CHALLENGES AND OPPORTUNITIES OF THE ECOLOGICAL FOOTPRINTING IN ROMANIA

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Rezumat

This article is structured in three parts, as follows: In the first part we summarized the different approaches in the literature of the concept of "ecological footprint". In the second part of the article the evolution of key components of those indexes and their determinants for Romania are exposed. The paper concludes with a summary of the main challenges and opportunities that can be identified from the analysis of the presented data.

Cuvinte cheie: *ecological footprint, CO2 emission, sustainable development*

Clasificare JEL : *O44, O50, P28, Q01, Q56*

1. Literature review

During the last years significant changes occurred within the trinomial economic environment-ecological environment-social environment.

The economic environment together with the social one - represented in the new patterns of consumption - have influenced the ecological environment - represented by the environmental dimension of the consumption of goods and services.

In 1992, William Rees, professor at the University of British Columbia, was the one who first used the concept of global ecological footprint.

He stated that: "Globalization is increasing the total human ecological footprint far beyond the capacity of the planet to sustain that level of consumption."[8]

The ecological footprint is closely related to the consumption patterns. The consumption patterns are dependent on the production of goods and services. Production of goods and services is directly influenced by the economic exploitation - in the manufacturing process - of all categories of natural resources.

The ecological footprint is calculated by relating human consumption of natural resources to the earth's ability to regenerate them and it is expressed in global hectares [11].

The Ecological Footprint was designed to measure an important aspect of sustainability: the extent to which Earth's productive ecosystems are able to satisfy the humanity's consumptive demands by regenerating themselves. Thus, the Ecological Footprint is an image of the ratio between a country's demand for resources and its capacity to regenerate those resources in a given year.

A change in consumption patterns requires a strategy that takes into account the imbalance of excessive consumption and ignoring the limited resources available." (HPI Report, 2006, p.14, NEF)

Thus The Happy Planet Index (HPI) occurred. HPI measures the environmental efficiency of the welfare distribution of the social models around the globe. Three categories of indicators are used to compute the HPI, namely: the ecological footprint, the life satisfaction and the life expectancy. The last one is also used to calculate the Human Development Index (HDI). These are reasons to assume a correlation between the ecological footprint and the human development index.

Lenzen and Wiedmann have presented a profoundly different concept of a Dynamic Ecological Footprint (DEF) method for forecasting and policy analysis that could become a complementary tool to the conventional method [5]. This approach links human consumption, bio-productivity and ecological footprint into a dynamic concept of

causality (figure no.1). This model allows a temporal analysis of consumption, production, land use, CO2 emissions, species diversity, and bioproductivity.

