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DEVELOPMENT POTENTIALS OF CO_2 EMISSION MARKETS IN REPUBLIC OF SERBIA

Bojan Djordjevic, Dragica Stojanovic, Mira Djordjevic

[1] *John Neisbitt University Belgrade, Faculty of Management Zajecar, 19000 Zajecar, e-mail bojan.djordjevic@fmz.edu.rs*
[2] *John Neisbitt University Belgrade, Faculty of Management Zajecar, 19000 Zajecar*
[3] *John Neisbitt University Belgrade, Faculty of Management Zajecar, 19000 Zajecar*

ABSTRACT. Human civilization is still bound to nature systems and its inner processes, regardless of powerful technology progress. Changes in the nature, especially ones that are the result of CO_2 emission, demand internationally conducted action. Creation of unique financial market for CO_2 emission trading inspired big global companies to become a part of it. Even though this market itself is a novelty, its rapid growth indicates future dominance. This paper presents basic features of CO_2 emission markets, as well as system of trading with permits for this emission type in EU countries – so called EU-ETS. The aim of this work is, based on positive European experience, to indicate the possibilities of application of such trading in Republic of Serbia.

Key words: green house gas emissions, cap and trade, emission permits, EU-ETS, energy efficiency

РАЗВИТИЕ НА ПАЗАРИТЕ НА CO_2 ЕМИСИИ В Р. СЪРБИЯ

Боян Джорджевич, Драгица Стоянович, Мира Джорджевич
[1] *John Neisbitt University Belgrade, Faculty of Management Zajecar, 19000 Zajecar, e-mail bojan.djordjevic@fmz.edu.rs*
[2] *John Neisbitt University Belgrade, Faculty of Management Zajecar, 19000 Zajecar*
[3] *John Neisbitt University Belgrade, Faculty of Management Zajecar, 19000 Zajecar*

РЕЗЮМЕ: Независимо от висшите технологии, човечеството все още силно зависи от природните системи и процеси. Промените в природата и климата, причинени от CO2 емисиите, изискват подходящи действия в международен план. Все по-широко се очертава тенденцията към разширяване на пазара на CO2 емисиите, развиван от глобалните компании. Въпреки че е сравнително нов, този пазар непрекъснато бележи ръст. В статията е разкрита спецификата на подобни пазари, по-специално на Европейските пазари. Описани са възможностите за търгуване на CO2 емисии в рамките на Р Сърбия.

Ключовеи думи: газови емисии, търговия, допустими стойности на CO2 емисии, енергийна ефективност

Introduction

Cutting CO_2 emissions requires world-wide agreements on policy instruments, which create enough incentives for the industry and for consumers to apply energy efficient technologies and to adapt their behavior. Cap-and-Trade systems seem to be acceptable instruments, which have a number of advantages: First, caps can be set according to the desired CO_2 emission reductions such that the target achievement can be controlled periodically. Secondly, it is left to the market forces to determine the intensity of mitigation efforts in the different sectors of the economy. Under ideal conditions a least-cost trajectory will be found. Thirdly, the developing and transition countries might be interested in participation, if the caps are set accordingly, e.g. in terms of CO_2 emissions per capita. Under such a regime these countries could continue to foster industrial development and nevertheless sell emission rights for a long period of time.

While the principle of emission trading looks simple, it is quite a challenge to develop a workable scheme and design it for implementation in Serbian environment. This is the starting point for our research study. We focused on Serbian market, meaning energy and electricity production and transport, because this market shows a rapid growth of CO_2 emissions. In this case, the one trading scheme is possible – The European CO_2 emissions trading scheme (EU-ETS), which can be open in our environment.

Trading models and European CO_2 emissions trading scheme (EU-ETS)

Emissions trading scheme can be generally organized in two ways (Environmental Defense Fund, 2014): 1) "*cap & trade*" system and 2) *baseline & trade* system. The difference between those two lays in setting emission restrictions and a way of distributing emission permits. In cap & trade system, competent authorities set the estimate emission restriction for all emitters within the trading system, and based on that estimate restriction, they set unique restrictions for each one of them in particular. In baseline & trade system equal restrictions are set for all companies.

