Green Growth and Sustainable Development

Monitoring Progress towards the Environmental Millennium Development Goals

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***Abstract*—According to the Organization for Economic Cooperation and Development (OECD), Green Growth means "Fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies". Furthermore, since Sustainable Development provides an important context for Green Growth, The United Nations Millennium Development Goals (MDG) include the goal "Ensure environmental sustainability", which considers four specific targets related to the development policies, the biodiversity loss, the proportion of people without access to safe drinking water and sanitation facilities and the improvement in the lives of slum dwellers. In this context, our paper aims to provide both analytical and empirical contributions for the monitoring of the MDG achievements. With this regard we firstly propose a Poverty-Growth-Environment triangle, and then we analyze the available statistical evidence in order to summarize the current progress and future perspectives towards the Environmental Millennium Development Goals.**

Keywords- MDG; growth; environment; poverty; EKC.

I. INTRODUCTION

The increasingly industrialized and interconnected world is experiencing harmful environmental changes, which could threaten future human wellbeing.

In this context, the Organization for Economic Cooperation and Development (OECD) has launched the Green Growth initiative, which –according to [1] – aims "Fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies".

Green growth can be considered as a subset of sustainable development, since it is narrower in scope, focusing on measurable progress at the interface of the economy and the environment.

Appropriate information and comparable data are required in order to track progress towards green growth, and with this aim, the OECD is exploring a list of suitable indicators, which should consistently combine economic and environmental information, leading to a System of Environmental and Economic Accounting (SEEA) which is currently in progress.

The challenge of ensuring environmental sustainability is also included in the United Nations Millennium Development Goals (MDG). More specifically, four different targets are specified within this goal, including a total of ten indicators, which allow monitoring the progress towards the environmental objectives.

In this paper we firstly describe the Poverty-Growth-Environment relationships and their connections with the environment targets included in the Millennium Development Goals.

Then, we focus on the available indicators in order to quantify progress towards these targets, also analyzing the regional disparities and testing for convergence.

Finally the paper ends with some concluding remarks and a list of the main bibliographical references.

II. GREEN GROWTH AND ENVIRONMENTAL MDG

The Millennium Development Goals (MDGs) provide a combination of human needs and basic rights that every individual around the world should be able to enjoy. More specifically, the United Nations Millennium Declaration adopted in the General Assembly Resolution 55/2 (year 2000) by 189 State Members established certain fundamental values including freedom, equality, solidarity, tolerance, respect for nature and shared responsibility, leading to a set of specific and measurable objectives known as the Millennium Development Goals (MDG) to be achieved by 2015.

The eight agreed goals are respectively referred to poverty, primary education, gender equality, child mortality, maternal health, diseases as AIDS and malaria, environmental sustainability and global partnership. In this paper we mainly focus on the seventh goal, described as "Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources", which includes four specific targets and a list of ten indicators, as summarized in Table I.

A detailed description of these indicators appears in [2].

The achievement of the Millennium Development Goals requires concrete strategies and special attention to the most vulnerable people, countries and regions. Therefore, we adopt the conceptual framework proposed by F. Bourguignon in his Poverty-Growth-Inequality triangle described in [3], assuming that "the rapid elimination of absolute poverty, under all forms, is a meaningful goal for development". Within this context, Figure 1 illustrates the

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Poverty-Growth-Environment Triangle approach to the environmental MDG.

TABLE I. ENVIRONMENTAL MDG TARGETS AND INDICATORS

Targets	Indicators
7A: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources 7B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.1 Proportion of Land Area covered by forest 7.2 CO2 emissions (total, per capita and per $1 GD, PPP) 7.3 Consumption of ozone-depleting substances 7.4 Proportion of fish stocks within safe biological limits 7.5 Proportion of total water resources used 7.6 Proportion of terrestrial and marine areas protected 7.7 Proportion of species threatened with extinction
7C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	7.8 Proportion of population using an improved drinking water source 7.9 Proportion of population using an improved sanitation facility
7D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums

Source: United Nations, Millennium Development Goals

More specifically, speaking in terms of the MDG targets, we should focus on halving by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation, and achieving by 2020 a significant improvement in the lives of slum dwellers. Both objectives are related to the Poverty vertex of the triangle.

