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Multiple Scenarios Simulation of Global Ecological Footprint Based on Empirical Mode Decomposition Method

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Abstract

A nonlinear dynamic simulative model has been discussed with variable cycles of entire world per capita ecological footprint taken from 1961 to 2003. The model was further classified and decomposed and extracted by the empirical mode decomposition (EMD) method. To deal with the problems proposed in the *Living Planet Report* 2006, three ecological footprint scenarios are presented. Simulative numerical values of the three global per capita (GPC) ecological footprint scenarios are also analyzed based on the simulative model. The results show that: 1) The clear varying cycle of global per capita EF growth is 4.6 years, 9.5 years, 19.5 years and 41 years over the last 42 years; 2) According to the business-as-usual scenario, if the global per capita increases positively with the constant growth, it is expected that GPC EF would be 3.262 gha in 2050. Assuming global per capita biocapacity (BC) to be 1.236 gha, global per capita ecological deficit (ED) would increase from 0.4 gha in 2003 to 2.026 gha in 2050; 3) The slow-shift scenario shows global per capita EF would decrease from 2.23 gha in 2003 to 1.619 gha in 2080 and 1.406 gha in 2100, if the negative annual change rate of it is 0.447 percent. Global per capita ED would decrease from 0.4 gha in 2003 to 0.222 gha in 2080 and 0.038 gha in 2100, if global per capita BC is 1.397 gha; 4) The rapid-reduction scenario depicts global per capita EF would decrease to 1.414 gha in 2050, if the negative annual change rate is 0.842% from 2003 to 2050. Assuming global per capita BC to be 1.461 gha, global per capita ecological reserve (ER) would be 0.047 gha, and overshoot would be eliminated in 2050. Global per capita EF would decrease to 1.054 gha in 2100, if the negative annual change rate is 0.438% from 2050 to 2100. Assuming global per capita BC to be 1.474 gha, GPC ER would be 0.420 gha. Then, wild species of the planet will be allocated nearly 28.5% of the planet's biological productivity, which coincides with the results of *Living Planet Report* 2006.

Keywords

Ecological Footprint, EMD, Dynamic Model, Nonlinear Simulation

1. Introduction

Natural capital is essential core sustainability [1]. However, effective management is more important, which depends on the reliable measurement procedure. There are many indices of assessment sustainability for the ecosystem [2]. Both academia government and non-government organizations around the world have given positive attention to EF analysis [3]-[7] to access and estimate the sustainability metrics such as the sustainable utilization of natural resources [8].

The conventional spectrum analysis method of time series is mostly based on Fourier spectral analysis. The resolution rate of Fourier spectral analysis can be very high in frequency, but extremely low in time [9]. The wavelet analysis could bear some resolution rates in frequency and at the same time hold signal characteristics in time. However, the Heisenberg imprecise measure theory limits the advancement wavelet analysis precision in frequency and time, and the illusive harmonious wave could also be engendered [10] [11]. Comparing to the wavelet transform, the Hilbert transform could obtain more elaborate partial characteristics but disagree with the signal of width [10]. It is a well-known fact that economic, social and some natural factors such as, (climate, population, and used land) influence the change of EF in a nonlinear system. There are multiple spatio-temporal scales, and the time series data are almost nonlinear and nonstationary. So, various traditional analyses on long time series could not express reliable variations at different time scales, because of their limitations.