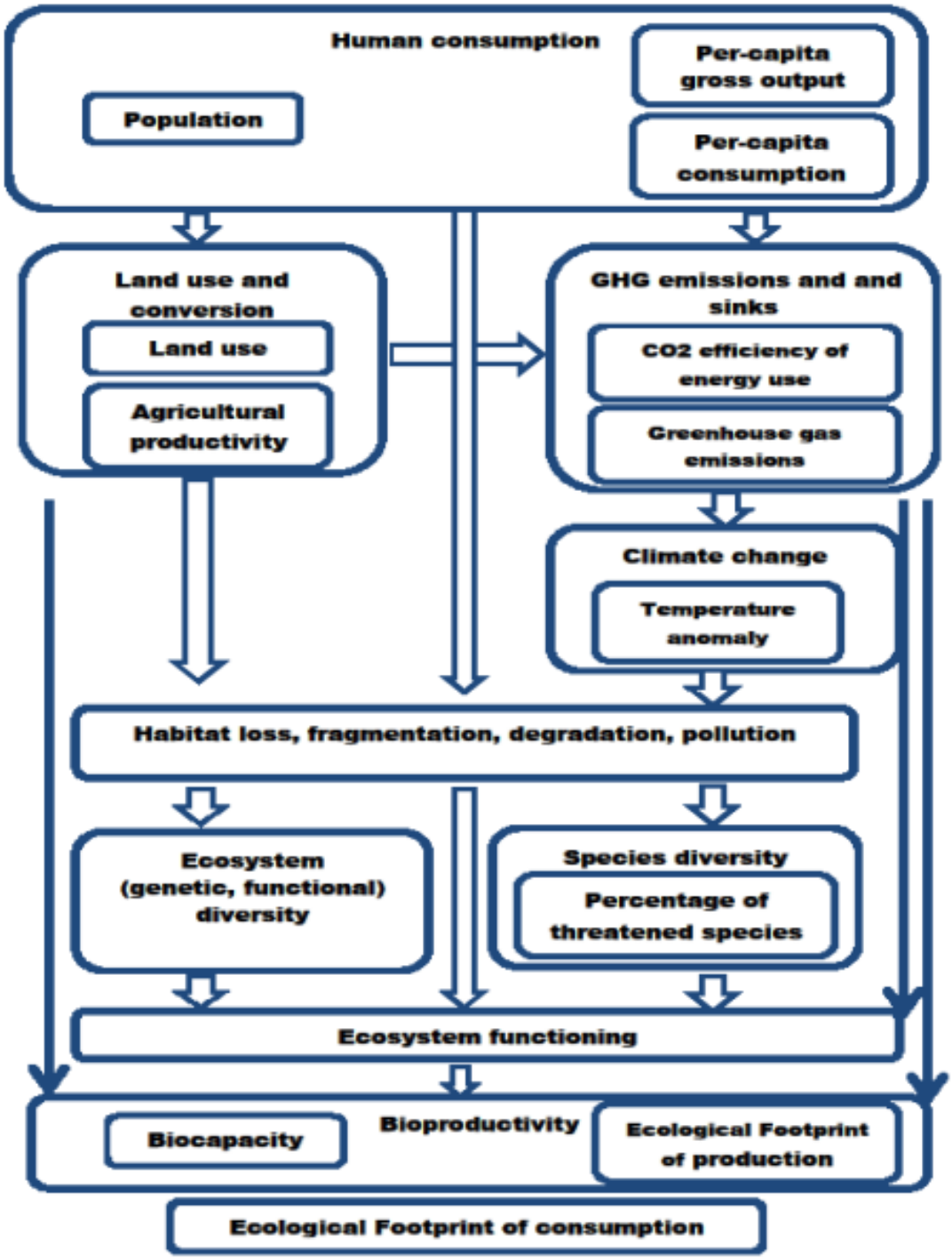

Fig. 1 **A dynamic causal Model of Human Consumption, Bioproductivity and Ecological Footprint**
Source: Adapted from Lenzen, M et.al. - Forecasting the Ecological Footprint of Nations: A Blueprint for a Dynamic Approach

Six important elements constitute Ecological Footprint and Biocapacity. These are shown in the Table. No. 1. Currently, the carbon component has the weight in the ecological footprint, representing 53 per cent (Figure no.2).

There are studies which affirm that 1.5 Earths are required to satisfy the humanity's pressure on nature. Since the 70s, humanity's demand has exceeded the planet's biocapacity.

Tabel. No.1 **The components of The Ecological Footprint**

Cropland	Ecological footprint of agricultural land consists of areas used to produce food, feed, oil crops, and rubber.
Grazing land	The Ecological Footprint of the grassland consists of areas used for animals which are subsequently used for meat, milk and wool production.
Forest land	The Ecological Footprint of the forest lands consists of the wood used for: fuel and timber (raw material)
Fishing ground	The Ecological Footprint of fisheries is calculated based on the estimated primary production of fish.
Built-up land	The Ecological Footprint of the land Inside is the productive land (land which activities such as transport, housing, industrial structures and hydropower).
Carbon uptake land (to accommodate the carbon footprint)	Carbon uptake land is the only component of the Ecological Footprint, pursuing a waste product: carbon dioxide, consisting of the amount of forest land required to absorb anthropogenic carbon dioxide emissions (Ewing et al., 2008).

Source: Adapted by the authors from Ewing et al., 2008

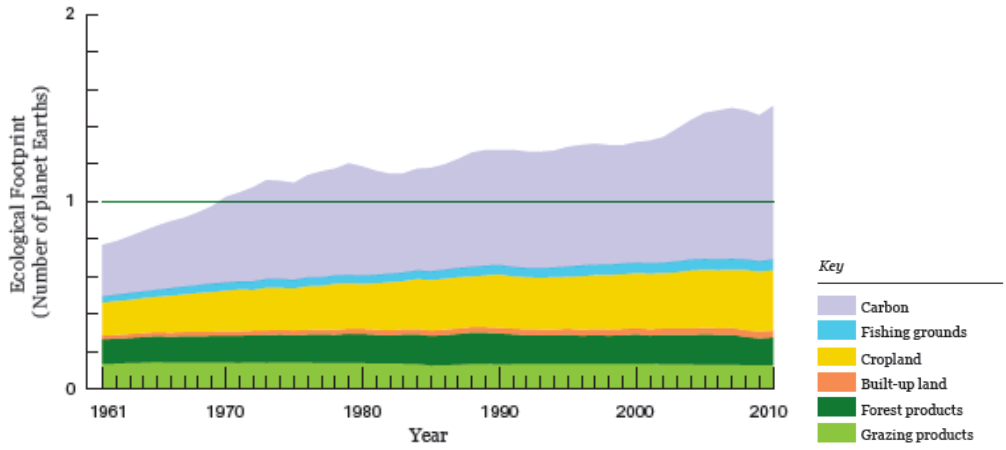

Figure no. 2 **Global Ecological Footprint by component (1961-2010)**
Source: Global Footprint Network, 2014, WWF Living Planet Report 2014 p. 32