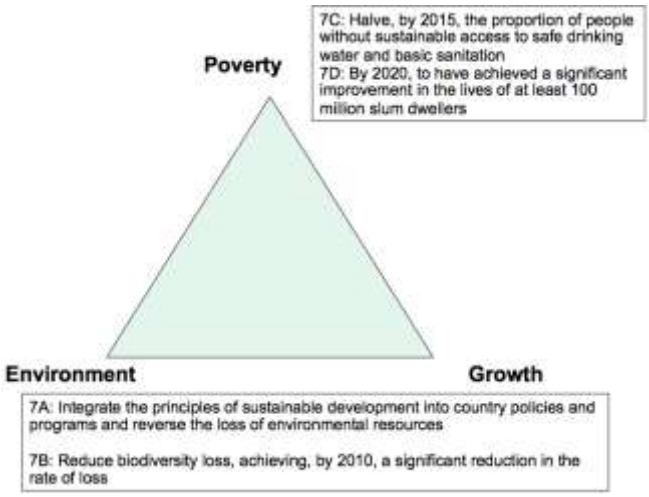

Figure 1. Poverty-Growth-Environment Triangle and Millennium Development Goals

In a second stage, a balance should be found between the objectives of growth and environment, whose relationships have been widely studied, leading to a controversial debate mainly focused on the Environmental Kuznets Curve (EKC).

Inspired in the inverted U-shaped relationship between inequality and per-capita income proposed by Simon Kuznets [4], the Environmental Kuznets Curve holds that environmental quality initially worsens with the increases in per-capita income, but then improves after an Income Turning Point (ITP).

Since a wide variety of empirical investigations regarding the EKC have been published during the last decades, some meta-analyses have been recently developed in [5] and [6]. As expected, results indicate that the estimated EKC-type relationships depend on several aspects as data characteristics, environmental indicators or methodological choices.

III. MONITORING PROGRESS TOWARDS THE MDG

Three years to the deadline, broad progress on the MDGs has been reported by United Nations [7], especially regarding the reduction of extreme poverty and the proportion of people without access to improved sources of water, and the improvement in the lives of slum dwellers. Nevertheless, achievements were unequally distributed across and within regions and countries. Moreover, progress has slowed for some MDGs after the international crisis, which has significantly impacted the economic perspectives thus affecting the odds of achieving the required targets.

With the aim of providing a more complete description of the progress towards the environmental goals during the last decades and the future perspectives for 2015 and beyond, in the next sections we present a spatial analysis based on the United Nations Database.

A. Poverty Targets

Since the poverty reduction should be considered a priority, we firstly focus on poverty indicators, which have shown a good behavior according to the 2012 Millennium Development Goals Report [7]. More specifically, preliminary estimates confirm that the first target of the MDGs (cutting the extreme poverty rate to halve by 2015 its 1990 level) will be achieved at the global level.

This report also emphasizes that number of people living in extreme poverty (with less than 1.25 dollars a day) and the corresponding poverty rates are falling in every developing region, including Sub Saharan Africa, where the figures are particularly higher.

Regarding the environmental goals, the reduction of poverty is the aim of targets 7C (halving the proportion of people without access to safe drinking water and basic sanitation) and 7D (achieving a significant improvement in the lives of at least 100 million slum dwellers). According to the 2012 MDG Report, the world has already met the target of halving the proportion of people without access to improved sources of water, and improvements have been

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achieved in the lives of 200 million slum dwellers, thus exceeding target 7D.