Even though cap & trade emission trading system is thought to be more efficient compared to baseline & trade system, there are still some flows and limitations. To be more precise, problems are unsettled and unpredictable prices of permits (possible solution could be "transaction-in-advance" (*forward*)), high administrative and legal costs, distribution of emission permits and finally, possibility of corruption. The major disadvantage of cap & trade system is said to be the company's real emission estimation that considers introduction of taxes on gas emission (Tax system) would improve ecology results. Basic difference between cap & trade emission trading system and tax system is that when setting the emission limits *(cap)*, the quantity is also set, while permits prices and penalties are variable (Jaffe at all., 2009; Lu at all., 2012; Center for Climate and Energy Solutions, 2011). Certain conditions must be fulfilled in order to form a successful emission trading system:

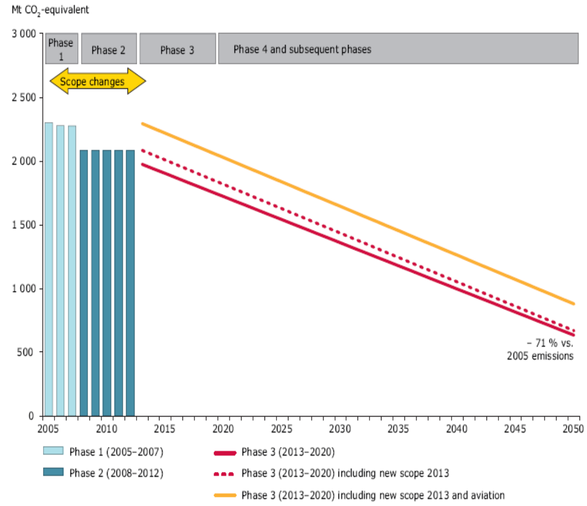
1. ***First***, it is necessary to have enough participants for both trading and permits selling (Carmona at all., 2009);
2. ***Second,*** it is vital to have low transaction costs when trading permits. Otherwise, neither sellers nor buyers will have any interest in trading (Stavins at all., 2003);
3. ***Third***, to secure normal functioning of emission trading system it is necessary to have a strong regulatory system which protects the market stability. Stable trading system largely depends on permits emission control, tracking system (monitoring), verification of reduction and tracking emission registry (Tuerk at all., 2009).

Emission trading scheme is the main pillar of EU climate policy defined in 2005 and it is based on setting restrictions on overall emissions (Braun, 2009). More precise, EU-ETS is based on *"cap and trade"* principle, where "*cap"* or limitation, presents the entire quantum of certain gasses that can be emitted by factory, power plant and other facilities within the system. The value of "cap" reduces over time, leading to emission reduction. Within "cap", companies get or buy emission units which can be traded among them, depending on companies' needs. Besides, they are in position to buy limited number of credits in the international market, which are the outcome of projects which contribute to emission reduction worldwide. Limitation of entire number of emission units available on the market ensures their value. At the end of the year, plants must ensure enough emission units to cover their overall annual green house gas emissions. Otherwise, they will be facing harsh penalties. If a company successfully reduces annual emissions, it is entitled to keep surplus of emission units, which can be used for future needs or it can sell them to other companies (Cook, 2009). Realization of EU-ETS is carried out in three phases (European Environment Agency 2008):

1. ***Phase one*** (2005 - 2007) included approximately 12.000 companies that made about 40% of EU gas emission. Data about annual emissions of some countries and polluters from energy sector, production of iron and steel, cement, glass, etc., were gathered during this period;
2. ***Phase two*** (2008 – 2012) aimed to correct the mistakes from phase one and to expand the program. Unfortunately, this was a period of world economic crisis, which led to reduction of emission permits demand. With reduced demand, surplus of unused permits appear on the market, which affects the price of emission permits. This is the period of strict penalties for those plants that were unable to cover their emissions with permits (fines were 100 €/tCO_2). Another characteristic of this period was introduction of trading system to airlines (2012). Besides 27 member countries of EU, Iceland, Liechtenstein and Norway joined the scheme;
3. ***Third phase*** (2013 - 2020) predicts longer trading period that should contribute to higher predictability of market, which is necessary for promotion of long-term investments and emission reduction.

Perspectives of further EU-ETS development until 2050 are presented in *Figure 2* (European Environment Agency, 2013).

