PRESENT ENVIRONMENT AND SUSTAINABLE DEVELOPMENT, VOL. 6, no. 1, 2012

A LOCAL APPROACH OF SOME PHENOMENA WITH CLIMATIC EFFECTS AT THE GLOBAL LEVEL. CASE STUDY: PIATRA NEAMT TOWN

Dumitru Letos[1], Cristina Letos[2]

Keywords: Indicator, greenhouse gases, radiative forcing, climate change, energy consumption, sustainable development.

Abstract. Even though on the global level and especially on European plan, climate change problem is tackled with great attention by: United Nations, European Council, European Commission and European Parliament into many official documents concerning with sustainable development, as well as some research institutions and working groups such as EUROSTAT, IPCC, OECD, etc., do it in many reports, analyses and assessments on this theme, local application comes hardly on an efficient level because of a delay and an disparate approach. Global impacts upon climate change have the origin at the local level and therefore any global effect can be mitigated starting from local level through operating upon the original causes. Among local processes generated by human activities with great impacts upon climate change are: greenhouse gases emissions (GHGs) and energy consumption. Monitoring these processes at the local level by using some adequate indicators such as: *Local Contribution to Global Warming Potential* and *Total Local Rude Energetic Consumption* can be carried out important steps for an efficient urban audit concerning the sustainable development at the local level and implicitly on the global plan.

1. Greenhouse gases emissions (GHGS) and radiative forcing

Human activities result in emissions of the following long-lived GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous protoxide or nitrous oxide (N_2O), together with other substances as halocarbon gases: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF_6), which destroy the natural stratospheric ozone, increase the quantity of artificial ozone (O_3) and increase the radiative forcing. The largest part of these gases result from burning conventional fuel as fossil fuel in different human activities: industry, transport, agriculture etc.

[1] Phd student Universitatea „Al. I. Cuza” Iasi, Facultatea de Geografie si Geologie, Romania, dumitruletos@yahoo.com
[2] Phd student Universitatea „Al. I. Cuza” Iasi, Facultatea de Geografie si Geologie, Romania, dumitruletos@yahoo.com

The accumulation of greenhouse gases in the atmosphere leads to a warming process of the atmosphere brought about by „*catching the infrared radiation reflected by Earth surface*" (IPCC, 2007). Greenhouse effect upon the Earth's atmosphere is a natural phenomenon and a necessary precondition for maintaining life on Terra, but without exceeding a certain point, otherwise it can have negative effects. It is known that without atmosphere, the Earth's average temperature would be lower with about 33^{o}C, but keeping the emissions of greenhouse gases on a high level that natural phenomenon is artificially amplified and conducts irreversibly to fast climate change with dangerous repercussions, sometimes unexpectedly, on the environment generally and the human society especially.

Atmosphere pollution with greenhouse gases is a global phenomenon but its causes are at the local level, where the effects come back, therefore the local level is considered as the basic level in tackling the climate change and where there is necessary a permanent monitoring and finding practical solutions to mitigate dangerous effects on short term and even to improve the quality of environment on long term, limiting gradually the causes which generate global effects.

According to the Yearly Report of Neamt Environment Protection Agency, (Report 2009), and to the series of data during 2008, the analysis of greenhouse gases emissions in Piatra Neamt area is based on the inventory of emissions recorded at NT1, an urban background station which is located near Piatra Neamt Meteo Station and has automatic analyzers which monitor online the air quality, counting hourly and daily averages. These series of data are delivered to the server of Neamt Environment Protection Agency and then to the public panel in the centre of the town and to Air Quality Evaluation Centre belongs to National Environment Protection Agency at Bucharest (Report 2009).

The inventory of long-lived GHGs emissions at the local level of Piatra Neamt points out negligible quantities of halocarbon gases (HFCs, PFCs and SF_6), but relative considerable quantities of: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Because nowadays in Piatra Neamt area there are few industrial factories with GHGs emission potential in technological process due to the phenomenon of deindustrialization during the last decade and because the local production of electric power is based only on hydroenergy, the main fields which generate GHGs are: the production and consumption of thermal energy in industry, the production and consumption of thermal energy for population houses, and the urban transportation. For technical reasons, we changed the emissions of methane and nitrous oxide in carbon dioxide-equivalent (CO_2 -eq) according to specific global warming coefficients for every gas established by the working group of Intergovernmental Panel of Climate Change (*IPCC's Third Assessment Report, 2001*), as in the formulae:

