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THE KYOTO PROTOCOL IN A GLOBAL PERSPECTIVE[+]

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ABSTRACT: *The global climate has changed notably since the beginning of the Industrial Revolution. Atmospheric concentrations of greenhouse gasses (GHG) have increased dramatically followed by an increase in global average temperature. In order to avoid negative potential outcomes of global warming, countries have adopted the United Nations Framework Convention on Climate Change that has so far been ratified by 192 countries. In 1997 the Kyoto Protocol, a binding GHG reduction plan, was adopted and entered into force in 2005. But several countries, including the USA, have had doubts about the potential negative consequences of the planned 5% global joint reduction of GHG. However, studies generally show that on a macroeconomic level: (1) welfare loss in terms of GDP and lost growth in EU is low; (2) it differs among economies; and (3) permit trading and permit price (in either global or regional markets) is highly correlated with the welfare loss. The main objective of the paper is to describe the attitudes and responses to the Kyoto Protocol from a global perspective. The paper has three objectives. First, to provide an overview of global greenhouse gas emissions and the big drivers behind these emissions. Second, to present where different countries, both developed and less developed countries, such as India, China and the countries of South-east Europe currently stand as regards their efforts to achieve the Kyoto Protocol requirements. Third, to analyse the responses and attitudes to the Kyoto Protocol from a country development perspective.*

Key words: *Kyoto protocol; Green house gasses; CO2 concentration; Clean development mechanism*

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1. INTRODUCTION

The global climate system has changed notably on both global and regional scales since the pre-industrial era. At least some of these changes are directly and indirectly attributable to human activities. Atmospheric concentrations of key anthropogenic greenhouse gases[1] have reached their highest recorded levels, primarily due to the combustion of fossil fuels, agriculture and land-use changes (Climate Change, 2008). Industrialisation and other human-related activities have increased the relative presence of the human factor dramatically. Anthropogenic GHG emissions have been growing very fast as well as atmospheric concentrations of CO2 and other GHGs[2]. Prior to the Industrial Revolution the atmospheric CO2 concentration was about 280 ppm. Now it is about 370 ppm and rising. Concentrations of other GHGs are also increasing: N2O and CH4 concentrations have increased by about 17% and 151%, respectively, since 1750 (Sterman and Sweeney, 2002).

These high concentrations of CO2 and other GHGs are mainly due to emissions in developed economies. Today's developed economies have historically contributed significantly more to the problem of global warming due to the two centuries of industrial development. United Nations environmental data show that in 2004 the USA, Australia and Canada were the biggest per-capita emitters with 24, 26 and 23 million tonnes of CO2 equivalent emissions per capita (data for 2004, United Nations Environmental indicators, 2009). The World Bank (2009) reports that in the OECD the per capita CO2 emissions in 2004 were 13 metric tonnes, in the Euro area 8, in East Asia and Pacific 3 and 1 in South Asia. But, on an aggregate level, the developing economies also contribute a significant amount of CO2 emissions. Due to their rapid economic growth, the amounts will increase faster than in developed countries.

Climate change has become a major issue of concern and anxiety around the globe during the last decade. While some countries are dedicating their efforts to protecting and preserving our environment, others fail to see the connection between the benefits and the costs of such actions and prefer to do nothing about it. The purpose of the article is to analyse the resistance to climate change, its economic perspective and the attitudes of different countries. First, we present the background to the fight against climate change and its economic consequences. Then we focus on the emission performances and projections for the developed economies and emerging economies (China, India, Latin America, Russia and countries of former Yugoslavia), with a special emphasis on Slovenia. We examine their current positions vis-à-vis the Kyoto Protocol and summarise the policy actions each region has taken to reduce its GHG emissions.

[1] These are: carbon dioxide, methane, nitrous oxide and tropospheric ozone (O3).

[2] These also include nitrous oxide (N2O), methane (CH4), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorinated carbons (PFCs), and others.

2. FIGHTING CLIMATE CHANGE: KYOTO AND BEYOND

Scientists worry that human society and natural ecosystems cannot adjust to rapid climate changes. In order to tackle the challenges in a timely manner, several international treaties and numerous other activities have taken place. Most importantly, in 1994 the United Nations Framework Convention on Climate Change (UNFCCC) entered into force and to date it has been ratified by 192 countries. In 1997 the Kyoto Protocol was adopted and entered into force in 2005[3]. As of 13 May 2008, 181 countries and one regional economic integration organisation (EEC) had deposited instruments of ratification, accession, approval or acceptance (Kyoto Protocol: Status of Ratification, 2008). The European Union went even beyond the demands of the Protocol with the first and second European Climate Change Programme (ECCP) and is taking the initiative to become the leader of global policy initiatives in the fight against climate change.

The UNFCCC considers the possibilities of how to reduce global warming and deals with potential solutions to the consequences of the already inevitable temperature change. The Convention parties acknowledge that climate change is a shared responsibility and that it can be affected by GHG emissions. Governments that have ratified the Convention gather and share information on GHG emissions, different national policies and best practices and launch national strategies for targeting GHG emissions. They also set strategies for adapting society to the expected consequences of climate change, including the provision of financial and technological support to the developing countries. They also co-operate in preparing for adaptation to the impacts of climate changes (United Nations Framework Convention on Climate Change: Essential Background, 2008).

However, the Convention only encourages countries to reduce GHG emissions. It does not bind them. As a result, in 1997 the Kyoto Protocol, as an addition to the treaty, was approved by a number of nations. The Protocol introduces more powerful and legally binding measures for the reduction of global greenhouse gas emissions (United Nations Framework Convention on Climate Change: Essential Background, 2008). The detailed rules for implementation of the Protocol were adopted at the 7th Conference of the Parties (COP7) in Marrakesh in 2001 and are called the 'Marrakesh Accords' (Kyoto Protocol, 2008). The Kyoto Protocol came into force in February 2005.

The Protocol sets binding targets for 37 industrialised countries and the European community (also known as Annex I countries[4]). The aim is to reduce GHG emis-

[3] The text of the Protocol to the UNFCCC was accepted in Kyoto, Japan, on 11 December 1997. Countries were able to sign it from 16 March 1998 to 15 March 1999 at the United Nations Headquarters, New York. During that period 84 countries signed the Protocol. Other parties may accede to it at any time. The Protocol is subjected to ratification, acceptance, approval or accession by the Parties. The Kyoto Protocol entered into force on 16 February 2005, 90 days after at least 55 Parties to the Convention, including Annex I Parties which accounted for at least 55 % of the total CO2 emissions for 1990 from that group, had sent their documents of either ratification, acceptance, approval or accession (Kyoto Protocol: Status of ratification, 2008).

[4] The list of all countries (Annex I and others) and their current status of ratification can be found at: http://unfccc.int/files/kyoto_protocol/status_of_ratification/application/pdf/kpstats_amendments.pdf.

sions[5] to an average of 5% compared to the 1990 level. The reduction must be achieved over the 2008-12 period. Given that the developed industrialised economies are also the biggest emitters and have since industrialisation been the primary cause of the accumulation of GHG emissions, the Protocol sets a heavier burden on the developed economies on the principle of 'common but differentiated responsibilities.' Also, the developed countries are expected to provide additional financial resources to advance the implementation of commitments by developing countries. Both Annex I and non-Annex I Parties must co-operate in the areas of: (a) the development, application and diffusion of climate friendly technologies; (b) research on and systematic observation of the climate system; (c) education, training and public awareness of climate changes; and (d) the improvement of methodologies and data for greenhouse gas inventories (Kyoto Protocol Reference Manual on Accounting of Emissions and Assigned Amounts, 2007).