In order to provide a more detailed analysis of these achievements we can compute a Performance Index, defined as:

$$I_t = \frac{X_t - X_{1990}}{X^* - X_{1990}} \quad (1)$$

where X_{1990}, X_t, X^* respectively denote the 1990 value, the current value and the proposed target. This index has been recently computed in [8], showing outstanding progress for poverty goals while the lowest levels correspond to AIDS spread, child mortality and access to primary education.

Table II summarizes the results obtained for target 7C, showing significant differences between regions (Eastern Asia shows the best behavior while the worst corresponds to Sub Saharan Africa) and also between indicators 7.8 and 7.9 (the progress achieved with regard to access to drinking water is higher than the improvement in sanitation facilities).

Furthermore, differences also exist between rural and urban areas (although this information is not collected in the table), being the rural performance higher than the urban indicator.

TABLE II. PERFORMANCE INDEX FOR TARGET 7C

Region	Performance Index	
	7.8 Population using an improved drinking water source	7.9 Population using an improved sanitation facility
World	1.08	0.55
Developing Regions	1.07	0.58
Northern Africa	0.77	1.29
SubSaharan Africa	0.47	0.11
Latin America & Caribbean	1.20	0.75
Eastern Asia	1.44	1.07
Southern Asia	1.29	0.45
South-Eastern Asia	1.17	0.85
Western Asia	0.53	0.50
Oceania	0.00	0.00

Source: Self elaboration using United Nations Database

Regarding target 7D, Figure 2 represents the proportion of urban population living in slums, showing a positive evolution with the exception of Western Asia, whose figure increases during the last decade. Nevertheless, the worst situation corresponds to Sub Saharan Africa, with more than 63% of its urban population living in slums.

On the opposite side, an outstanding improvement is found in Northern Africa, whose initial situation was similar to that of Latin America and Caribbean, but has gradually decreased leading to the lowest proportion of urban population living in slums. Positive behaviors are also found in Southern, Eastern and South-Eastern Asia, whose figures decreased significantly.

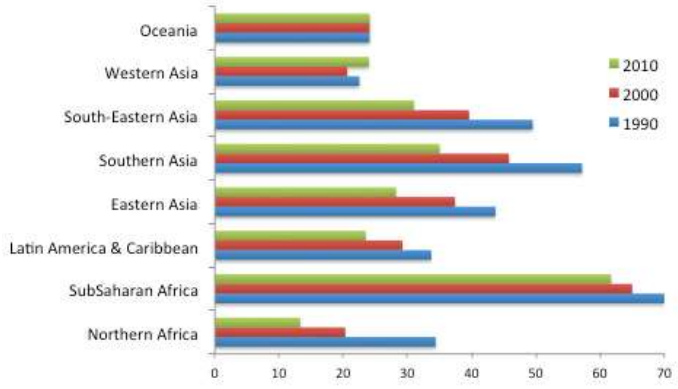

Figure 2. Proportion of urban population living in slums

B. *Environmental MGDs and regional convergence*

The previously proposed Performance index cannot be computed for most environmental goals, since they do not provide a specific target. Nevertheless, progress towards the MDGs can be approached through the cumulative growth rate, computed as:

$$r = \left(\frac{X_t}{X_{1990}} \right)^{\frac{1}{t-1990}} - 1 \quad (2)$$

Besides summarizing the MDG achievements, cumulative growth rates provide a useful tool in order to analyze regional disparities or test for convergence. Thus, table III summarizes the main regional results referred to eight different environmental targets (only 7.4: proportion of fish stocks within safe biological limits and 7.5: proportion of total water resources used, have been excluded due to the lack of information).

In general terms, the obtained results agree with the expected signs, leading to negative rates of growth for the proportion of species threatened with extinction (7.7), the proportion of urban population living in slums (7.10), and the consumption of ozone-depleting substances (7.3).

Table III also shows a parallelism in the behaviors of developing regions and the world as a whole. This fact is quite interesting and leads to the question of regional convergence.