(1) $1\times CO_2 = 21\times CH_4 = 310\times N_2O$

(2) 1t CO_2 = 21t CH_4 = 310t N_2O

During 2008, when economic activities weren't confronting the rebound generated by economic crisis, the whole quantity of CO_2 –eq emissions resulted in the economic sphere, meaning both fields: technological process and production and consumption of thermal energy, was summed about at 103.897,6 t/year (42%), adding the quantity of CO_2 –eq emissions resulted from production and consumption of thermal energy in population houses based on mini-centrals and estimated at 67.880,4 t/year (28%) (both district centrals and private centrals), adding also the quantity of CO_2 –eq emissions resulted in urban transport activities counted at about 75.000,2 t/year (30%) (indicators 1,2,3 Annex and Figure 1).

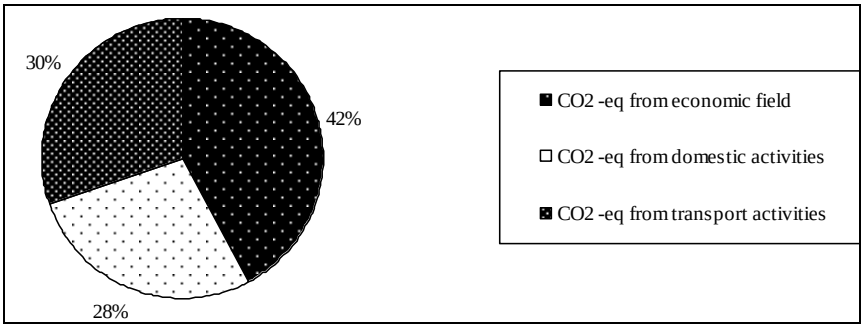

Fig. 1 – The percentage of CO_2 –eq emissions in the main activity fields

It is easy to notice that the largest quantity of CO_2 –eq is produced by economic activities, while the smallest one by the thermal system for population houses. Among all industrial unities, the highest quantity of CO_2 –eq is produced by PETROCART A.S. (factory of cellulose and paper) which generates yearly about 5.000 tons of CO_2 –eq. In fact it is the only industrial unity in Piatra Neamt that has an agreement for CO_2 emissions, according to Kyoto Protocol, the main emission sources being the thermal central of the factory and drying processes. The whole quantity of CO_2 –eq emitted during 2008 in Piatra Neamt was estimated at 246.778,2 tons (indicator A Annex) which meant 2.3 t/per capita/year (indicator 4 Annex), being situated under the national average in 2007 about 4,4 t/per capita/year (*IEA Statistics, 2010*).

A small part of the CO_2 quantity is taken off through absorption process in local vegetation, in this case local forests because the other types of vegetation and agricultural lands are negligible as area and absorption capacity. So, according to

the absorption average capacity of CO_2 by forests in the boreal hemisphere (aged 50-70 years) estimated about 0.95 t/ha/year (Global Change Biology, 1998), there is a result of 3.351,6 t/year of CO_2 (for those 3528 ha) (indicator 5 Annex) which is taken off from the initial quantity, thus the final balance for 2008 was 243.426,6 t/an CO_2 –eq (indicator A Annex).

In order to determine the concrete effects of CO_2 –eq emissions, we resort to a particular type of Global Warming Potential (GWP), an indicator introduced by SETAC which points out the measure that GHGs contributes to global warming process. IPCC uses a series of mathematical formulae to determine GWP starting from another index, Radiative Forcing Capacity (RF), which is the quantity of energy absorbed by GHGs on area unit and time unit otherwise that would be lost in atmosphere (IPCC, 2007), intending to estimate the future impact potential of GHGs upon terrestrial climate system. According to comparative analyses, IPCC proposes in Climate Change 2007, Synthesis Report, an estimated number for combined radiative forcing generated by increasing of concentration of CO_2, NH_4 and N_2O as to be +2.3 [+2.1 to +2.5] W/m^2 for 2005, larger than the radiative forcing generated only by the variation of solar radiation estimated on the average of +0.12 [+ 0.06 la + 0.30] W/m^2. In this vision, total radiative forcing depends on many factors: some natural factors as solar radiation, cloud albedo, surface albedo, and so on, but mostly anthropogenic factors, mainly the increase of CO_2 –eq concentration in atmosphere, estimated by IPCC at 279 ppm in 2005, with an yearly increase rate of 1.4 ppm/year during 1995-2005.