TABLE 1: *Annex I countries' emission targets*

Country	**Target (1990* - 2008/2012)**
EU-15*, Bulgaria, Czech Republic, Estonia, Latvia, Liechtenstein, Lithuania, Monaco, Romania, Slovakia, Slovenia, Switzerland	-8%
USA**	-7%
Canada, Hungary, Japan, Poland	-6%
Croatia	-5%
New Zealand, Russian Federation, Ukraine	0
Norway	+1%
Australia**	+8%
Iceland	+10%

* The base year is different in transition countries.
** Countries which have declared their intention not to ratify the Protocol.
Source: Kyoto Protocol Reference Manual on Accounting of Emissions and Assigned Amounts, 2007

The Kyoto Protocol introduced three new mechanisms to help economies achieve their targets: (1) emissions trading; (2) clean development mechanism (CDM); and (3) joint implementation. Article 17 (Decision 18/CP.7, 2001) of the treaty presents the basic guidelines on emissions trading. Countries can sell their spare emissions units to countries that are over their limits. The European Union took the lead in the field in 2005 by opening a new market for a new commodity 'GHG emissions'. The market is known as the 'ETS – Emissions Trading Scheme'. It was opened in 2005 (Emission Trading Scheme, 2008), and is the largest emissions market in the world. In 2006, the EU ETS globally accounted for around 81% of the global carbon market in terms of value and 67% in terms of volume. In the first two years, the desire was to enable a critical mass for the market to be able to function efficiently. The first assessment shows that the market gained the desired credibility and that real trading has evolved and actually helped

[5] The targets cover emissions of the six main greenhouse gases, namely: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF6) (http://unfccc.int/kyoto_protocol/items/3145.php)

economies reach their Kyoto targets (Accompanying document to the Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC, 2008). The clean development mechanism has stimulated investment in emission reduction projects. According to the Article 12 (Action taken by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol at its first session, 2006) 'the purpose of the clean development mechanism is to assist Parties not included in Annex I to the Convention in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under the Article 3 of the Kyoto Protocol, in developing countries'. Joint implementation[6] is defined in the Article 6 of the Kyoto Protocol. It is a mechanism by which a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex B Party) can earn emission reduction units in order to meet its Kyoto target (ERUs, each equivalent to one tonne of CO2) from an emission-reduction or emission removal project in another Annex B Party. The mechanism offers countries an interesting option of fulfilling their commitment, while also stimulating FDI and technology transfer to developing economies, thereby stimulating also their development (Joint Implementation, 2008).

The Kyoto Protocol is therefore an important step towards a greener tomorrow since it is striving to become a global commitment for GHG emission reduction. Also, it importantly provides mechanisms for achieving the goals and represents an obligation on countries. In 2012 the first commitment period will end. The latest studies and environmental data (see Assessment Report 4 by the IPPCC) suggest that even more stringent goals might be needed to achieve the desired climate impact. The European Union has again taken the initiative. The 2007 Communication of the Commission (A European strategic energy technology plan 'Towards a low carbon future', 2007) warns that the related problems of climate change, energy supply and competitiveness require coordinated supranational, national and individual level action. The policies and measures that are being created are striving to achieve binding targets for 2020. The aim is to reduce greenhouse gas emissions by 20% (and even by 60-80% by 2050[7]), ensure 20% of renewable energy sources in the EU energy mix and reduce EU global primary energy use by 20%. World energy-related C02 emissions by region in the period of 1990-2030 are reported in Table 2.

[6] On joint implementation, see 'JI guidelines': http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2.

[7] According to: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1750&format=HTML&aged=0&language=EN&guiLanguage=en

TABLE 2: *World energy-related C02 emissions by region, 1990-2030 (Million metric tonnes C02)*

	History (a)			Projections (a)					Average Annual Percentage Change,
Region / Country	**1990**	**2003**	**2004**	**2010**	**2015**	**2020**	**2025**	**2030**	**2004-2030**
OECD									
OECD North America	**5,763**	**6,775**	**6,893**	**7,343**	**7,780**	**8,230**	**8,791**	**9,400**	**1.2**
United States (b)	4,989	5,800	5,923	6,214	6,589	6,944	7,425	7,950	1.1
Canada	474	589	584	648	659	694	722	750	1.0
Mexico	300	385	385	481	532	592	644	699	2.3
OECD Europe	**4,092**	**4,321**	**4,321**	**4,493**	**4,558**	**4,579**	**4,621**	**4,684**	**0.3**
OECD Asia	**1,543**	**2,129**	**2,183**	**2,269**	**2,353**	**2,423**	**2,495**	**2,569**	**0.6**
Japan	1,015	1,244	1,262	1,274	1,290	1,294	1,297	1,306	0.1
South Korea	238	475	497	523	574	614	649	691	1.3
Australia / New Zealand	291	410	424	472	490	516	549	573	1.2
Total OECD	**11,399**	**13,225**	**13,457**	**14,105**	**14,692**	**15,232**	**15,907**	**16,654**	**0.8**
Non-OECD									
Non-OECD Europe and Australia	**4,193**	**2,717**	**2,819**	**3,067**	**3,301**	**3,545**	**3,729**	**3,878**	**1.2**
Russia	2,334	1,602	1,685	1,809	1,908	2,018	2,114	2,185	1.0
Other	1,859	1,115	1,134	1,258	1,393	1,527	1,615	1,693	1.6
Non-OECD Asia	**3,627**	**6,479**	**7,411**	**9,711**	**11,404**	**13,115**	**14,759**	**16,536**	**3.1**
China	2,241	3,898	4,707	6,497	7,607	8,795	9,947	11,239	3.4
India	578	1,040	1,111	1,283	1,507	1,720	1,940	2,156	2.6
Other Non-OECD Asia	807	1,542	1,593	1,930	2,289	2,600	2,871	3,141	2.6
Middle East	**705**	**1,211**	**1,289**	**1,602**	**1,788**	**1,976**	**2,143**	**2,306**	**2.3**
Africa	**649**	**895**	**919**	**1,140**	**1,291**	**1,423**	**1,543**	**1,655**	**2.3**
Central and South America	**673**	**981**	**1,027**	**1,235**	**1,413**	**1,562**	**1,708**	**1,851**	**2.3**
Brazil	220	317	334	403	454	500	544	597	2.3
Other Central / South America	453	664	693	831	959	1,062	1,165	1,254	2.3
Total Non-OECD	9,847	12,283	13,465	16,755	19,197	21,622	23,882	26,226	2.6
Total World	**21,246**	**25,508**	**26,922**	**30,860**	**33,889**	**36,854**	**39,789**	**42,880**	**1.8**

(a) Values adjusted for nonfuel sequestration.

(b) Includes the 50 States and the District of Columbia.

Note: The US numbers include carbon dioxide emissions attributable to renewable energy resources.