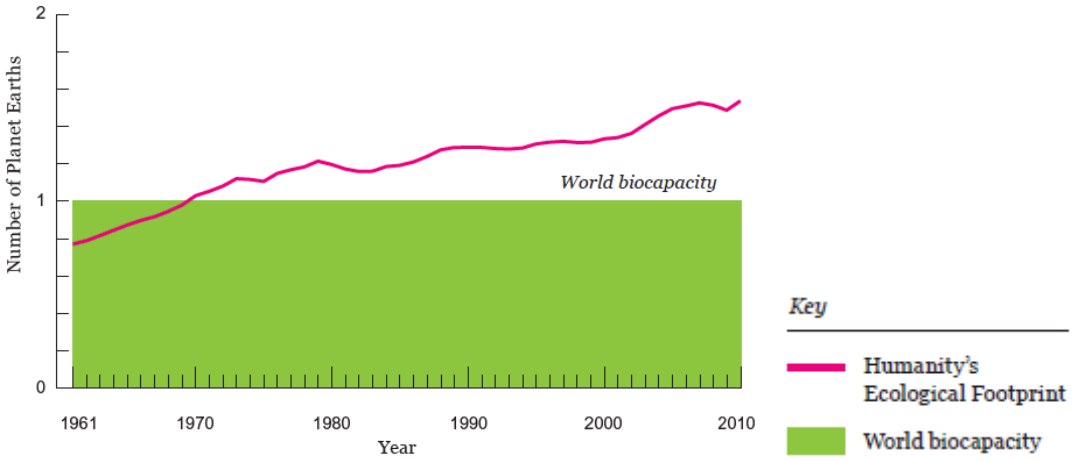

Figure no. 3 **Humanity's Ecological Footprint**
Source: Global Footprint Network, 2014, WWF Living Planet Report 2014 p. 10

2. Evolution of the ecological footprint indicators in Romania

Between 1996 and 2001 we can observe a decrease of the value of the average global ecological footprint, from 2.85 ghc to 2.20 ghc. At the same time the average value of the biocapacity decreased from 2.18 to 1.80 - suggesting a slight decrease of the bioproductivity.

In the period 2001-2005 the average value of the ecological footprint has increased from 2.20 ghc to 2.70 ghc - remaining approximately at this level until 2008. After this it registered a decrease, reaching in 2010 a value of 2.60 ghc. Approximately the same trend was recorded for the average value of the biocapacity, which rose to 2.10 ghc in 2005 and then tended to decrease to 1.7 ghc in 2010 (Table no.2).

Tabel no. 2 **Evolution of the World average Ecological Footprint and of the World average biocapacity**

Year / Indicator	1996	1999	2001	2003	2005	2008	2010
World average Ecological Footprint per person (ghc)	2.85	2.28	2.20	2.23	2.70	2.70	2.60
World average biocapacity per person (ghc)	2.18	1.90	1.80	1.78	2.10	1.80	1.70

Source: Data collected by the authors from the WWF's reports

These evolutions suggest a connection with the global economy evolution.

In terms of biocapacity, Romania is ranked 46 worldwide and 13th in the EU - according to data published in the 2014 Living Planet Report.

Therefore, Romania is a country which is "able"- yet - in terms of services provided by nature. The soil is not yet poisoned and worn and can produce food, the forests were not cut and yet can produce oxygen and absorb carbon, the waters still are filtered by vegetation and soil, managing to quench our thirst and to wet fields.

Furthermore, in terms of the ecological footprint per capita Romania is ranked the 70th in the world and has the best position throughout the EU. Thus, Romania has an ecological footprint of 1.4 global hectares per capita (ghc), mostly originating from carbon emissions. But the question that arises is whether this value is a measure of an environmental management more efficient than that of the large consumers such as USA (6.5 hgc), or of the underdevelopment, as our neighbors ranking, Costa Rica, Mauritania and Niger?