Even though these information give an evidence about the increasing concentration of CO_2 –eq at the global level, because the emissions of GHGs happen at the local level, we think that local area has to be introduced into this equation, and because GWP is an indicator having only a global aggregation level, it is necessary to evidence the contribution of local area to GWP, at least as a percentage of local emissions into the national and global quantities of GHGs (IEA, 2010). We propose a complex indicator in order to evaluate a segment of urban sustainable development into an urban audit as *Local Contribution to Global Warming Potential*, which can gather many specialized indicators referring to local GHGs emissions (Annex).

According to the calculations from Table 1, quantitative values of CO_2 -eq emissions in Piatra Neamt during 2008 mean 0.000258 % of the total emissions at national level and 0.000000083 % of the total emissions at global level for that year (indicator I Annex). If Romania is situated on 40^{th} place on the Globe as quantity of GHGs emissions, for the local area it is not possible to establish a certain place, but there is a very little contribution to Global Warming Potential with 0.000000083 %. This process can be appreciated from two perspectives which evidence two types of impacts: from its very little contribution to GWP that

generates a *satisfactory impact* upon the global environment, but until those GHSs are absorbed into the high atmosphere (accumulating in stratosphere), they are pollution sources in the local level generating air pollution, accumulation of positive entropy and thereby generating a *moderate negative impact* upon the local environment (indicator A Annex).

Tab. 1 – The ratio among global, national and local levels for some statistical indicators during the 2007-2008 interval

Levels	Area		Population		GHGs emissions	
	Absolute values (km^2)	Percentage (%)	Number inhabitants	Percentage (%)	Quantity (Th. tons)	Percentage (%)
Globe	148.939.100	100	6.670.000.000	100	29.321.302.000	100
Romania	238.391	0,16	21.500.000	0,32	94.138.000	0,321
Piatra Neamt	77,47	0,000052	107.000	0,0016	243,4	0,000000083

Sources: National Statistics Institute; Neamt Environmental Protection Agency

2. Energy consumption

Energy consumption includes all types of energy that are consumed as: electric power, thermal energy and all kinds of energy resulted from burning gas and liquid fuel for economic, family, public and for other sectors. If inside a society of consumption, energy consumption expresses the economic level and standard of living, in our vision based on sustainable development principles, energy consumption has a double role: a dynamic one for sustaining the economy and society development and a role of impact upon the environment as increasing the radiant energy that is emitted towards atmosphere, contributing to increasing the positive balance recorded at the limit between troposphere and stratosphere on the background of amplifying the radiative forcing. In IPCC's vision, terrestrial surface and atmosphere function together like a system where there are inputs and outputs of radiant energy and the balance of energy happens in tropopause where are caused variations of radiant energy called also radiative forcing. The experts of IPCC considered 1750 as a mark year in the evolution of radiative balance, and agreed for the acceptance of the term *positive radiative forcing* for the phenomenon when the inputs are large than the outputs of radiant energy as the term of *negative radiative forcing* for the phenomenon when the inputs are smaller than the ouputs of radiant energy. Besides solar radiation, cloud albedo, surface albedo and presence of GHGs, the radiative balance is influenced also by the supplementary radiant energy emitted from terrestrial surface to the atmosphere as a result of anthropogenic production and consumption of energy. While the concentration of GHGs in atmosphere is low, the most part of radiant energy would leave the

system and therefore the radiative balance can be negative or close to zero. But the progressive accumulation of GHGs leads to the growth of radiant energy absorption in tropopause and consequently to a positive evolution of radiative forcing which amplifies the greenhouse effect. As the accumulation of GHGs grows progressively keeping more energy in the atmosphere, the anthropogenic production and consumption of energy brings a supplementary contribution of radiant energy into the system, supplying the positive radiative forcing. In these conditions, energy consumption at the local level has a basic role in the global system as radiant energy generator; even more the ways of energy production together with technological level and consumption efficiency can amplify or diminish the global warming process.

3. Local consumption of electric power

Electric power consumption of Piatra Neamt was 448.742.701 KWh/year in 2008, that meant 25% of Neamt county consumption and 0.82% of Romania consumption for that year, while the population of the town held 19% of the county and 0.49% of country population, being a relative high consumption in comparison with its population percentage (indicator B Annex, according to the data supplied by different official documents, 2009).