Sources: History: Energy Information Administration (EIA), International Energy Annual 2004 (May-July 2006), website www.eia.doe.gov/iea/; and data presented in this report. Projections: EIA, Annual Energy Outlook 2007, DOE/EIA-0383(2007) (Washington, DC, February, 2007). Table 1, website www.eia.doe.gov/oiaf/aeo; and International Energy Outlook 2007, DOE/EIA-0484(2007) (Washington, DC, May 2007), Table A10.

Source: Energy Information Administration
Released Date: November 28, 2007

3. DEVELOPED COUNTRIES AND THE KYOTO PROTOCOL (US, EU, JAPAN AND AUSTRALIA)

There is a significant difference in the attitude various developed countries have to the Kyoto Protocol. While the United States decided to withdraw itself from the treaty, Australia ratified the Protocol in 2008. Its ratification was due to the country's change in political leadership. If the United States had ratified the Kyoto Protocol, it would have committed itself to reduce greenhouse gases by 7% below 1990 levels during the 2008-2012 period. However, in March 2001 the Bush Administration withdrew the USA from the 1997 Kyoto Protocol on climate change. As a reason, it stressed negative economic consequences and that many countries of the world were, at that time, exempt from the Protocol such as China and India (President Bush discusses global climate change, 2001).

The economic rationale that lies behind the US rejection of the Kyoto Protocol comes from estimates that the US would bear a disproportionate share of the burden of adjustment. The US government claims that the mandatory limits under Kyoto would result in a loss of USD 400 billion in industry and 4.9 million US jobs (United Nations Foundation, 2002). Other studies suggest that real GDP would fall at most by 2.9% during the 2008-2012 Kyoto compliance period, and by 3.0% to 3.5% by 2020. In addition, it is estimated that 1.7 million jobs in the 2007-2010 period would be lost in the USA if Kyoto mandates had been successfully implemented (Kyoto Protocol and Beyond: The High Economic Cost to the United States, 2002). In fact, the total costs of Kyoto mandates to the US economy have been estimated at roughly USD 5.5 trillion (Nordhaus, 2005). The largest source of greenhouse gas emissions in the USA comes from energy-related activities, which account for over three-quarters of its GHG emissions. More than half of its emissions come from large sources such as power plants and factories, while about a third comes from transportation (Foreign Electricity Emission Factors 1999-2002, 2008). The business capital stock is predicted to drop by 4.2% as the economy's potential to produce would slip by approximately 3.0%, while overall consumption would decline as consumers adjust to a rapid increase in living costs (Kyoto Protocol and Beyond: The High Economic Cost to the United States, 2002).

In 2002, the Bush Administration unveiled the 'Clear Skies and Global Climate Change Initiatives' which collectively seeks to accomplish the following goals: (1) by 2018, cut emissions of the three worst air pollutants by 70%; (2) cut GHG intensity by 18% over the next 10 years; and (3) achieve goals comparable to the Kyoto Protocol using market-based approaches (Policies in Focus: Environment, 2008). The US goal is to lower emissions from an estimated 183 metric tonnes per million dollars of GDP in 2002 to 151 metric tonnes per million dollars of GDP in 2012. The policy focuses on reducing emissions through technology improvements and dissemination, improving the efficiency of energy use, voluntary programmes with industry, and shifts to cleaner fuels (United States, 2008b). However, this policy has drawn criticism from many, including the economist Paul Krugman: 'GHG intensity is the volume of GHG emissions divided by GDP. The Bush administration says that it will reduce this ratio by 18% over the next decade,

but since most forecasts call for GDP to expand 30% or more over the same period this is actually a proposal to allow a substantial increase in emissions. In fact, the administration's target for reduction in GHG intensity might well be achieved without any policy actions – which is good news, because the Bush administration has proposed nothing much' (Krugman, 2002).

In comparison, Australia's annual targeted emissions are projected at 108% of 1990 levels during 2008-2012. However, if it fails to meet its emissions targets during the 2008-2012 period it will be penalised by a 30% decrease in its allowable emissions in the post 2012 commitment period. Nevertheless, the latest emissions projections indicate that Australia is on track to meet its Kyoto target. Australia plans to continue reducing its emission levels through its Carbon Pollution Reduction Scheme. There are two distinct elements of the Carbon Pollution Reduction Scheme: (1) a cap on carbon pollution; and (2) the ability to trade carbon permits. The cap is set in order to reduce carbon pollution and the ability to trade ensures that carbon pollution is reduced at the lowest possible cost. The Australian government has set a cap on the total amount of carbon pollution allowed in the economy by covered sectors and will issue permits up to the annual cap each year. Permits will be required by industries for every tonne of GHG they emit, and at the end of the year firms will be held liable for each tonne of carbon pollution produced. The prices of permits are set by the market. If a firm can reduce carbon pollution more cheaply than the prevailing market price of permits, it would prefer to reduce carbon pollution than buy permits. The current administration believes this system will give firms the flexibility to choose the most cost-effective way to meet the carbon pollution cap while, at the same time, provide greater financial incentives for firms to develop and adopt technologies to reduce emissions (Emissions Monitoring, 2008).

The European Union (EU) has taken quite a different approach since the ratification of the Protocol by all its member states in May 2002. The European Commission launched the European Climate Change Programme (ECCP) in June 2000. The goal of the ECCP is to identify and develop all necessary elements of an EU strategy to implement the Kyoto Protocol. The emissions inventory compiled by the European Environment Agency for 2006 shows that EU-15 emissions dropped by 0.8% from 2005, taking emissions to 2.7% below their levels in the base year (1990 in most cases). This puts the EU-15 well on track to meeting its Kyoto Protocol target (Tilford, 2008).

The European Union was also the first to implement emissions trading (European Trading Scheme, ETS). Under the scheme, large emitters of carbon dioxide must monitor and annually report their CO2 emissions. Also, they are committed every year to return an amount of emission allowances to the government that is equivalent to their CO2 emissions in that year. This currently covers more than 10,000 installations in the energy and industrial sectors which are collectively responsible for close to half of the EU's emissions of CO2 and 40% of its total greenhouse gas emissions (Europa, 2008)

Further, the European Union is working hard to promote an even more active environmental policy. In January 2007 the European Commission set out proposals and op-

tions for an ambitious global agreement in its Communication 'Limiting Global Climate Change to 2 Degrees Celsius: The Way Ahead for 2020 and Beyond'. To underpin these commitments, EU leaders set three key targets to be met by 2020: 1) a 20% reduction in energy consumption compared with projected trends; 2) an increase to 20% in renewable energies' share of total energy consumption; and 3) an increase to 10% in the share of petrol and diesel consumption from sustainably-produced bio-fuels (European Environment Agency, 2008). In January 2008, the Commission proposed a major package of climate and energy-related legislative proposals to implement these commitments and targets, which are now being discussed by the European Parliament and the Council of the EU. EU leaders have expressed their wish for an agreement to be reached on the package before the end of 2008. The good news is that the EU-15 dropped emissions by 0.8% between 2005 and 2006, despite the fact that GDP increased by 8% over the period. This means that the EU has succeeded in further separating emissions from economic growth (Ellerman and Buchner, 2007).