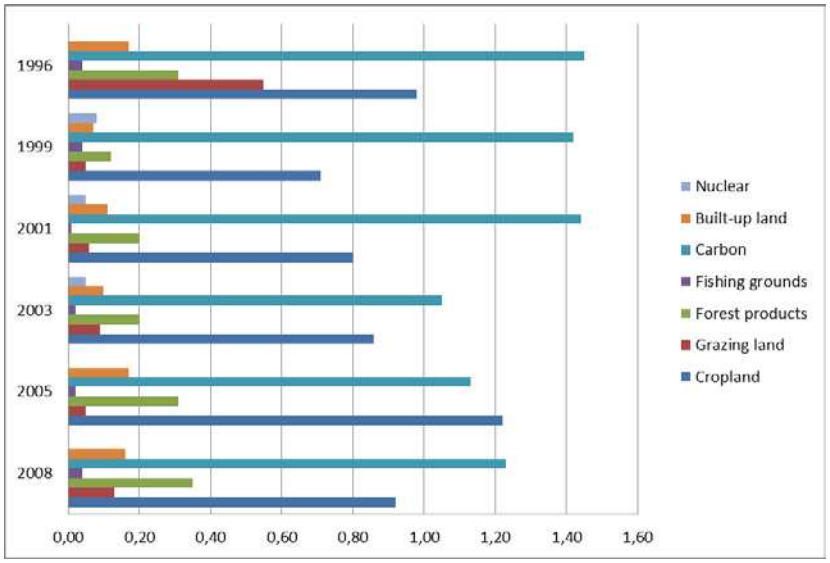

Figure no. 6 **Footprint composition – Evolution for Romania**
(global hectares per capita)
Source: Computed by the authors from the data of the WWF's reports

These results have to do with the collapse of the industry more than with the governments of Romania's strategic vision. Although steps on the path of sustainability have been made in terms of managing forests and rivers, a holistic approach is missingthat incorporates climate change and protection of nature in general planning processes. Romania's challenge is to significantly increase economic prosperity without increasing its carbon footprint. To succeed, we need to focus efforts on modern techniques and sustainable practices and prioritize energy efficiency.

Regarding the components of the ecological footprint, for Romania the following aspects are found (Figure no.6 and Figure no.7):

- The Carbon uptake Land is the major determinant of the ecological footprint. Its value has recorded little variations in the period 1996-2001. It then decreased from 1.44 hgc to 1.05hgc in 2003, after that it increased relatively steadily reaching a value of 1.23hgc in 2008.
- The Cropland is on the second place in the structure of the ecological footprint in Romania, representing about 30%. It fell from 0.98hgc in 1996 to 0.71hgc in 1999, showing a decrease of the cultivated agricultural land. After 1999 this indicator's value increased until 2005, when it reached 1.22 hgc. In 2008 there was again a decrease.
- The Forest Land recorded approximately the same trend, and also the Bild-up Land.
- The Grazing land and the Fishing ground showed both oscillating evolutions.

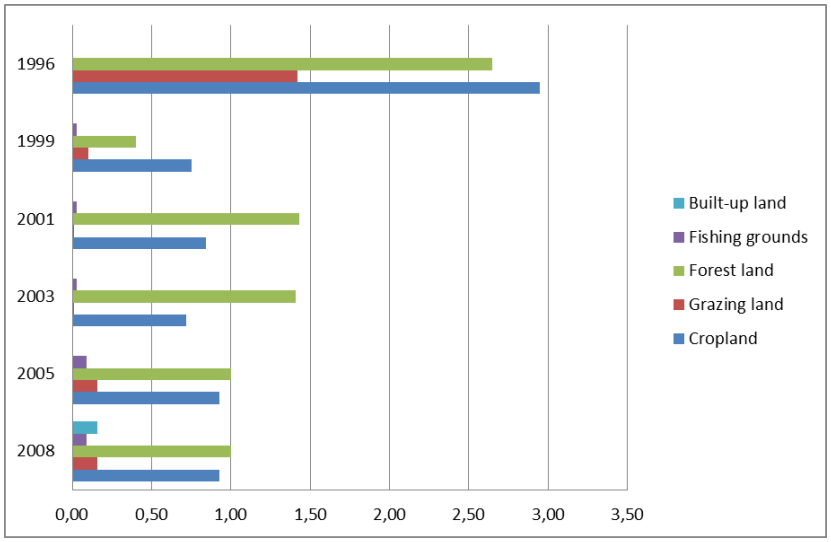

Figure no.7 **Biocapacity composition – Evolution for Romania (global hectares per capita)**

Source: Computed by the authors from the data of the WWF's reports

3. Conclusions

In this context, at national level, the ecological footprint is an indicator which can express synthetically the pressure exercised on the biosphere by the population of a country through the consumption processes. Hence the link between ecological footprint and consumption patterns results.

Sustainable Consumption represents "that form of consumption which use goods and services that respond to basic needs, enhancing the quality of life, improving resource efficiency and minimizing emissions of waste and pollutants over the life cycle, so as not affect the future generations' lives" [10].

In this context, the followers of eco-economic and eco-social models attempt to make their mark on consumerist tendencies, aiming to determine the orientation of both the economic operators and population, towards more pronounced ecological and eco-social consumption patterns.

We can assume that: "The green economy requires changing consumer habits. It speaks thus about sustainable consumption patterns and green consumption patterns"

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