Electric power consumption shared on activities fields in Piatra Neamt during 2008 points out the following values: 6.467.941 KWh/year for public consumption (1%), 82.613.760 kWh/year for domestic consumption (18%) and 359.661.000 KWh/year for economic consumption (81%) (indicators 6,7,8 Annex and Figure 2). The yearly average consumption of total electric power per capita in Piatra Neamt was 4.189 KWh/pc/year during 2008, being higher than Romania's average estimated at 2.524 KWh/pc/year. The only explication for that difference depends on a high level of economic consumption with a highly consuming power industry (indicator 12 Annex).

A detailed quantitative analyses points out that the average consumption per house in Piatra Neamt was about 160 KWh/month during 2008, placing the town close to Romania's average of 165 KWh/month, and furthermore, associating this with the domestic average consumption of electric power per capita estimated at 771 KWh/pc/year, proves again a standard of living for the inhabitants close to Romania's average (indicators 8, 9 Annex). The average public consumption of electric power per capita was at 60.37 KWh/pc/year during 2008, proving economical power consumption placed near to the lowest limit for a normal operation (indicator 10 Annex).

A short conclusion points out that while public and domestic consumption are placed close to national average, sometimes with economical tendencies; economic consumption has a very high level due to some characteristics of local industry

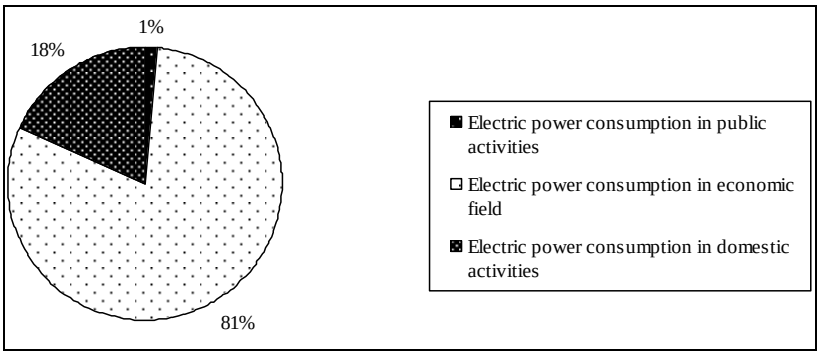

Fig.2 – Percentage of electric power consumption on main fields of activities

such as high consumptions and low technology. The modest characteristic of total local electric power consumption in association with the ecological way of production (100% hydroenergy) generates a moderate positive impact of that activity field upon the local sustainable development (indicator B Annex).

4. Local fuel consumption

Fuel consumption includes fuel for means of transportation and gas for producing thermal energy and domestic consumption. The consumption of fuel for transportation in local area may be analyzed by using some indicators linked to some different types of fuel (traditional and ecological) and the effects upon the environment. The total rude fuel consumption in transport activities of Piatra Neamt during 2008 was estimated at 32,608,782.6 l/year (result of personal investigation which corroborated the analyze of solid fuel with the urban stock of means of transport and CO_2 –eq emissions from transport activities) that meant an average fuel consumption in transport activities per capita of 304.4 l/pc/year (indicators 13, 14 Annex). The percentage of ecological fuel in local urban transport was estimated at 3% as an average for all fuel stations in the local area, pointing out an incipient stage in using that kind of fuel (indicator 15 Annex).

The local rude gas consumption in 2008 was 81,799,409 m^3/year, shared on the following fields: 60.5% of gas consumed in economic and public activities and 39.5% of gas consumed in domestic activities (indicators 16, 17, 18). Summing all conventional fuel consumed reported as tons of conventional fuel (t.c.f.), we can notice that fossil gaseous fuel has 67%, followed by fossil liquid fuel with 32% while the ecological liquid fuel has only 1% as reporting to the whole quantity (Figure 3).