Japan ratified the Kyoto Protocol in June 2002 making it the 73rd signatory to the UN agreement. Japan was required to reduce emissions by 6% of its 1990 level. To achieve that target, the government is not only urging industry to cut its emissions of carbon dioxide but is also promoting grassroots measures among regional authorities and individual households. The country has also focused on increasing its nuclear energy capacity. Japan perceives nuclear energy as a crucial way to cut GHG since nuclear power plants generate no CO2. The government set a target last May to increase the share of electricity from power plants to between 30% and 40% or more until 2030. Currently this share is 30% (Globalis, 2008).

4. EMERGING ECONOMIES AND THE KYOTO PROTOCOL (CHINA, INDIA, RUSSIA AND LATIN AMERICA)

China and India ratified the Kyoto Protocol in 2002. Latin American countries (LAC) signed and ratified the Kyoto Protocol between 1998 and 2002. However, none of these countries (and all other developing countries) are under the obligation to reduce their greenhouse emissions under the common but differentiated responsibilities clause of the Kyoto Protocol.

China and India have a similar attitude to the Protocol. Both countries maintain the stand that the gas emissions level of any given country is a multiplication of its per capita emission and its population. As a result, both nations stress the fact that per capita emission rates of developing countries are a tiny fraction of those in the developed world (Suri, 2005).

In August 2007, the Chinese government drafted the *Recycling Law* which stipulates that governments at all levels should make plans on the development of a recycling economy. It also introduces reward and punishment systems for companies, encouraging them to develop recycling technology and making them responsible for the recycling of their

products (Chinese National Climate Change Programme, 2007). China has also set specific energy-saving targets, including reduction of the energy consumption per unit of GDP by 20% by 2010, and increasing the forest cover by 20%. In August 2008, two environment and energy exchanges were launched in Shanghai and Beijing, respectively, as the country increased efforts in emission cutting and energy conservation. Multinational companies can now come to China and buy carbon credit on the exchange (China National Environmental Protection Plan in the Eleventh Five-Years, 2006-2010).

India has also recognised climate change as a problem. The country has several low lying areas that become flooded on a regular basis and this problem is bound to compound in the future as a result of increased global warming. The floods in 2008 in the Indian states of Bihar and Assam displaced millions and illustrate the fact that, unless developing countries tackle the problem of climate change, citizens of these countries are bound to face the consequences of such extreme weather conditions (Flood Situation Improves in Bihar, 2008).

For a long time Russia used to maintain the same stand as the United States. However, in 2004 it did a U-turn. Russia realised that in order to continue growing its accession to the WTO was crucial. In exchange for the European Union's support for Russia's admission to the WTO, Russia approved and ratified the Kyoto Protocol in 2004. Thus the decision to finally ratify the Kyoto Protocol was more political than anything else.

However, due to the fact that Russia has vast portions of land that are uninhabited, it will have excess carbon credits which it can sell to other countries/companies in foreign countries and profit from this transaction. As a result, Russia would not have major problems meeting the commitments and constraints laid down by the Kyoto Protocol since it can sell emission credits and make profits of up to USD 4.4billion (Russia Ready to Sell Carbon Credits, 2008). The country has also established 'target environmental investments' that aim at spending income from quotas trade on various projects for reducing GHG emissions (Ministry for Economic Development, 2005).

Lastly, for Latin American countries (LACs) the most significant impact of the Kyoto Protocol is the Clean Development Mechanism (CDM). This programme will generate investment and promote the transfer of environmentally-friendly technologies to the developing countries, including the LACs. These projects include renewable energy, biofuels, forestation and waste handling. Today, 44% of all projects registered worldwide are placed in LACs. There is huge potential for Latin America and the Caribbean region to continue implementing CDM activities and take advantages of the opportunities these activities offer in terms of investment and environmental improvement. At the same time, it helps industrialised countries meet their Kyoto requirements.

The developing economies stress that the developed economies have historically been more responsible for the problem of global warming. In June 2008, the Chinese President, Mr. Hu Jingtao claimed at the G8 Plus Five meeting that developing countries like China and India cannot be expected to cut emissions before industrialised ones do (Re-

cycling law to bolt progression price system, 2008). India, China and Brazil are insisting that developed countries like the USA should reduce their greenhouse gas emissions by 30% of their 1990 levels before 2020, and by 80% before 2050. The carbon footprint of the United States is four times that of China and 15 times that of India. Therefore, the responsibility for cleaning up the polluted atmosphere rests almost totally on the USA on the principle that it is the polluter who should pay (Venkataramani, 2008).

5. KYOTO PROTOCOL IN SOUTH-EAST EUROPEAN COUNTRIES

South-east European (SEE) countries are the least industrially developed countries in Europe. They have, compared to other EU countries, by far the lowest emissions of carbon dioxide (CO2) if assessed per person. While EU countries are reducing GHG emissions by investments in modern technologies and projects of energetic efficiency (requirements set by Kyoto and European Environment programme) the SEE countries still need to do that.

When comparing countries within the SEE region, Serbia and Montenegro[8] are by far in the worst position concerning the reduction of CO2 emission intensity. However, it has to be noted that the current level of emissions in Serbia is significantly lower than it was in 1990. It is lower by over 30% (Avlijaš, 2007). Montenegro intends to reduce its GHG emissions by 20% and increase energy efficiency and reduce energy consumption as well by 20% by 2010 (ReRep regional meeting on Energy and Climate in South Eastern Europe, 2008). Croatia is doing much better in reducing its emissions and in the implementation of new policies and projects. From 1990 to 2005 GHG emissions dropped by 30.5 million tonnes CO2 equivalent, a 5.4% decrease, and on per capita level its emissions dropped by roughly 6.5% (ReRep regional meeting on Energy and Climate in South Eastern Europe, 2008). Macedonia is in a similar position, mostly due to its slower industrial development. Total CO2 equivalent emissions in Macedonia range from 11.9 to 14.4 million tonnes CO2 equivalent (Macedonia's Second National Communication under the UNFCCC, Executive Summary, 2007).

The Republic of Serbia ratified the Kyoto Protocol on 19 October 2007. It was one of the last countries in the region to do so. The delay was due to the lack of clear state priorities as well as complex procedures of passing laws. Consequently, Serbia has lost a couple of years compared to other emerging markets on emission trading and on the implementation of other measures and laws that are needed in order to cut emissions.

A preliminary analysis estimates that the carbon abatement potential in Serbia is in the range of 20 million tonnes CO2 equivalent to 25 million tonnes CO2 equivalent per year. The resulting potential investment to mitigate greenhouse gas (GHG) emissions can be expected to range between EUR 120 million and EUR 225 million per year with valuated market prices ranging between 6 and 9 euro per tone of CO2 equivalent (CDM Portfolio, 2007)

[8] Montenegro's share in the overall GHG emission of Serbia and Montenegro is only 5%.

The biggest polluter in Serbia is traffic. Namely, 50% of the air pollution in Serbia is due to traffic. Together with BIH and Macedonia, Serbia is the only country in Europe that did not abolish the need to use leaded gasoline (Korlat, 2007). One of the solutions to cutting the air pollution that is caused by traffic is to build a metro and establishing a ring around the capital of Serbia, Belgrade. However, this would take time, since local and national governments cannot afford such a demanding infrastructure investment (Ivanova, 1999).