Figure 2. Perspective EU-ETS cap up to 2050



Source: European Environment Agency, 2013

Trading with national emission limits in 1st and 2nd phase was defined by all member countries in their National plans for CO_2 emission reductions. These plans had to be reviewed and accepted by European Commission who issued instructions for creation of National plans. Basically, these Plans were checked in comparison to GDP growth and CO_2 intensity reduction, taken from PRIMES 2005 modeling for the II trading period. Individual restrictions for member countries of EU put together made the restriction for EU.

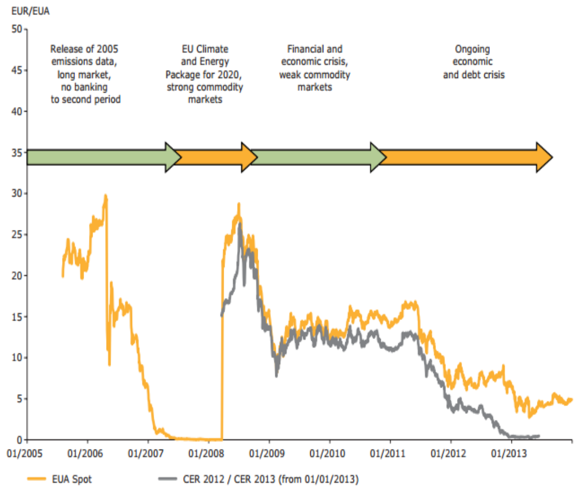
From III trading period and further on, EU-ETS limitation manages the stocks of permits within EU-ETS, according to realization of 20% emission reduction in 2020 in comparison to 1990, which makes reduction of 21% compared to 2005 in ETS sectors. Since 2013 limitations are being reduced with application of linear reduction factor of 1.74% up to average limitations from 2008-2012. In the long run, the current linear reduction factor of 1.74% annually would lead to emission reductions in EU-ETS sectors of about 71% compared to levels from 2005 to 2050. (for all member countries of EU-ETS). Enlarged linear reduction factor would produce bigger emission reductions. Application of linear reduction factor of 2.2% from 2021-2050 would lead to emission reductions in EU-ETS sectors of 84% below levels from 2005-2050. (all member countries of EU-ETS) (EEA Report, No 6/2014, Trends and projections in Europe 2014).

Since 2012, EU governments have been auctioning ETS permits to polluters mainly in the power generation sector. In July 2014, €154,934,560 was raised from the auction of 26,222,000 permits at a carbon price of below €6.A total of €3,933,436,035 has been raised between 13 November 2012 and 31 July 2014.Some countries, such as Germany, use 75% of these revenues to support domestic low-carbon investments and the remaining 25% to support international low-carbon investments. It has provided urgently needed additional financing to countries such as Bulgaria (€101,228,215), Romania (€225,598,515) and Poland (€322,031,455) that require additional finance for investments to stimulate growth. By 2020 50% of EU ETS permits will be auctioned and more in the period after 2020 (European Energy Exchange, 2014).

Price trends on CO_2 emission market

Global market of CO_2 emission is rapidly growing. According to Calel's research (2013), total market value was over 175 billion USD in 2011, which is 20 times more compared to 2005. As for all other goods, market price of emission permits depends on offer and demand, and can also be affected by project realization. Price fluctuation of EUAs and CER in period 2005 - 2013 is shown in *Figure 3*.

Figure 3. Price fluctuation for EUAs and CER 2005-2013



Source: EEA Report, No 6/2014, Trends and projections in Europe 2014

Analyzing prices in period 2005-2013, one can easily see that price range of EU-ETS was 1,17 – 30 € per permit. Price of emission permit constantly grew till April 2006. when reached its maximum of 30 €/tCO_2, only to have suddenly dropped to 10 €/tCO_2 in May, that same year. After the reports on emission limits of member countries were published (first binding period), it was quite obvious that National plans for emission permits distribution granted too many permits. Accordingly, in the next period, the price of EUA continued to drop, so in March 2007 it was 1,2 €/tCO_2, and in June only 0,13 €/tCO_2. Due to economic crisis in the following years, volume growth of emission trading was slower, which affected the market price of emission permits (CERs and VERs[1]) (Gloaguen and Alberola, 2013). While the price of emission permits dropped in 2009, it starts to grow in the following period. Specifically, January 2010 price was 12,85 €/tCO_2, and in January 2011 it was 14,97 €/tCO_2. But, after October 2011 prices of emission permits dropped again, so in January 2012 it was 8,06 €/tCO_2. With some fluctuations, for the next few years the price of emission permits keeps dropping, so in December 2014 it was 7,34 €/ tCO_2 (Koch, 2014). Having in mind previously said, it is clear that expressed volatility of CO_2 emission market prices is a result of continuous imbalance between offer and demand of emission permits. Main reasons for that are (Carbon Market Watch Policy Briefing, July 2014):