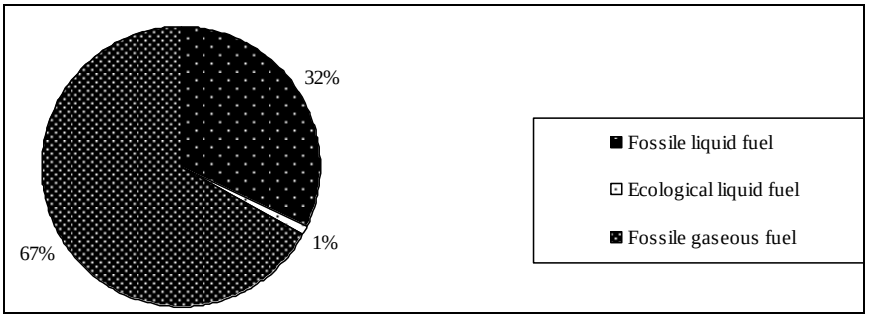

Fig. 3 – Percentage of different kinds of fuel consumption

As the majority of economic and domestic activities are based on an unsustainable power support concerning that about 97% of local fuel consumption in transport activities are fossil fuel and over 95% of thermal energy is produced by burning gas, we can conclude that local fuel consumption generates a *moderate negative impact* upon the local environment and upon the local sustainable development (indicator C Annex).

5. Local consuption of thermal energy

The entire local economic field, all public institutions and about 96% of houses in Piatra Neamt were provide with thermal energy during 2008 by burning gas and only 4% by other sources: stoves and minicentrals on wood. Total local consumption of thermal energy was estimated at 470,634 Gcal/year, which meant a per capita consume of 4.4 Gcal/pc/year. That consumption was shared on different fields of activities as: economic field and public institutions held 43% of thermal energy consumption, while houses held 57%, which totalized 15% as thermal consumption connected to public system and 42% as thermal consumption based on private centrals (Figure 4).

The thermal public system bore back during the last 10 years due to an explosion of flat-centrals phenomenon, so that for present period in Piatra Neamt, over 70% of houses have their own thermal system and only about 26% of houses are connected to the thermal public system. Even though local administration succeeded to invest during 2006-2008 over 1000 milliard RON to rehabilitate the old thermal public system with 194 new thermal centrals with a power of 200 – 800 KW each one, every central connecting only 2-3 blocks of flats in order to increase the efficiency, more and more householders have been preferring to assemble their own thermal system for a supplementary autonomy. We appreciate that the decreasing of local thermal consumption in association with the growth of consumption efficiency by choosing centrals of small capacity would generate a

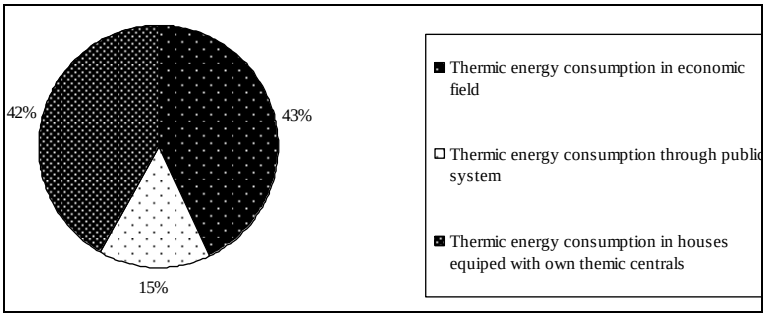

Fig.4 – Percentage of thermal energy consumption on main fields of activities

moderate positive impact upon the local environment and implicitly upon local sustainable development with better effects over global climate system (indicator D Annex).

6. Total local energetical consumption

Applying the equivalence formula concerning local energy consumption in order to change all kinds of consumptions into tons conventional fuel (t.c.f.), (according to ISMU), we obtain the following:

$$(3)\ 1\ \text{Gcal} = 4.18\times10^{9}\ \text{J}$$

$$(4)\ 1\ \text{m}^3\ CH_4 = 35.5\times10^{6}\ \text{J/m}^3$$

$$(5)\ 1\ \text{l}_{\text{liquid fuel}} = 43.1335\ \text{MJ/l}$$

$$(6)\ 1\ \text{Gcal} = 10^{9}\ \text{cal} = 10^{6}\ \text{kcal} = 1.163 \times 10^{3}\ \text{kWh} = 1.163\ \text{MWh}$$

$$(7)\ 1\ \text{t.c.f} = 7 \times 10^{6}\ \text{Kcal} = 8.1414 \times 10^{3}\ \text{kWh} = 8.1414\ \text{MWh} = 7.0\text{Gcal}.$$

Totalizing them at the local level for 2008, we can obtain about 269,553.57 t.c.f., and can appreciate into a sustainable perspective (quantity of fuel, quantity of GHGs, ecological energy, local contribution to GWP) that generating a *satisfactory impact* upon sustainable development of the local area.