Environmental questions in Serbia have also been aggravated by poor spatial planning which was neglected for 10 years. The country's infrastructure is at an unsatisfactory level, which causes many problems, mainly traffic and parking related. Recently, some regulations have been improved (Dulić, 2008). River pollution is another important isue. Serbia ranked highly among the 13 Danube countries in terms of phosphorous and nitrogen discharges, and reducing its nutrient containing waste discharges into the Danube is its international commitment. Serbia has already many projects underway aimed at reducing river pollution: the system of alerting for floods and chemical accidents, implementation of the GIS (geographical informational system) and the identification of all hot-spot enterprises on rivers all around the country (Closing Report for Technical Advising Activities and Co-ordination of the Preparation Phase of the Drepr Project, 2005).

The Kyoto Protocol is both an environmental protection and economic priority for the government of Serbia, which also gives great opportunities for foreign investment. To stimulate activity in the field, a number of environment-related laws and regulations have been adopted[9] in 2008, and another 186 are planned to be adopted according to the National Programme by 2012, including a law about ratifying the Arhus Convention (Environmental Performance Reviews, 2007).

The development of a national strategy for Serbia's incorporation into the Clean Development Mechanism under the Kyoto Protocol is crucial for effective implementation of the Kyoto Protocol. Serbia has great potential for the GHG Project Development. Some projects are already in progress, mainly those focusing on alternative energy sources. The total hydro potential in Serbia is 25,000 GWh a year, including 3 Mtoe/ year[10] of renewable energy potential. Biodiesel also has some prospects.[11] Serbia has already opened the first biodiesel plant[12]. With four geothermal provinces, especially Pannonia and Neogen, Serbia has very favourable geothermal characteristics, which gives an opportunity of 5,000 tone savings of crude petroleum annually (Assessment of the Projects' Potential in the Field of Renewable Energy Sources, Energy Efficiency and Forestry Management, in the Framework of Clean Development Mechanisms foreseen by the Kyoto Protocol

[9] Law on the regulation of waste, Law on the packaging and packaging waste, Law on protection against ionised radiation and nuclear safety, Law on the prohibition of development, production, storage and usage of chemical weapons and their disposal.

[10] Including the potential of small hydro plants of 0.4 Mtoe.

[11] 80% is based on biomass, both from harvesting and industry residuals and from agriculture.

[12] With enough capacity to cover 2% of annual fossil fuel consumption.

in the Republic of Serbia, 2007). The Energy Efficiency Agency has already undertaken a project of installing heating pumps for sanitary water and space heating. There are no wind turbines in Serbia yet, but strategies to develop them by 2015 are being prepared. Serbia also has six thermal power plants, but with over 90% the production mostly relies on fossil fuels (3,936 MW) and only 353 MW of production relies on natural gas and oil. The main strategy is to switch to the use of biomass and natural gas and oil. The industrial sector has great potential for increasing its energy efficiency and reducing its consumption. The biggest savings can be achieved by the optimisation of the combustion processes (potential savings of around 940 GWh), an increase in efficiency of the existing boilers, modernisation of the control and regulatory systems of industrial processes (potential savings of around 1,880 GWh), the reuse of waste heat from industrial processes and a change of existing electric engines - potential savings of around 188 GWh (CDM Portfolio, 2007). Concerning waste management, CO2 savings could be approximately 410 ktCO2/ per year.

By the end of 2008 three strategies were adopted: the National Programme of Protection of Milieu, the National Strategy of Managing Waste and the Strategy of Introducing Cleaner Production. The final goals of Serbia are to improve environmental protection and mitigate climate changes by raising public awareness and to speed up the CDM projects and building national capacities of all relevant governmental bodies and other stockholders. These strategies could also finally help improve Serbia's position in the region,

Montenegro ratified the Kyoto Protocol on 4 June 2007. The next step was the establishment of a suitable environment for future CDM projects. Important changes have taken place in Montenegro, the majority of them were implemented by meeting requirements for entering the EU. Montenegro has set several objectives that are to be achieved by 2020. It intends to reduce its GHG emissions by 20% and increase energy efficiency and reduce energy consumption as well by 20%. The share of bio-fuels is to be raised by a minimum of 10% and the share of renewable energy sources will be raised to 20%.

Data on CO2 emissions have not yet been published, although estimates for 2003 are approximately 4 tonnes per person (Drugi Izvještaj o Stanju Životne Sredine, 2007). Emission concentrations of global indicators (sulphur dioxide and all nitrogen oxides) in all cities in Montenegro are far below the levels set by the laws of Montenegro (110μg/m^3) and in some cases above the level set by EU regulations (50 μg/m^3).[13] On the whole, the quality of air in Montenegro is satisfactory according to all indicators, except the level of flecks of dust (Ministry of Tourism and Environmental Protection, 2008).

To improve environmental quality and reduce emissions, several initiatives have been taken. Montenegro has great potential to generate a large number of carbon credits over the next few years by leveraging investments in a number of sectors (energy, waste, forestry and agriculture). In order to achieve this, projects that reduce GHG emissions or enhance sequestration have to be implemented. A preliminary analysis shows that the

[13] Konik, Srpska and Pljevlja

aggregate potential in terms of CO2 is around 2.5 million tonnes of CO2 equivalent per year (Ministry of Tourism and Environmental Protection, 2008). Interestingly, Montenegro has also introduced an eco-tax for the use of road motor vehicles and their auxiliary vehicles (the charging of the eco-tax started on 15 June 2008.).

Montenegro could also benefit from the CDM projects. The current CDM opportunities are projects under development as PDDs (Project Design Documents) which are expected to be submitted to the Designated National Authority by the end of 2008. The most interesting projects are: CDM project activities at the Aluminium Plant in Podgorica and Energy Efficiency at the Steel Mill in Niksic. There are also pilot initiatives to start the CDM development process which include Landfill Gas to Energy in Podgorica, Energy Efficiency at the Livnica Foundry A.D.; SHPP Krupac; SHPP Slano; and others. Further project proposals and programmatic CDM opportunities are at the project idea stage, and feasibility evaluation is necessary in order to analyse their real CDM potential.

One of the biggest issues in the Republic of Montenegro is wastewater treatment and management. Reconstruction of water collector and wastewater treatment services for Podgorica and Niksic – the two biggest Montenegrin municipalities – has already started. In terms of waste management the first step was to determine the location for a future sanitary landfill, the next thing was to purchase equipment for collecting and removing waste, and the construction of the recycle centre is expected to take place soon and be finished by 2014.

In order to ensure environmental awareness among the general public, many activities were already undertaken such as the promotion of renewable energy sources, minimisation of environmental impact and promotion of energy-saving schemes. In the agricultural sector the government introduced the Strategy for the Development of Food Production and Rural Areas. Implementation of the food brand 'Made in Montenegro' is also a big part of this. The Ministry of Tourism has promoted environmentally-friendly tourism through the Strategic Framework for the Development of Sustainable Tourism in Northern and Central Montenegro and the Tourism Development Strategy until 2020. The non-governmental organisation sector has increased and with its various activities and campaigns has raised public involvement in environmental issues.