The Hilbert-Huang Transform (HHT) was presented by N. E. Huang in 1998 [12] [13]. The HHT could transform nonlinear and nonstationary signals to linear and stationary signals. This method is intuitionistic, direct, and based on self-adaptive. It deals with signals with the Empirical Mode Decomposition (EMD), which is a powerful method for analyzing nonlinear and nonstationary time series. Different from the conventional method in transforming signals, it integrally decomposes signals into data series at different characteristic scales which contain and extrude the original characters of signals. Each data series is defined as an Intrinsic Mode Function (IMF). Different IMFs are stationary signals and have nonlinear characteristics. So, the characteristic information of the original signals can be well located by analyzing the IMFs. The Hilbert spectrum from the Hilbert-Huang Transform for IMFs is approximate to the wavelet spectrum, but it provides partially more detailed characteristics [10]. At present, different researchers have concluded that to extract the data series trends, EMD method performs best. Moreover, earthquakes, atmosphere science signal management, image management are the areas where the EMD method has been successfully applied [14] [15]. A nonlinear dynamic simulative model is presented with the varying cycles of GPC ecological footprint started from 1961 to 2003, putrefied and extracted by the EDM method. To solve the issues proposed in the *Living Planet Report* 2006 by the WWF in Beijing, China in October, 2006, three ecological footprint scenarios are presented. Simulative numerical values of the three global per capita ecological footprint scenarios are also analyzed based on the simulative model. Furthermore, the feasibility and difficulties of the above three scenarios are analyzed and evaluated. Some solutions and suggestions are proposed in this paper. This analysis can be useful to study rational natural resource utilization in order to eliminate global ecological overshoot. The current study could be helpful to solve the issues and predict the world sustainable development status. Furthermore, the proposed methodology could also help to predict and solve problems of EF for the longer time span.

2. Method and Data

2.1. Ecological Footprint

The EF analysis method has three primary indices: Ecological Footprint (EF), Biocapacity (BC) and Ecological Deficit or Reserve (ED/ER). EF is defined as summative places of land and water which are occupied by individuals, and the individual uses all the resources and also reproduce them. The participants in that economy have capabilities to absorb all waste and manage it using prevailing technology [16] [17] [18]. Later, Chen modified the concept concluding that EF is actually a measure of a process or organization capacity to absorb the waste and reproduce the resources with the help of prevailing technology [4]. In another study, Garry and Patterson suggested that total available productive land for the habitat can be measured by a metric BC [19]. BC is very important part of environmental planning and management and it has been studied from the 1970s. It deals with the consumption pattern of the society and gives indication with a change [20]. In situation, if the term EF is larger than BC values, it is named as Ecological Deficit (ED), it can occur in two situations *i.e.*, ecological overshoot and ecological trade deficit. On the other hand, if BC exceeds the EF, it is called an ecological reserve (ER). According to Monfreda [5], under this condition, the remaining resources can be used for providing services that are used by the other counties. In common practice, two assumptions are taken for the Ecological footprint calculations: 1) tracking the resources used and reproduced by the inhabitants and 2) converting the resource and waste flows in the useful area available [18]. Fossil-energy land-water area, pasture, cropland, and forest are the six main distinguished categories of the ecologically productive areas. In *Living Planet Report* 2000 [21], Loh measured and classified the footprints. Recently, these footprints are calculated worldwide.

The latest available data mentioned in *Living Planet Report* 2006 indicate that humanity's EF, in the earth, the impact of the living species is increasing and now reaches three times since 1961 [22]. In addition, 25% ecological impacts of human exceeded the world's capability to reproduce. Humans depend upon fossil fuels and they fulfill their energy demand by using fossil fuels and these fossil fuels are responsible for 48% of the carbon emissions to the globe. UAE is a country with the highest per capita EF and Afghanistan possess the minimum per capita EF. Some countries in Central Asia and North America and some EU counties are running a deficit.

There is an ecological reserve in the non-EU, Latin America, the Caribbean, and Africa. The average footprint per capita changed little in those low-and-medium-income countries, while, nearly about eighteen percent increase in the footprints are noted for high income countries. In conclusion, in the last 40 years, the countries with low income have yielded 0.8 global hectares per capita.

2.2. Empirical Mode Decomposition (EMD)

Using the envelops, the local maximum and minimum criteria are separately used by the help of decomposition method. Cube spline is used to measure upper and lower envelops, when extreme values are identified. m_1 represents their mean and h_1 shows the difference between available data and m_1.

$$h_1 = x(t) - m_1 \tag{1}$$

But, as the h_1 does not follow the stationary oscillatory pattern, therefore, $x(t)$ will replace the h_1; and, similarly, the mean of h_1 will be denoted by m_2.

$$h_2 = h_1 - m_2 \tag{2}$$

A specific criterion is used to stop the sifting process by repeating the process again and again. A value of 0.2 or 0.30 is set as values of SD.

$$\text{SD} = \sum_{t=0}^{T} \left[\frac{\left| \left(h_{i-1}(t) - h_i(t) \right) \right|^2}{h_{i-1}^2(t)} \right] \tag{3}$$

From the data, c_1 is the IMF component for the first data point. Equation (4) can be used to separate the c_1 from the rest of the data.

$$r_1 = x(t) - c_1 \tag{4}$$

In Equation (4), components that contain information for more extended periods are denoted by. It is considered as a newly generated data and endangered to the same sifting process.