Inside the local energy consumption, we can distinguish between unsustainable energy generated from conventional fuel by burning (liquid fuel and gas) which hold about 55% (18% and 37%) and so-called sustainable energy (electric power and thermal energy) which hold about 45% (20% and 25%), that

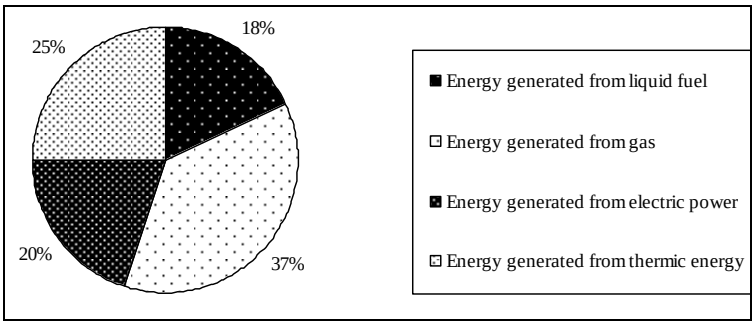

Fig.5 – Percentage of local energy types according to energetic sources

does not affect the local environment with chemical emissions but the global climate system with radiant energy, both of those categories of consumption having a small contribution to greenhouse effect and global warming process (Figure 5).

7. Determination of climatical and energetical impact indicator upon the environment

All the conclusions detached during the theoretical analyze we tried to concentrate into one analysis model like that proposed by EUROSTAT (Almunia, 2005), based on three levels of indicators: analytical, operational and principal (Annex). Besides we added also a synthetic one, in order to express in a qualitative manner the degree of local sustainable development inside the researched theme. This approach means a unification in stages of quantitative and qualitative indicators, from level 3 to level 1, finally all these levels have to be focused in the synthetic one (Annex, Table 2). Every indicator in upper levels has to receive a special code using the main initials of their names in order to be introduced easy into a diagram (Table 2).

Tab. 2 – Unifying local indicators concerning to climatic and energetic impact upon the environment

Synthetic Indicator	Level 1 Indicator	Level 2 Indicator
Climatic and Energetic Impact Indicator upon the Natural Environment (CEIINE)	Local Contribution to Global Warming Potential (LC-GWP)	Total GHGs Emissions (TGHGE)
	Total Local Rude Energy Consumption (TLREC)	Local Consumption of Electric Power (LCEP)
		Local Consumption of Liquid Fuel (LCLF)
		Local Consumption of Gas Fuel (LCGF)
		Local Consumption of Thermal Energy (LCTE)

Source: Annex

The graphic unification of operational and principal indicators concerning climatic and energetic impact upon the natural environment in order to obtain the synthetic indicator is made in Figure 6, using five categories of impact: major positive, moderate positive, satisfactory, moderate negative and major negative impact.

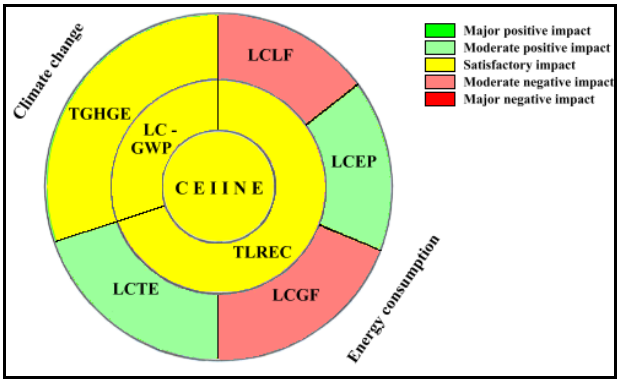

Fig.6 – Generative diagram of Climatic and Energetic Impact Indicator upon the Natural Environment (Sources: Annex, Table 2)

Total GHGs Emissions Indicator (TGHGE) at the local level is estimated to have a satisfactory impact upon the environment of global level, that transferring the same level of impact to the upper indicator, Local Contribution to Global Warming Potential (LC-GWP).