The Republic of Macedonia ratified the UN Framework Convention on Climate Change on 4 December 1997, and the Kyoto Protocol in July 2004 (Climate Change Macedonia, 2008). Since it does not belong to the group of highly industrialised countries, it shares only the common obligations for the response to climate changes: establishment of an inventory of greenhouse gas emissions and national reporting on actions taken in compliance with the Convention. Macedonia has one of the highest levels of energy consumption and GHG emissions per GDP among Central and Eastern European countries (National Strategy for Clean Development Mechanism for the first commitment period 2008 – 2012). The emissions per capita for 2000 are 7.16 tonne CO2 equivalent. The main contributor to the total CO2 equivalent emissions is the energy sector with about 70% of total emissions. The second biggest contribution comes from the agriculture sector with

about 10-15%, while all other sectors contribute less than 10% each (Macedonia's Second National Communication under the UNFCCC, Executive Summary, 2007). Besides the significant downfall in economic activities in the 1990s, total annual GHG emissions in Macedonia remained almost constant throughout this period (Macedonia's Second National Communication under the UNFCCC Executive Summary, 2007). In February 2007, the government adopted the National Strategy for the first Kyoto commitment period 2008-2012.

Energy generation capacities are based primarily on domestic lignite coal, imported liquid fuels and natural gas, hydro resources and wood biomass. Only 15 to 18% of the annual electricity production comes from hydro power plants. The geothermal energy contributes 2.4% in the heat production sector. Also solar energy is being used at a very low level. Therefore, a lot of opportunities exist for increasing the exploitation of the existing and new geothermal sources and for intensifying the use of solar energy.

The combined margin emission factor for the Macedonian electricity grid is 0.915 tonne CO2/MWh (Foreign Electricity Emission Factors, 1999-2002). Based on this fact one renewable energy project with expected annual electricity generation at the level of 60,000MWh per year could generate approximately 54,900 CERs (Certified Emission Reduction) annually or for the period 2008-2012 that means 274,500 CERs. Approximately USD 2.74 million (1 at 10USD/CER) can be mobilised by selling this amount of CERs. Hence, the CDM potential in Macedonia is considerable. Some of the biggest and most important CDM projects that should be realised in the future (some of them have already started) are: St. Matka (Matka 2) 36 MW hydropower project; Kozjak 80 MW hydropower project; a project for the construction of 29 new small hydroelectric plants with a total capacity of 89 MW; rehabilitation of the small hydro power plants in Macedonia; the Bitola coal-powered plant's rehabilitation; Toplifikacija 340 MW natural gas-powered cogeneration project; rehabilitation of the district heating systems in Skopje and Negotino; and the Kocani geothermal central heating system project (Stott, 2006).

In the waste sector, municipality and industrial waste is one of the biggest challenges in Macedonia. Since the economy started to recover, the volume of municipal waste has been growing and is projected to reach 828,000 tonnes per year by 2025 (National Strategy for the Clean Development Mechanism, 2007). The Macedonian priority LFG (landfill gas) project is the Drisla LFG collection and utilisation project. The Drisla landfill nearby Skopje is the only legally operating landfill in the country with high potential as a CDM project activity. In addition, according to the National Environmental Action Plan (NEAP) six new regional landfills for communal solid waste and technological waste are planned to be constructed.

Also, Macedonia has various business opportunities for more sustainable consumption policies. The current low use of synthetic fertilisers and pesticides in agriculture, along with the availability of agricultural workers, creates good opportunities for organic farming and the export of organic food products to Western Europe.

The Republic of Croatia signed the Kyoto Protocol in 1999 and agreed to reduce its greenhouse gas emissions by 5% from 2008 till 2012. To achieve the target set by the Kyoto Protocol Croatia has adopted numerous policies, projects, actions and measures[14].

Emissions started to rise in the 1996-2002 period by an average of 3.3% per year because of the revitalisation of the economy. However, as a consequence of the war and the process of transition, Croatia has a very low initial level of GHG emissions. It also generates less total and municipal waste per capita than certain European countries[15]. However this is due to small number of controlled landfills and large number of uncontrolled dumps. In European terms, Croatia has a relatively well-preserved environment. The preserved environment is the result of less 'heavy' industries in the overall industrial structure, but investments in environmental protection are also lower than in developed European countries (Strategic Development Framework for 2007-2013, 2007). Consequently, international assistance including technical and financial assistance is essential in this process.

The Energy Development Strategy of the Republic of Croatia from 2002 is currently under revision and involves the programmes SUNEN[16] (Solar Energy Utilisation Programme) and BIOEN[17] (Biomass and Waste Utilisation Programme) for environmental protection. The Master Plan of Energy Efficiency (2008) is currently being prepared with the goal of energy end-use savings of 9% by 2016 (Croatia: Short overview of the climate change and energy status, regional/cross-border projects, reporting, 2008). In industrial processes, a significant reduction could be achieved in the production of nitric acid with the installation of catalytic devices for the reduction of N2O emission. In the agricultural sector the estimates show that emission levels will increase and for now the most significant measure is the increased utilisation of bio-waste for energy purposes, and the production of bio-diesel. A significant reduction in emissions could be realised by avoiding the unnecessary production of waste and intensifying the classification and recycling the waste. Care for the environment, the protection of existing biological diversity and maintenance of natural resources must be integrated into tourism as an integral dimension of the development of infrastructure, energy, agriculture, industry, the shaping of the tourism product and the preservation and development of the Adriatic coast, the sea and the islands.

[14] The National Environmental Action Plan (NEAP) was published on 22 November 2001 with priorities connected with the environmental impact on health, ecosystems and socio-economic activities. Croatia prepared a proposal of National Climate Change Mitigation Strategy and Action Plan for implementation of the UNFCCC and the Kyoto Protocol was adopted via the Plan for Protection and Improvement of Air Quality in Croatia (2008-2011) on May 8, 2008 (Croatia: Short overview of the climate change and energy status, regional/cross-border projects, reporting, 2008). Creating the institutional framework for the usage of the Kyoto flexible mechanisms is in progress.

[15] 2,840 kg of total waste per capita in Croatia compared to 4,200 kg per capita in Slovenia or 6,000 kg per capita in Austria.

[16] The objective is to ensure all legal, incentive, promotional and other prerequisites for significant solar energy use acceptable for households and service sector (tourism), especially in the Croatian islands and coastal area.

[17] The programme plans to use waste-wood, straw and other waste, as well as conversions from biomass to liquid fuel for traffic purposes or as a base in the chemical industry. Crop and animal waste could be used as an energy source in agriculture, cattle breeding and in urban areas.