1. annual emission limits are higher than company's gas emission;
2. reduced possibility of international off-set credits use in EU-ETS due to surplus, and
3. decrease of industrial production as a result of great economic crisis.

[1] Verified Emission Reductions

Current Trends in the Energy Sectors of Region Countries and Projections

For all countries that have CO_2 intensive electricity production, a carbon price signal would make the sectors considerably uneconomic. This cost comes in addition to the cost of meeting requirements to manage local pollutants covered by the IED and LCPD in Table 1 (see Appendix).

Table 2. (see Appendix) below applies a carbon price of €5, current EU-ETS prices, and €30, which is expected to be the EU-ETS price in 2025, according to Point Carbon. We use IEA data on installed capacity in 2012 which more accurate than projected 2012 installed capacity which was used in Energy Strategy scenarios. Projections submitted to the Energy Community Strategy are presented in Table 3. (see Appendix).

There is a considerable difference between IEA data and Energy Community Strategy projections for 2012, with the former indicating that these countries would be paying a higher carbon price. For instance, the difference between emissions costs at a €30 carbon price would be of nearly €60 million for Moldova and €90 million for Bosnia and Herzegovina.

Serbia and Montenegro face the most immediate concerns as they are closest to becoming members of the EU. As EU member states, they will be required to meet all EU climate and energy legislation and join the EU-ETS. Ukraine's electricity generation is the most polluting in terms of greenhouse gas emissions. Due to its geographical proximity to the EU and industrial trade flows, it faces the highest risk of potential carbon-related border measures, should the EU decide to pursue this route.

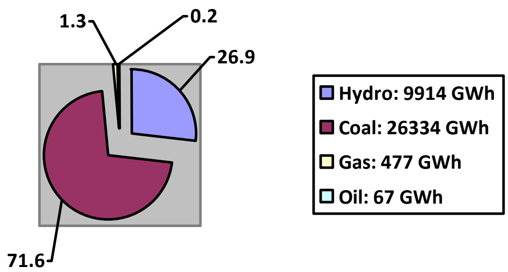
Albania experiences a cost advantage as its power generation capacity is 99% non-fossil fuel. However, it too will indirectly pay a carbon price if it continues to import CO_2-intensive electricity from neighbors and if it uses its fossil fuel capacity. There is a risk that Albania may lock-in domestic hydro capacities for export to EU countries, such as Italy and Greece, through long term power purchase agreements, leaving the domestic consumption to imports. Moldova has a lower CO_2 emission profile because it uses natural gas for about 90% of its electricity generation.

A carbon price is essential to inform investors of the likely economic performance of projects. Table 4 and 5 applies a carbon price of €5, which is similar to today's EU-ETS price, as well as a €30 price expected by 2025 on projected electricity production of the new capacity (see Appendix).

SERBIA: Energy and Electricity Market Analysis

Serbia's economy is the third most greenhouse gas intensive among the Energy Community countries. It consumes 2.7 times more energy per unit of output than an average OECD country (European Commission, 2014). It also has the highest rate of coal production compared to other Energy Community countries. Two thirds of the electricity consumed is coal-generated. The remainder comes from hydropower with 1% from gas-based CHP.