Because Local Consumption of Electric Power (LCEP) and Local Consumption of Thermal Energy (LCTE) are integrated into the category of moderate positive impact and Local Consumption of Liquid Fuel (LCLF) respective Local Consumption of Gas Fuel (LCGF) are integrated into the category of moderate negative impact, their unification generates an upper indicator, Total Local Rude Energy Consumption (TLREC) integrated into the category of satisfactory impact as an average among them all (Table 2, Figure 6). Unifying the two indicators of level 1 which have the same category of impact generates the synthetic indicator, Climatic and Energetic Impact Indicator upon the Natural Environment (CEIINE) that points out a *satisfactory impact* upon the sustainability level of the natural environment and implicitly upon the sustainable development of Piatra Neamt (Table 2, Figure 6).

Conclusions

The transposal of general principles and rules concerning to sustainable development from the global or continental plan to local level is a responsibility

ANNEX

CLIMATE CHANGE AND ENERGY CONSUMPTION

Level 1	Sub-theme	Level 2	Level 3	Values	Sources	Data Series
I. Local Contribution to Global Warming Potential	Climate change	A. Total GHGs Emissions (t/year): Theoretical 246,778.2 Effective 243,425.2 (2008)	1. Quantitative emissions of CO_2 -eq generated during production and consumption of thermal energy in economic field (t/year)	103,897.6	EPANT	2008
			2. Quantitative emissions of CO_2 -eq generated during production and consumption of thermal energy for population's houses based on gas thermal centrals (t/year)	67,880.4	EPANT	2008
			3. Quantitative emissions of CO_2 -eq generated by urban transport (t/year)	75,000.2	EPANT	2008
			4. Emissions of CO_2 -eq per capita (t/pc/year)	2.3	EPANT	2008
			5. Removable rate of CO_2 in absorption	3351.6	Analysis	2008
II. Total Local Rude Energy Consumption (electric power, thermal energy and fuel) 269,553.57 t.c.f.	Energy consumption	B. Local Consumption of Electric Power 448,742,701 kwh/year = 55,118.6 t.c.f.	6. Public consumption of electric power (kWh/year)	6,467,941	TH	2008
			7. Electric power consumption in economic field (kWh/year)	359,661,000	TH	2008
			8. Domestic consumption of electric power (kWh/year)	82,613,760	TH	2008
			9. Average consumption of electric power per house (kWh/month)	160	TH; EPANT	2008
			10. Average public consumption of electric power per capita (kWh/pc/year)	60.37	TH	2008
			11. Average domestic consumption of electric power per capita (kWh/pc/year)	771	TH	2008
			12. Average consumption of total electric power per capita (kWh/pc/year	4189	TH	2008
		C. Local Consumption of Fuel: 147,201.57 t.c.f. shared: liquid fuel 48,070 t.c.f.; gas fuel 99,131.57 t.c.f.	13. Rude consumption of liquid fuel in transport activities (l/year)	32,608,782	Investigation	2008
			14. Average consumption of liquid fuel in transport activities per capita (l/pc/year)	304.4	Investigation	2008
			15. Percentage of biofuel consumption in transport activities	3	Investigation	2008
			16. Rude consumption of gas at the local level (m^3/year)	81,799,409	APRC	2008
			17. Percentage of gas consumption in local economic and public fields into the whole consumption	60.5 %	EPANT	2008
			18. Percentage of gas consumption in domestic activities into the whole consumption	39.5	EPANT	2008
		D. Local consumption of Thermal Energy 67,233.4 t.c.f.	19. Total consumption of thermal energy Gcal/year	470634	TH; EPANT	2008
			20. Consumption of thermal energy per capita (Gcal/pc/year)	4.4	TH; EPANT	2008
			21. Percentage of thermal energy consumption in economic field and public institutions into whole thermal consumption	43	TH; EPANT	2008
			22. Percentage of thermal energy consumption in thermal public system into whole thermal consumption	15	TH; EPANT	2008
			23. Percentage of thermal energy consumption in houses equipped with own thermal centrals into whole thermal consumption	42	TH; EPANT	2008