Dealt is treated as the new data and as described above. Equation (5) is a result of repetition of all r_1.

$$r_1 = x(t) - c_1, r_2 = r_1 - c_2, \cdots, r_n = r_{n-1} - c_n \tag{5}$$

i.e.

$$x(t) = \sum_{i=1}^{n} c_i + r_n \tag{6}$$

Thus, classified IMFs are achieved, and a residual, r_n, which is defined as the constant value or mean trend.

There is no doubt that EMD is a compelling method. However, there are some problems associated with EDM *i.e.* endpoint treatment is strongly influenced by this method. We employed cube spline to calculate envelopes. But endpoints make the spline very sensitive. It is imperative to take measures to avoid from the propagation of end effects into the interior solution. Hence, the current problem will be solved by the extrema extending method [23].

The Boundary Processing exists not only in designing of the numeric filter and transforming wavelet, but also in the EMD method. The boundary processing method of stretching symmetrically mirror image is adopted in this paper [24], which handles boundary up rush and undershoot rationally in the process of EMD.

2.3. Data

The global time series from 1961 to 2003 in this paper is obtained by considering simplicity and authority. Our assessment and analysis are based on the series data of *Living Planet Report* by WWF [21] [22] [24] [25]. The world's per capita EF data from 1961 to 2001 are calculated based on the global total EF and total population in the corresponding year from *Living Planet Report* 2004. The data in 2002 is from https://www.footprintnetwork.org/ and that in 2003 is from *Living Planet Report* 2006. The basic dynamic trend is demonstrated in **Figure 1**.

Figure 1 shows that over the 42 years, the world's per capita EF has constantly increased with fluctuation. The world's per capita EF was 2.3005 gha and 2.3026 gha in 1979 and 1988 respectively. Later, it saw a reduction. It was stationary in recent years. The average annual growth rate of world's per capita EF is 0.6756% according to **Figure 1**.

3. Analysis with EMD Methodology

In this section, the EMD method is presented to analyse the fluctuation and causes of global per capita EF at multi-time scales. From **Figure 2**, it can be seen

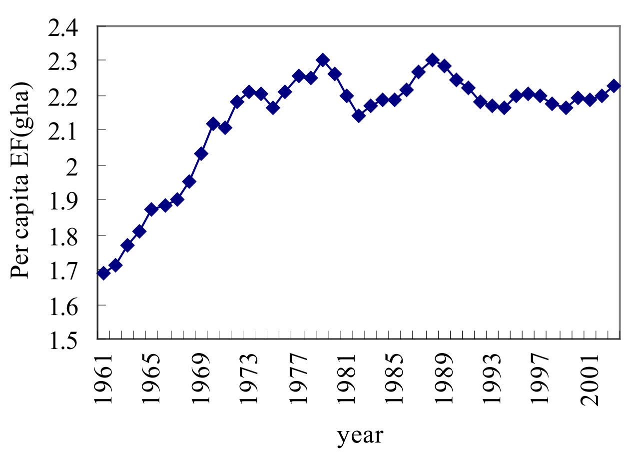

Figure 1. Calculation of global per capita EF (1961-2003).