In the 2000-2004 period total energy consumption in Croatia grew at a rate of 3.1% annually and the use of energy from renewable sources (wind and biomass energy) is in the initial stage. In the 2000-2005 period the amount of land used for eco-agriculture increased 600 times, but is still negligibly small (about 0.2% of total agricultural land). Forest degradation is growing because of trans-boundary air pollution and forest certification has begun. In 2003, the Protected Ecological and Fishing Zone was designated but with no effect. The unfavourable structure of transport is growing because public passenger transport has decreased and the road transport of goods has risen considerably (11-fold in the 1997-2004 period). From 1997 to 2003 the number of passenger cars rose by 39%. In the 1998-2005 period the number of accidents with environmental consequences expanded almost threefold. The organisation of responsibilities has not ensured an integral approach to chemical management. There is no integrated system for monitoring the transport of chemical substances, but specific groups of chemicals such as hazardous chemicals are covered by monitoring. The average amount of municipal waste generated in 2004 was 295 kg per capita, which is a 20% rise compared to the 1997-2004 period. The Croatian part of the Adriatic is very high in quality. Only specific semi-closed coastal areas are moderately polluted because of the absence of an integrated coastal area management. Croatia does not have systematic soil quality monitoring and there is no recognition of the importance and equality of soil as an environmental component. Also, there is a lack of targeted research in cases of polluted working and living environments and effects on human health (State of the Environment Report of the Republic of Croatia, 2007).

During the last decade, numerous documents on environmental protection have been adopted in the Republic of Croatia. Nevertheless, the information network and human resources at the local level are still lagging behind the legislation, creating a gap between policy measures and their implementation. Also, existing knowledge and information level are not in line with the gravity of the problem. Croatia has also not established an integral computerised system for waste management to reform and close existing 'wild' landfills, and to establish centres for waste management. There is also no improvement in the level of coverage of the country with the public water supply system, the quality of wastewater treatment, the availability of the sewage network and the quality of the flood defence system.

Slovenia is known for its regional diversity and beauty but, in spite of this, it faces the excessive burdening of its environment, much like the rest of the world. It is considered one of the European countries with few non-renewable natural resources, yet with a significant per capita consumption of natural resources. In addition, Slovenia export goods, that are mostly produced by emission-intensive industries with low value added and high resource and energy consumption. Like elsewhere around the world, greenhouse gases represent a particular environmental problem in Slovenia. With the intention of limiting their growth, Slovenia is active on both the domestic and international level in performing and creating directives and legislature, promoting the sustainable use of natural resources and developing new environmental technologies. Thus, Slovenia passed the Act Ratifying the Kyoto Protocol to the United Nations Framework Conven-

tion on Climate Change and provided the legal basis and fixed goals for the limitation of GHG emissions.

The use of final energy in 2005 equalled 4,957 kilotonnes of crude oil equivalent. The average annual growth of consumption in the 1992-2005 period was 3.1%, and in 2000-2005 it was 2.2%. The largest share of pure energy consumption in 2005 fell to manufacturing and construction, followed by traffic, domestic use, and other use. The fastest growth of energy consumption was recorded in other uses and traffic (ARSO, 2008). The most pressing air pollution problems in Slovenia are connected with pollution by photooxidants (particularly ozone) and atmospheric particles. According to ARSO information, GHG emissions in 2006 increased by 0.6% compared to 2005, or by 8.8% compared to 2000 (ARSO, 2008).

Road freight transport, measured in tonne kilometres, has seen significant increases after Slovenia's admission to the EU as the number of tonne kilometres of Slovenian freight transporters in 2004 increased by 28% compared to 2003, while in 2007 the number of tonne kilometres rose by 95% in comparison to 2003. The share of bus transport is declining and slow increases in passenger rail transport have been noticed. The ownership of personal vehicles in Slovenia is growing quickly and has nearly doubled in the past 20 years, from 296 in 1991 to 501 in 2007 personal vehicles per 1,000 inhabitants (ARSO, 2008).

In 2006, manufacturing and services created 5,910,356 tonnes of waste. 59% of all waste created in manufacturing and services was recycled in Slovenia, 31% was dumped, and the remains were sold abroad (5%), or temporarily stored. In spite of the increase in recycling, the total amount of disposed waste has not decreased (ARSO, 2008).

The use of water in Slovenia in the 1999-2004 period indicates growing consumption. The largest consumer of water is energy supply (72% after 2003), followed by domestic consumption (19%), industry and mining (9%), whereas the smallest share is attributed to agriculture (ARSO, 2008).

In 1995 the urgency of alleviating global climate effects led to ratification of the Kyoto Protocol, signed in Slovenia in October 1998 and ratified in July 2002. It demands the reduction of anthropogenous GHG emissions at an average of 8% in the 2008-2012 period compared to the starting year[18] (ARSO, 2008b).

Compared to the base year of 1986, in 2006 GHG emissions were lower in most sectors; the only exceptions are waste and traffic sectors (DZRS, 2008). The highest GHG emissions are produced by the energy sector, which contributed 84.3% of all GHG emissions in Slovenia in year 2006, agriculture contributed 9.9%, industrial processes 6%, and waste 3.4% (ARSO, 2008). In the energy sector, the largest share of GHG emissions is

[18] The starting year used in asserting target GHG emissions for Slovenia for the 2008-2012 period under the Kyoto Protocol is 1986 for CO2, CH4, and N2O, and 1995 for F-gases (PFC, HFC, and SF6). The initial emissions were measured at 20,203 kt CO2 equivalents.

attributed to the combustion of fuels in the production of electrical energy and heating. CO2 emissions in the production of electrical energy and heat in 2005 were 6% higher than in 1990, and contributed around 38% to the total CO2 emissions. Traffic is the second largest source and in 2006 represented 23.3% of total GHG emissions. Traffic emissions in 2006, compared to the source year, had increased by 136% (OPTGP, 2006).

Most of the laws and regulations which are planned as instruments for implementation of the Kyoto Protocol in Slovenia stem from the legal framework of the EU. The measures include all fields: energy industry and traffic, industrial processes, agriculture and lumber industry, as well as waste management. Slovenia seeks to use these measures to apply approximately half of the necessary reductions of emissions, and the other half of the reductions are expected to be a result of increasing CO2 pollution sinks, particularly in wooded areas, which is permitted under the resolution of the Conference of the Parties to the Convention on Climate Change (OPTGP, 2006).

Slovenia has passed several documents and legislative acts which pertain to implementation of the Kyoto Protocol. The founding document is the Resolution on the National Programme of Environmental Protection, which defines the National Programme of Environmental Protection (NPVO) that aims to generally improve the environment and the quality of living and the protection of natural resources. The basic direction of the policy of environmental protection, defined by the Environment Protection Act and the first National Programme of Environmental Protection (NPVO, 1999), aims to guarantee sustainable development rather than the usual way of solving environmental issues by use of technical measures of limiting pollution. The goals and measures are defined in the framework of four fields: climate change, natural and biotical diversity, quality of life, and waste and industrial pollution (ReNPVO, 2006).

The core executive document for the field of climate change in Slovenia is the Operative Programme for GHG Emission Reduction until 2012 (OPTGP, 2006), which the Slovenian government passed in July 2003, while the last revised version was passed in December 2006. It defines the key measures and instruments for the achievement of Kyoto goals and demands in individual sectors through these measures. The Operative Programme defines the measures for the reduction of emissions, the measures for the achievement of these measures, the responsible parties, the responsibilities for the execution of these measures, the deadlines on the execution of individual measures, an estimate of costs, and the identification of financial sources (OPTGP, 2006; ReNPVO, 2006). The goals defined by the Environment Protection Act and the National Programme of Environmental Protection are also supported by several sector programmes, which likewise include measures which will assist in attaining a reduction in GHG emissions.