Figure 4. Serbian Electricity mix (2012)



Its 3.935 MW total capacity is organized into three regional government-owned entities - Nikola Tesla, Kostolac and Panonske. Nikola Tesla and Kostolac operate six lignite-based thermal power plants. Panonske operates three CHP with a total capacity of 353 MW (Ministry for Infrastructure and Energy, 2011). Oil production has doubled over the last 10 years, while gas production has been increasingly replaced with imports. Serbia's current dependence on natural gas, which is imported from Russia through Ukraine and Hungary, exceeds 80%, which makes it highly sensitive to price shocks and endangers its security of supply. Moreover, the oil and gas company Naftna Industrija Srbije is co-owned by Gazprom Neft (56.5%) and the Government of the Republic of Serbia.

The Serbian authorities have announced the phase-out of some of their outdated **TPPs** by 2025, and to build several new coal-fired plants (Serbian National Assembly, 2014):

- 2 x 750 MW to utilize Kolubara mine (Nikola Tesla B3 and Kolubara B - completion date unknown)
- TPP Novi Kovin: 2 x 350 MW
- TPP Stavalj: 300 MW
- TPP Kostolac B3 (350 MW - new unit in existing TPP Kostolac B).

Serbia's per capita's energy consumption is currently four times that of Germany, with electricity losses of up to one fifth of the final consumption, which leads to high energy prices and shortages (GIZ, 2014). In October 2013, Serbia adopted its Second National Energy Efficiency Plan to comply with Energy Community Treaty obligations. It sets out the target of a 9% reduction of the final domestic energy consumption by 2018 compared with a 2008 baseline. So far the government has only analyzed the savings potential in buildings and has implemented training programs for energy efficiency experts. According to GIZ (2014), private and public support measures are not well coordinated and a clear roadmap has yet to be delivered.

Advantages of CO_2 emission market growth for Serbia

Considering former analyses and projections, crucial points of emission market growth would be the following:

1. **A price signal on current greenhouse gas emissions:** Total coal and gas generated electricity emissions, in 2012, were 25,806,330 tones CO_2. At a carbon price of €5 this would cost the electricity generators €129,031,650. With a carbon price of €30 this would cost €774,189,900.
2. **Planned new fossil fuel capacity:** Serbia is planning to build an extra 2.85 GW coal-fired capacity, with construction costs estimated at €6.7 billion, to which a carbon cost of €419 million/year should be added.
3. **Implementation of the Industrial Emissions Directive:** Plant modernization and/or replacement in line with the directive's provisions would require an investment of €2.7 billion, by 2018.
4. **Renewable energy:** Serbia has a great potential to develop renewable energy and further investments should be channeled in this area, with a view to its future membership of the EU. Displacing planned new coal with renewable energy to generate a similar amount of electricity would save up to €2.5 billion (if replaced by wind).
5. **Energy efficiency:** With almost half of its energy imported and an increasing electricity demand, Serbia must swiftly address the efficiency issues related to its energy system through better coordination of policies and actions, significant financial support and coherence between public and private investments. Its current electricity losses mount to over €215 million per year.

Keeping in mind global effects of climate changes, as well as growing number of ecological catastrophes all around the world, the Kyoto protocol question becomes more and more significant. The necessity of implementing this document is quite obvious. Republic of Serbia signed Kyoto protocol on January 17th 2008. Even though Serbia's position is mainly defined by causes and consequences of transition to EU membership, certain experiences of some countries might be of importance for understanding global tendencies and defining one's position. This particularly refers to tendencies related to negotiations on future activities of international community regarding climate changes and taking over commitments which are (not) in accordance with economic and social abilities. (Todić and Grbić, 2014).

Using international emission market to enhance energy efficiency of one country can have certain consequences, such as 1. attracting new technologies, 2. encouraging economy innovations, 3. improving economy's competitiveness and 4. encouraging long-term economy growth (Avlijaš, 2007). That way, global emission market of GHG represents real opportunity for Serbia to improve its energy efficiency. In accordance with that, Kyoto protocol implementation would enable encouragement of Serbia's economy growth. That is the way to secure regulations and make conditions for establishment of market mechanisms for gas emission reduction. There is also economy support for introducing new, energy efficient technologies, as well as greater use of renewable energy resources. Of course, this issue must be carefully dealt with, based on others' experiences (for example Croatia) and theirs solutions for gas emission market development, and make the most acceptable choice for us.