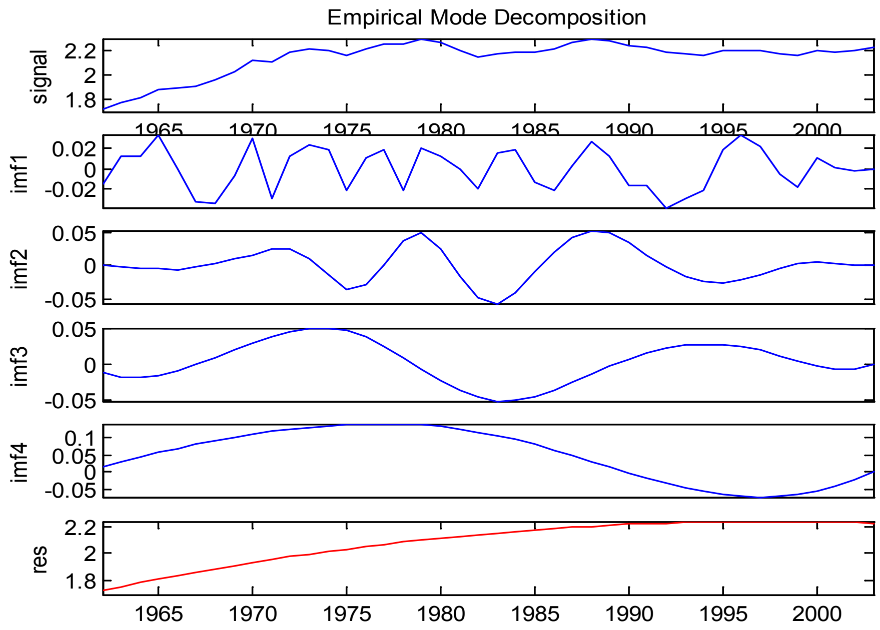

Figure 2. IMF and residual trend R of variations of the global per capita EF.

that the data points are classified into one residential and four IMFs. Figure 2 shows that IMF_1 ponderance expresses the 4.6-years-period fluctuation, while IMF_2, IMF_3, and IMF_4 express 9.5 years period, 19.5 years, and 41 years, respectively (Table 1). From the decomposed periods, the fluctuation periods of global per capita EF basically coincide with the economic cycles by economists.

4. Results of Multiple Scenarios Simulation

4.1. Three Ecological Footprint Scenarios in *Living Planet Report* 2006

Three ecological footprint scenarios of the world were proposed in *Living Planet Report* 2006 (Figure 3). However, it is a simple framework. First, the linear prediction of business-as-usual scenario is not practical because the change of EF is essentially a nonlinear system influenced by those economic, social factors and other natural factors of technology, climate, population, land use and so on. Second, in the slow-shift scenario or rapid-reduction scenario, a target to achieve in the coming 47 years or 97 years is put forward. Then, it brings forth how much the EF components will reduce or increase in order to achieve this goal. In fact, the target of 47 years or 97 years is too far away from present days, so that it could not effectively help set baselines and targets and monitor achievements and failures. Therefore, a nonlinear dynamic simulative model with periodic fluctuation is proposed based on the above analysis to coincide with the EF variations and to set some goals to achieve annually. Simulative numerical values of the three global per capita ecological footprint scenarios are analyzed based on the simulative model, correspondingly related to a business-as-usual scenario, slow-shift scenario and rapid-reduction scenario in *Living Planet Report* 2006.

Table 1. Variance contribution by IMF_{1-4} and its order.

IMF_i ponderances	IMF_1	IMF_2	IMF_3	IMF_4	RES
Periods (T_i, Years)	4.6	9.5	19.5	41	∞
Variance contribution (k_i, %)	1.08	1.76	2.22	15.22	79.72

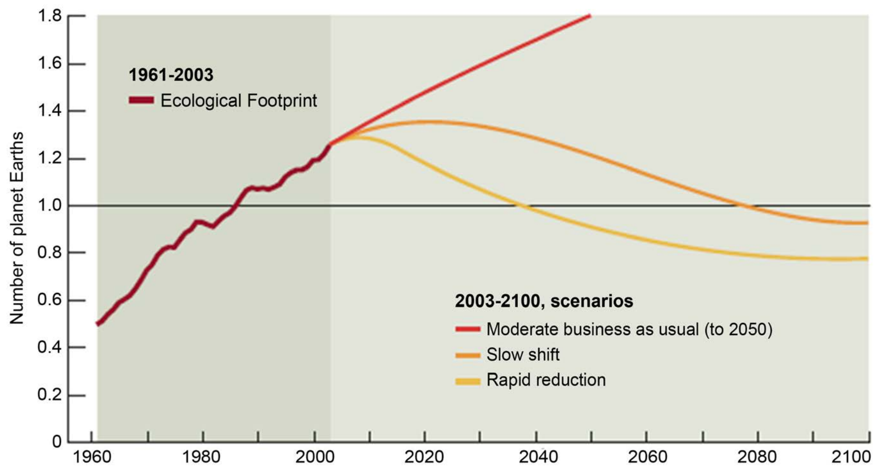

Figure 3. Three ecological footprint scenarios in *Living Planet Report* 2006.