mainly of local authorities supported by national and regional administration. Inside a globalized economic and environmental system, local level has to play the role of fundamental cell as well as generator of causes with global effects but also as decision centre for implementing new developing models for sustainability. The interdependence between local and global, natural and anthropological, economy and environment brings the request for local authorities to choose the best solutions after a thorough knowledge of the problem for a scientific substantiation of every decision. Inside this vision, the present approach is a small link into a long chain of knowledge and attitude in order to propose a type of analysis in a certain location about the basic causes with global impacts upon climate change, trying to put in quantitative and qualitative relations the two levels, local and global. It is a trial to transpose the European prospect proposed and sustained by European institutions into a useful instrument for local analysis of an acute problem. It can become a main method for investigating the local sustainability referring to causes that affect global climate and implicitly its manifestations on the local plan. While European Commission requests more insistently for local authorities to implement urban audit as a very useful instrument to measure and monitor the level of local sustainability, this proposal comes to welcome that demand and to help local administration to apply an efficient analysis instrument. This approach starts from some results and analysis models proposed by international specialized institutions such as EUROSTAT and IPCC, managing to adapt them at the local level. We used the case study of Piatra Neamt in order to give an example of practical application of the promoted instrument according with this vision. Connecting and summing up the *Local Contribution to GWP* and the *Total Rude Energy Consumption* into one synthetic indicator as *Climatic and Energetic Impact Indicator upon the Natural Environment* allows us to have a good evaluation of the local sustainability and of its impact upon the global climatic system. Even though the analysis inside the case study pointed out a satisfactory impact of the local area Piatra Neamt into the global climatic and energetic circuit where the local level is only a small subsystem, it could become an analysis model for every town and every local subsystem concerning the study theme.

AKNOWLEDGEMENT

This article is a result of research carried out by Dumitru Letos and Cristina Harabagiu (cas. Letos) financed by POSDRU Project (POSDRU/6/1.5/S/25).

References:

Almunia, M., (2005). *Sustainable Development Indicators to monitor the implementation of the EU Sustainable Development Strategy***,** Communication to the members of the Commission, Brussels, 3-5

***Commission of the European Communities, (2005). *Sustainable Development Indicators to munitor the implementation of the EU Sustainable Development Strategy*, 9-20
***Commission of the European Communities, (2007). *Progress Report on the Sustainable Development Strategy*, 5, 6
***EUROSTAT, (2007). *Monitoring Report of the EU SustainableDevelopment Strategy*, Statistical books, 66-83
EUROSTAT, (2007). *Indicators and better policy-making: the case of sustainable Development,** Luxemburg, 1-4
***European Commission, Joint Research Centre, Institute for Systems, Informatics and Safety, (1999). *An European System of Environmental Pressure Indices, First Volume of the Environmental Pressure Indices Handbook*: *The Indicators, Part I: Introduction to the political and theoretical background, European Commission*, Joint Research Centre, Institute for Systems, Informatics and Safety (ISIS), whole document
***Global Change Biology, (1998), *Long-term measurements of boreal forest carbon balance reveal large temperature sensitivity*, 443-450
***Intergovernmental Panel on Climate Change, (2001). *Third Assessment Report, 2001*, 244,245
***Intergovernmental Panel on Climate Change, (2007). *Climate Change 2007: Synthesis Report*, 4, 14-17
***International Energy Agency, (2010), *CO2 Emissions from Fuel Combustion*, Highlights, 50
***Local Commity for Emergency Situations, (2009). *Analyse Plan for Risk Covering in Piatra Neamt town*, 41
***Neamt Environment Protection Agency, (2009). *Annual Report concerning the quality of environment factors*, 23-39
***Neamt Environment Protection Agency, (2009). Rude data series referring to local GHGs emissions during 2008
***Neamt Environment Protection Agency, (2009). Inventory of GHGs emissions recorded to NT1 during 2008
***National Statistics Intitute, (2009), Statistics Data
***Townhall of Piatra Neamț, (2008). *Strategia de Dezvoltare Locală a Municipiului Piatra Neamț 2008-2015*, 56, 57

ABBREVIATION

APRC – Analyse Plan of Risk Covering; CO_2 –eq – CO_2 equivalent; EPA NT – Environmental Protection Agency Neamt; GHGs – Greenhouse Gases; GWP – Global Warming Potential; IEA – International Energy Agency; ISMU – International System of Measure Unities; IPCC - Interguvernmental Panel of Climate Change; NT1 – Neamt Meteo Station No. 1 pc – per capita; RON – Romanian monetary unity; SETAC - Society of Environmental Toxicology and Chemistry; TH – Townhall; t.c.f. - tons conventional fuel.