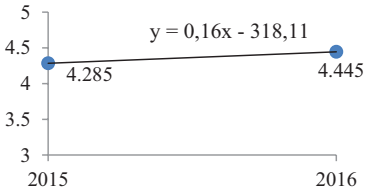
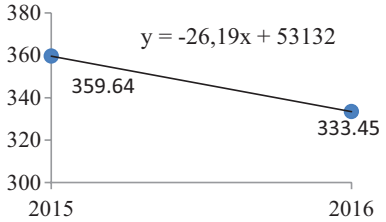
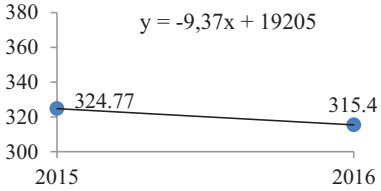
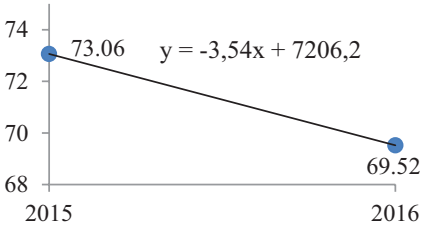
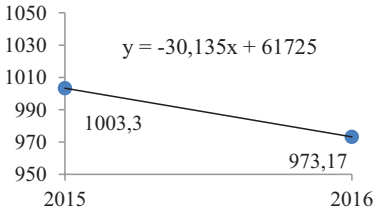
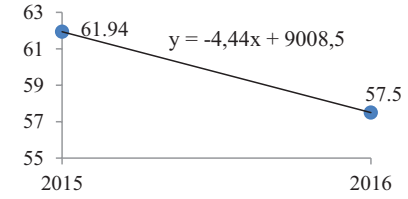
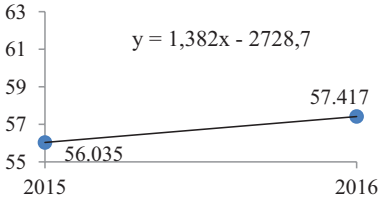
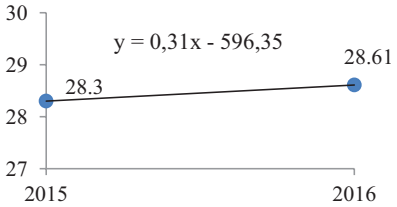
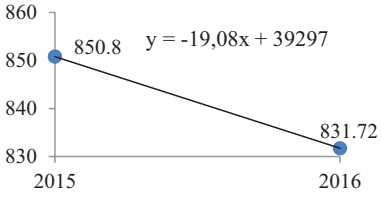
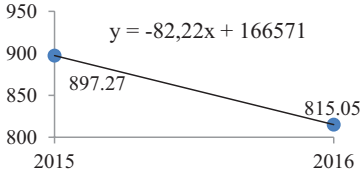
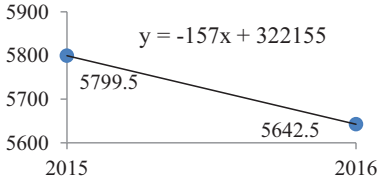
- Energy performance and energy efficiency
- Non-renewable energy consumption and energy intensity of production
- GHG emissions (tons of CO_2-eq.) and the intensity of these emissions
- Emissions of other pollutants (absolute value and intensity)
- Extraction of natural resources
- İmpacts and dependences on natural capital and biodiversity
- Waste management (e.g., recycling rates).

We have developed our own set of eco-efficiency indicators by bringing the standards of business practices of the above mentioned organizations, such as WBCSD, NRTEE, UNCTAD and the HJ/T274-2015 standard, into uniform compliance (Table 1). We did not include such an indicator of the HJ/T274-2015 standard as value added per unit of industrial area, because it refers to the efficiency of work on the territory of the industrial eco-park. The

Table 1: The harmonized set of eco-efficiency indicators

Indicator	Calculation of the indicator
Energy intensity	Added value (billion US dollars)/Energy consumed by the enterprise (million GJ)
Water use	Added value (billion US dollars)/Fresh water consumption by enterprise (million m^3)
Ozone layer destruction	Added value (billion US dollars)/Ozone-depleting substances emissions (metric ton of CFC11-eq.)
Greenhouse gas emissions	Added value (billion US dollars)/GHG emissions (million tons CO_2-eq.)
Waste formation	Added value (billion US dollars)/Total amount of solid waste generated (metric ton)
Water pollution	Added value (billion US dollars)/Waste water discharge (million m^3)
Materials consumption	Added value (billion US dollars)/Consumption of materials (metric ton)

Table 2: Decoupling of environmental impacts from economic growth

Parameter	G7 Companies	E7 Companies
Economic value retained, billion US dollars		
Energy consumption, million GJ		
Fresh water consumption, million m^3		
Greenhouse gas emissions, million tons of CO_2-eq.		
Waste water discharge, million m^3		
Solid waste, thousand tons		

decoupling of environmental impacts from economic growth is shown in Table 2.

Eco-efficiency indicators were included in the set if they were presented in at least one or more of the 4 standards. We didn't rely on the standards of purely one industry, agreed measurement units of the indicators and, importantly, from the standpoint of G7 Group and E7, analyzed the national standards of Canada and China in addition to the global.

We consider that the assessment of environmental performance using the set of indicators developed by us is feasible for firms in all industries, especially fund-intensive (pharmaceuticals, metal industry, mining, etc.). In addition to our set, companies may include eco-efficiency indicators that are relevant to their business (business-specific).