4.2. Constructed Model

The dynamic simulation model is constructed based on the above analysis as follow:

$$\frac{\mathrm{d}x}{\mathrm{d}t} = \sum_{i=1}^{n} rx\cos\frac{2\pi t}{T_i} \quad (i = 1,\cdots,n) \tag{7}$$

Then:

$$x(t) = x_0 e^{rt + r\frac{T_1}{2\pi}\sin\left(\frac{2\pi t}{T_1}\right) + r\frac{T_2}{2\pi}si\left(n\frac{2\pi t}{T_2}\right) + \cdots + r\frac{T_i}{2\pi}\sin\left(\frac{2\pi t}{T_i}\right)} \tag{8}$$

x is the global per capita EF (gha/year), t is the time (year), r is the change rate of global per capita EF and T_i is the period.

Taking T_1, T_2, T_3, and T_4 in Table 1 into Formula (8), we can get:

$$x(t) = x_0 e^{rt + r\frac{4.6}{2\pi}\sin\left(\frac{2\pi t}{4.6}\right) + r\frac{9.5}{2\pi}\sin\left(\frac{2\pi t}{9.5}\right) + r\frac{19.5}{2\pi}\sin\left(\frac{2\pi t}{19.5}\right) + r\frac{41}{2\pi}\sin\left(\frac{2\pi t}{41}\right)} \tag{9}$$

Formula (9) is the nonlinear dynamic simulative model with periodic fluctuation for global per capita EF.

4.3. Simulation of a Business-as-Usual Scenario

The predictive results of global per capita EF from 1961 to 2003 are shown in Table 2 according to Model 9, if its average annual growth rate is 0.6756% consistently. The relative errors of the real values and predicted values of the global per capita EF from 1961 to 2003 are calculated in Table 2. The average relative error over the past 42 years is 6.948%, and the revisory average annual growth rate is 0.7033%.

Table 2. The real values and predicted values of global per capita EF (gha).

Year	Real Values	Predictive Values	Error (%)
1961	1.692	1.692	0
1965	1.874	1.832	−2.235
1970	2.117	1.894	−10.514
1975	2.165	1.914	−11.578
1980	2.262	1.965	−13.124
1985	2.188	2.019	−7.741
1990	2.243	2.018	−10.045
1995	2.198	2.029	−7.669
2000	2.196	2.234	1.728
2001	2.190	2.278	4.007
2002	2.2	2.330	5.909
2003	2.23	2.381	6.771

The simulative results of global per capita EF from 2003 to 2050 are shown in Table 3 and Figure 4 according to Model 9, if its average annual growth rate is 0.7033% consistently and its initial value was 2.23 gha in 2003.

Table 3 and Figure 4 show footprint per capita would increase from 2.2 gha in 2003 to 3.262 gha in 2050, if its average annual growth rate is 0.7033% constantly. This result is 0.662 gha, which is larger than those of the business-as-usual scenario in *Living Planet Report* 2006. The results are predicted based on the increasing trends of population, food consumption and carbon emission by fossil fuels in the last 42 years, while assuming their growth rates are constant. Moreover, the business-as-usual scenario in *Living Planet Report* 2006 is based on United Nations' optimistic projections which consist of increasing trends in food and fibre consumption, and population and CO_2 emissions [26]. According to the report, the CO_2 ecological footprints would increase by only about 60% in 2050. However, we think it could be hardly achieved because of our present energy consumption structure and the difficulty in implementing the Kyoto Protocol.

The per capita ecological deficit would increase from 0.45 global hectares in 2003 to 2.026 global hectares in 2050, if the average BC per person reduces from 1.78 global hectares in 2003 to 1.236 global hectares in 2050, as predicted by WWF in *Living Planet Report* 2006. In the current condition of the ecological deficit, ecological assets exhaustion and large-scale ecosystem collapse will become increasingly possible before 2050 [22]. The increased BC could not compete with human ecological deficit within the Earth's biocapacity limits though it may take effect in some way. Thus, the essential access to eliminating the global ecological deficit is to reduce global total EF and per capita EF.