The overall potential of GHG emission reductions in all sectors in Slovenia is estimated at 3,495,000 tonnes of CO2 equivalent (Markovič-Hribernik, Murks, 2006). The majority of measures taken to reduce GHG emissions are currently taken in the field of energy. Considering the target projections (OPTGP, 2006) which Slovenia was intending to reach in the coming years with the intention of realising the requirements of the

Kyoto Protocol, the emissions in public power plants and heating plants in the target period (2008-2012) were to be lowered by 5% compared to 2004, particularly due to technological modernisation, a partial transfer to the use of natural gas, and part of the reduction was to be achieved by emission trading. The total estimated potential of GHG emission reductions in the energy sector is estimated at 1,469,000 tonnes of CO2 equivalent (Markovič-Hribernik, Murks, 2006). Due to new cogeneration units which supply both electricity and heating, and due to an increase in the production of electrical power, an 8% increase of emissions in remote heating is expected despite the measures taken (OPTGP, 2006). By increasing the production of electricity from renewable energy sources (RES), in addition to the indirect reduction of GHG emissions, a commitment of providing 33.6% of electrical energy production from RES by 2010 is also being followed.

The increase of transport in recent years has made politicians and the public focus increasingly on the field of traffic (Amendment to the Reply of the Government of the Republic of Slovenia to a Parliamentary Inquiry, 2008). Emissions in this sector stem primarily from road traffic, while rail and internal air traffic have a barely noticeable contribution. Road traffic has caused total emissions of GHG in the last two years to rise by more than 1% annually, which invalidates the measures taken to reduce emissions in all other sectors (Amendment to the Reply of the Government of the Republic of Slovenia to a Parliamentary Inquiry, 2008) Under the target projections for expected emissions in the target period, in spite of the measures taken (public transportation, transit, biofuels etc.), emissions will grow by 5% compared to emissions in 2004 (OPTGP, 2006). The overall potential of GHG emission reductions in the traffic sector is estimated at 475,000 tonnes of CO2 equivalent (Markovič-Hribernik, Murks, 2006). The most important measures for reducing emissions of GHG in traffic are predicted by the strategy of the EU for the reduction of emissions of personal motor vehicles and include the stimulation of public transport, the stimulation of transiting from roads to railroads, and stimulation of the use of biofuels (OPTGP, 2006).

6. CONCLUSION

The potential impacts of global climate change are wide and hard to predict, while it is also hard to assess their potential economic consequences. Despite numerous disagreements among scientists the general notion is nonetheless that the fight against climate change is necessary to minimise the future damage and to enable sustainable development. The data show that the linear warming trend over the 50 years from 1956 to 2005 (0.13 °C per decade) is nearly twice that for the 100 years from 1906 to 2005. Also, the average temperature is expected to rise by an additional 1.4 to 5.8 °C by 2100.

The growth of industrial activity in the past 150 years has been singled out as the most important culprit for the increasing concentrations of greenhouse gases. Prior to the Industrial Revolution the atmospheric CO2 concentration was about 280 ppm; today, it is about 370 ppm and rising. The concentrations of other GHGs have been increasing

very fast, too. Increased amounts of GHGs are responsible for the additional presence of radiation and consequently the warming of the atmosphere.

The fight against climate change must be an international project, including both developed economies, which are responsible for the majority of past GHGs emissions, and developing economies, which are becoming ever more important emitters. The Kyoto Protocol, an international agreement on the reduction of greenhouse gases emission, is the biggest step towards ensuring a greener future. As of 13 May 2008, 181 countries and one regional economic integration organisation had deposited instruments of ratification, accession, approval or acceptance of the Kyoto Protocol, which commits economies to a joint reduction of GHGs by 5% till 2012.

One of the greatest fears of implementing the Kyoto Protocol was the fear of its economic consequences. Despite the clear notion that not ratifying the Protocol might not have significant short-term damages (although the majority of economies would suffer in the long term if global warming were to persist at current rates), some economies have been reluctant to ratify it. But the research shows that the welfare loss in terms of GDP and lost growth in the EU is low and differs among economies. Also, the broader the Kyoto coalition is, the lower the individual country impact will be. One of the biggest mechanisms for reducing the cost is the mechanism for permit trading: the broader the market, the lower the price will be. Activities to protect the environment are also expected to create new business opportunities as environmentally linked new markets, niches and products emerge, opening new job opportunities and create competitive advantages and growth opportunities for economies.

Efforts to stop the increase in GHG emissions should be a global priority. According to estimates from the Stern Review, if we do not act now the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. In contrast, the costs of action (reducing GHG emissions to avoid climate change impacts) could be as much as 1% of global GDG each year. Even though the assumptions of the Stern Review are questionable, the Review is definitely an eye opener as it illustrates the fact that climate change is a serious threat to global development and sustainability. Although the evidence presented throughout the paper shows there is a legacy behind these emissions, this should not be used as an argument by developing countries to not take part in these actions and try to reach a global solution. Actions on climate change do not need to stop the growth aspirations of the developing countries. There is a variety of options to cut emissions, but strong policy action around the globe is necessary to induce the use of alternative solutions.

Despite the great variety seen among the countries covered in this paper, many problems that they face are similar. Often, those problems could have similar solutions, applicable and transferable to many other countries. In the EU-27 area, GHG emissions were reduced by 7.9% between 1990 and 2005, and the values from 2005 are said to be retainable in 2010 if all the measures passed in the EU region are successfully implemented. With the adopting of additional measures, the EU is attempting to reduce GHG emissions by

11% by 2010 compared to 1990. The primary goal has been to also reduce emissions by 20% by 2020 compared to 1990, but considering the current trends and without the implementation of drastic measures, implementation of Kyoto mechanisms and introduction of pollution sinks, this goal does not appear attainable (EEA, 2007).

One of the main conclusions of this analysis is that SEE countries can turn their absence of energy efficiency into a comparative advantage in the global market of gas emission. Certainly, every market has its own risks although risks in the gas emission market do not exist for developing countries, except for those that invest by themselves in projects and even then the risk is limited to the loss of additional profit from emission credits and not to the loss of invested capital because an improvement in energy efficiency is an investment in itself and not an expense. In the case of a bilateral or multilateral investment, the investor bears all the risk.

In addition, some challenges remain, e.g. the lack of reliable data on pollution and industrial emissions, the need for better co-ordination among the variety of institutions responsible for environmental protection, environmental awareness is still a distant goal, various relevant strategies and programmes have been established but their implementation has still to follow. A key opportunity for addressing these challenges lies in regional co-operation. The fight against global warming must be based on a shared vision of long-term goals and on an agreement on frameworks that will accelerate action over the next decade, and it must build on mutually reinforcing approaches on regional, national and international levels (Stern, 2006). However, in practice this is often a problem. Due to the unequal distribution of costs and benefits between individual countries different opinions exist among them as well as between prospective actors within each country, including scientists, environmental non-government organisations, businesses, international organisations and economists. Therefore, an important role here is played by the opinions of non-governmental organisations (like Umanotera in Slovenia) and independent experts who, in addition to their significant professional input into raising awareness and solving problems, also contribute a much more radical approach and a certain level of objectivity since they are not influenced by certain political and other interest groups.

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