There is a possibility that Serbia could turn the lack of energy efficiency into comparative advantage on gas emission global market. If activities in this area would be realized the way it is done in EU countries, it would enable Serbia, through some justified investments, new technologies and knowledge, to become more competitive in both EU and global market. In other words, sole fulfillment of basic EU demands regarding, above all, enhancement of renewable energy resources use and energy efficiency, can ensure Serbia's placement in EU market and, respectively, survival and liquidity of domestic companies. (Božanić, 2012).

Table 1. Investment costs of TPPs/CHPs for compliance with IED (in EURO)

Country	Pollutant			Total (€)
	Dust (PM) (€)	NO_x (€)	SO_2 (€)	
Serbia	64,700,000	109,500,000	536,500,000	710,700,000
Bosnia and Herzegovina	33,500,000	53,000,000	288,300,000	374,700,000
Macedonia	47,000,000	57,600,000	167,000,000	371,600,000
Montenegro	0	4,900,000	46,000,000	50,900,000

Table 2. Application of a carbon price on existing electricity generation capacity (IEA data)

Country (IEA Data)	2012 (GWh)	CO_2 emissions (t)*	€ 5	€ 30
Serbia	26,811	25,806,330	129,031,650	774,189,900
Bosnia and Herzegovina	9,841	9,523,930	47,619,650	285,717,900
Macedonia	5,130	4,850,940	24,254,700	145,528,200
Montenegro	1,367	1,325,990	6,629,950	39,779,700

*Calculations based on average lignite-powered plants emissions of 0.97 kg/KWh and gas-fired plants emissions of 0.55kg/KWh.
Source: EIA http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11

Table 3. Application of a carbon price on existing electricity generation capacity (Energy Community data)

Country (EnCom Data)	2012 (GWh)	CO_2 emissions (t)*	€ 5	€ 30
Serbia	26,992	26,092,780	130,463,900	782,783,400
Albania	254	165,100	825,500	4,953,000
Bosnia and Herzegovina	6,663	6,463,110	32,315,550	193,893,300
Macedonia	6,716	5,704,340	28,521,700	171,130,200
Montenegro	1,150	1,115,500	5,577,500	33,465,000

Table 4. Estimated carbon cost for new coal capacity (national plans)

Country	Coal capacity to be added GW*	Electricity production GW**	CO_2 emissions (t)	€ 5	€ 30
Serbia	2,85	14,408	13,975,760	69,878,800	419,272,80
Bosnia and Herzegovina	1,95	9,694	9,403,180	47,015,900	282,095,400
Macedonia	0,3	1,854	1,798,380	8,991,900	53,951,400
Montenegro	0,22	1,367	1,325,990	6,629,950	39,779,700

*According to on the ground plans - see individual states' analysis for more details and sources.
**Calculation based on 2012 installed capacity/electricity production ratio (IEA data)

Table 5. Estimated carbon cost for new coal and gas capacity (Energy Community Strategy)

Country (EnCom Data)	Capacity to be added *		Electricity production** GWh	CO_2 emissions (t)	€ 5	€ 30
	Coal (GW)	Gas (GW)				
Serbia	2,5	0,5	15,079	13,732,030	68,660,150	411,960,900
Albania	0	0,1	426	234,300	1,171,500	7,029,000
Bosnia and Herzegovina	1	0,7	6,723	4,425,810	22,129,050	132,774,300
Macedonia	0,3	0,3	3,073	2,444,050	12,220,250	73,321,500
Montenegro	0,35	0	2,012	1,951,640	9,758,200	58,549,200

* Energy Community Strategy projections, p.46.

** Calculation based on 2012 installed capacity/electricity production ration (Energy Community Strategy data)

Conclusion

The most modern instrument of environmental policy in developed market economies is pollution permits trade. Unfortunately, the world still cares much more for the money than urgent solution of problems that are affecting the Earth. In market economy, CO_2 market will inevitably become determining factor of environment preservation. Since Serbia is regarded as developing country, well planned environment policy could ensure good results for Serbia's economy, which is currently experiencing big problems due to high intensity of gas emission in various production processes. Joining CO_2 market, Serbia accomplishes comparative advantage; on one side, it will have direct benefit from gas emission limit, and on the other side it will gain extra public interest. Having everything said in mind, CO_2 global market presents rare opportunity for Serbia to get involved in sustainable development, enlarge energy efficiency I make significant steps toward further economy expansion.

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