Furthermore, as we have previously said, the achievement of the MDGs is particularly important for poor regions and countries, thus suggesting the need of testing for convergence. With this aim we have tested, for each of the considered indicators, if the cumulative rates of growth are inversely related with the initial registered values, referred to year 1990.

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TABLE III. CUMULATIVE GROWTH RATE 1990-2010

Region	Environmental Indicator							
	7.1	**7.2**	**7.3**	**7.6**	**7.7**	**7.8**	**7.9**	**7.10**
World	-0.2	1.7	-8.5	2.0	-0.1	0.8	1.3	
Developing Regions	-0.3	3.2	-9.1	2.2	-0.1	1.0	2.0	-1,7
Northern Africa	0.0	1.8	-12.4	1.0	0.0	0.3	1.1	-4.6
SubSaharan Africa	-0.5	0.0	-12.5	0.4	0.0	1.1	0.7	-0.6
Latin America & Caribbean	-0.5	0.9	-12.3	3.9	-0.1	0.5	0.8	-1.8
Eastern Asia	1.1	4.5	-8.4	1.4	-0.1	1.5	4.6	-2.2
Southern Asia	0.1	3.6	-6.6	0.8	-0.1	1.1	2.7	-2.4
South-Eastern Asia	-0.7	3.8	-0.3	2.7	-0.1	1.1	2.1	-2.3
Western Asia	0.8	1.6	-5.0	7.3	0.0	0.2	0.3	0.3
Oceania	-0.4	0.2	-13.8	9.7	0.0	0.0	0.0	0.0

Source: Self elaboration using United Nations Database

The estimation results are summarized in Table IV, suggesting the existence of convergence only for some of the considered indicators.

More specifically, only two out of eight regressions lead to significant coefficients at the one percent level (related to indicators 7.3 and 7.8) while two more estimated coefficients result to be significant at the five percent level.

Nevertheless, we must stress that all the estimated coefficients, even when non-significant, show negative sign, thus excluding the existence of divergence.

TABLE IV. CONVERGENCE ANALYSIS

Indicator		
	Estimated slope	R squared
7.1 Proportion of Land Area covered by forest	-0.0001 (*)	0.13
7.2 CO2 emissions (per capita)	-0.003 (**)	0.28
7.3 Consumption of ozone-depleting substances	-0.0000002 (***)	0.58
7.6 Proportion of terrestrial and marine areas protected	-0.003	0.18
7.7 Proportion of species threatened with extinction	-0.00001	0.10
7.8 Proportion of population using an improved drinking water source	-0.00019 (**)	0.29
7.9 Proportion of population using an improved sanitation facility	-0.0003 (***)	0.56
7.10 Proportion of urban population living in slums	-0.0001	0.03

Source: Self elaboration using United Nations Database

* significant at 10% **significant at 5%; ***significant at 1%.

IV. CONCLUDING REMARKS

The Millennium Development Goals (MDGs) include the challenge of achieving environmental sustainability, specifying four targets referred to the development policies (7A), the biodiversity loss (7B), the proportion of people without access to safe drinking water and sanitation facilities (7C) and the improvement in the lives of slum dwellers (7D).

With the aim of monitoring the progress towards the environmental MDGs, we have assumed a Poverty-Growth-Environment framework, thus considering poverty (targets 7C and 7D) as a first priority, and then focusing on the growth-environment goals (targets 7A and 7B).

Following this approach and according to the available information, we can conclude that progress has been made during the last two decades, although significant disparities remain between different regions and targets.

Thus, our results confirm that Sub Saharan Africa performance is particularly poor for most of the considered indicators, while Eastern Asia performs quite well in most of the considered goals.

Regarding convergence, the regressions of the cumulative rates of growth on the initial values lead to negative estimated coefficients for all the considered indicators, but only half of them result to be significant at the 5% level.

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