We have tested our harmonized set of eco-efficiency indicators by plotting the separate graphs for the energy companies of the G7 and E7 countries in the next section of our paper. While conducting the analysis of the company's non-financial reports, we used the selection methodology recently proposed for energy enterprises (Kalabikhina and Krikunov, 2018).

Of the 250 companies in the Platts Top 250 2018 rating system, we analyzed the non-financial reports those 56 companies (33 G7

Group companies and 23 of E7) that published them in the global reporting initiative (GRI) database (GRI, 2019). At the same time, an obligatory condition for selection was the publication by firms of such statements for two consecutive periods, 2015 and 2016. Inclusion in the analysis of reports for subsequent years 2017 and 2018 was impracticable due to their low representation in the database.

An integral element of the study was also the calculation of economic value retained. A review of modern corporate practice has shown that this value (held by an enterprise) is obtained by deducting from the value added (economic value generated) payments made by the company to suppliers of goods and services, employees, suppliers of capital, to governments (in the form of taxes) and local communities.

However, the financial statements in accordance with IFRS do not currently contain a separate item for the total payment of wages to employees. Also, payments to local communities within the framework of payments by the state in the territories of presence remain opaque, namely without a clear and orderly explanation of such payments, so these payments have not been considered by us. We carried out the calculation of added value on the basis of our own methodology using open financial data (here, the data from information source investing.com).

The formula is as follows:

Economic value retained=Total revenue for the fiscal year
± Other revenue
– Total cost of revenue
– Selling, general, administrative expenses
– Cash taxes paid
– Cash ınterest paid
– Total cash dividends paid

We point to the imperfection of non-financial accountability of energy companies. Thus, the 56 enterprises report least on the consumption of materials and on the share of recycled production waste that is present in this consumption. The ozone-depleting substance emissions figure was also left out of our consideration, as enterprises reported such emissions as minimal. The average accountability of G7 countries is 68.8% and of E7 countries is 73.3%.

4. RESULTS AND DISCUSSION

4.1. Research Results

Large companies consider the public interests of stakeholders not only in connection with the concern of their capitalization growth or goodwill, but also from the standpoint of coordination of their own economic interests and the interests of local communities in the regions of their businesses. At the same time, interested groups can use corporate social responsibility reports to monitor corporate actions (Shayakhmetova and Krikunov, 2017).

Sustainable production implies that economic output can be increased, and at the same time the resources used and polluting effects can be reduced. This condition has been defined as "decoupling" and is considered a significant concept for the successful integration of economic and environmental environments (Enevoldsen et al., 2007). The separation of environmental impact from economic growth is of key importance under coordinating the industrial growth with the green economy.

Absolute decoupling occurs when the value added is created at the same or decreasing impact on the environment. Absolute separation is highly desirable from a sustainable development perspective. Relative separation occurs when an increase in value added is accompanied by a similar or smaller increase in environmental impact.

In this regard, we consider it important to monitor the reduction of emissions and consumption of resources, that is, the analysis of the time periods of reduction. Such monitoring of eco-efficiency of economic activity will reduce the existing imbalance of under-accounting of non-financial factors of development, which in the past unfortunately often led to erroneous decisions at the level of management, investors and other stakeholders.

4.2. Discussion

The analysis of non-financial reports showed that not all of considered companies report on consumption of heat energy along with electric. While many of them do not specify the quantity of energy which was used for own needs, instead they report on the volume of energy for commercial sale.

In the GRI standard there is an indicator as "total water withdrawal by source," but enterprises often do not pay attention to the breakdown of water sources and do not take into account the consumption of such a limited resource as fresh water and reflect, for example, marine cooling water for nuclear power plants discharged back into the sea/ocean.

In the GRI standard, there is such an indicator as "Total water discharge by quality and destination," but companies often neglect such a breakdown and publish the volume of wastewater as the water used, and this is usually not equal volumes. For example, at the moment hydroelectric power plants reflect as wastewater the water passed through their turbines, and it is obvious that the figures of such "effluents" rise sharply.

With regard to solid waste, enterprises should reflect on a consistent basis (from period to period) the part of their recycling which is reused and thus falls into the consumption of materials.

5. CONCLUSION

The aim of the harmonization is to promote the concept of eco-efficiency by developing a common measurement system that can guide enterprises around the world. This will enable company managers and stakeholders to use environmental performance indicators as a means of achieving and measuring progress towards economic and environmental sustainability.

Harmonization of definitions, rules for the calculation and presentation of eco-efficient indicators can help to establish quantifiable targets and facilitate inter-firm comparisons. In fact, this will lead to universally recognized, transparent and verifiable indicators that can be widely used and integrated into existing accounting and reporting systems.

Analysis of the slope of the curves for companies from the G7 countries showed that for them the condition of decoupling is not fulfilled, because there is no growth in value added. It follows from this that the developed countries enterprises considered do not adhere to the concept of sustainable development. Analysis of slope curves for companies in E7 countries shows that they comply with the condition of absolute decoupling in energy consumption, fresh water consumption, wastewater and solid waste emissions.

At the same time, the calculation of the slope of the value added curve using the arctangent function (slope of 9°) and the slope of the GHG emissions curve (slope of 54°) of E7 companies indicates an increased rate of GHG emissions, which in this case indicates the absence of decoupling. To conclude, it should be noted that socially responsible companies implementing the decoupling in their economic activity are able to gain competitive advantages in the framework of sustainable development, provided the transparency of business.

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