4.4. Simulation of Slow-Shift Scenario

The slow-shift scenario in *Living Planet Report* 2006 shows that total human

Table 3. Simulative values of global per capita EF from 2003 to 2050 when $r = 0.007033$ (gha).

Year	2004	2005	2010	2015	2020	2025
Per Capita EF	2.304	2.352	2.453	2.518	2.495	2.629
Year	2030	2035	2040	2045	2050	
Per Capita EF	2.599	2.642	2.766	3.099	3.262	

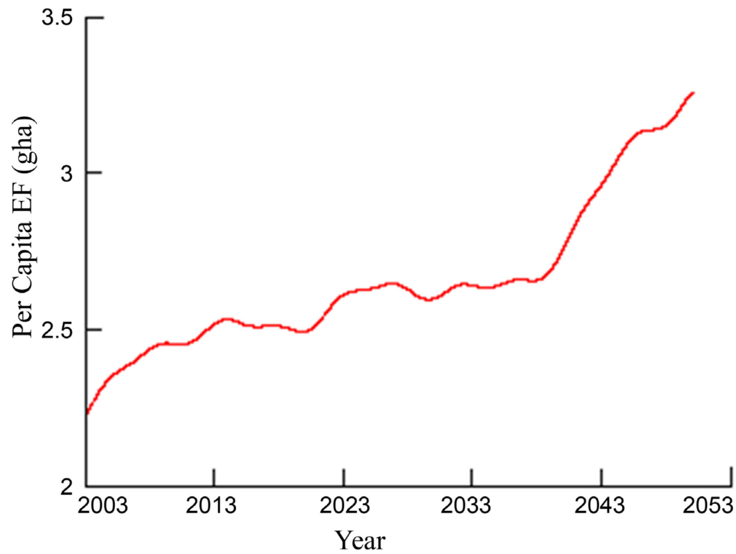

Figure 4. Simulative chart of global per capita EF from 2003 to 2050 when $r = 0.007033$.

ecological footprint in 2100 would be 15% less than that in 2003. If biocapacity gains are sustained with an increase of 20% by 2100 and inhabitants are growing moderately, the situation will arise in which ecological footprint per capita would decrease from 2.2 global hectares to around 1.5 global hectares. That is human EF would fall to 1.505 gha in 2080 and 1.263 gha in 2100.

The annual decreasing rate of global per capita EF should be 0.447% ($r = -0.00447$), if it drops from 2.23 gha in 2003 to 1.263 gha in 2100. Table 4 and Figure 5 show the simulative results of the global per capita EF from 2003 to 2100 according to Model 9, if the decreasing rate remains 0.447% with its initial value of 2.23 gha in 2003.

Table 4 and Figure 5 show that global per capita EF would be 1.619 gha in 2080 and 1.406 gha in 2100. The global per capita deficit would be 0.222 gha in 2080, if the global per capita biocapacity is 1.397 gha. While it would be 0.038 gha in 2100, if the global per capita biocapacity is 1.368 gha. Our simulation shows global ecological overshoot could not dispel in 2080 or in 2100, if the average annual decreasing rate of global per capita EF is 0.447%.

Only when the average annual decreasing rate of global per capita EF reaches 0.62%, could the global per capita EF fall to 1.396 gha in 2080 and 1.176 gha in 2100 by repeated adjustment with Model 9. In this way, global ecological overshoot would end in 2080; in result, the allocation portion for the wild species will

Table 4. Simulative values of global per capita EF from 2003 to 2100 when $r = -0.00447$ (gha).

Year	2004	2005	2010	2015	2020	2025	2030	2035	2040	2045
Per Capita EF	2.184	2.156	2.099	2.064	2.077	2.008	2.023	2.002	1.944	1.806
Year	2050	2055	2060	2065	2070	2075	2080	2085	2090	2100
Per Capita EF	1.751	1.730	1.704	1.674	1.679	1.696	1.619	1.537	1.471	1.406

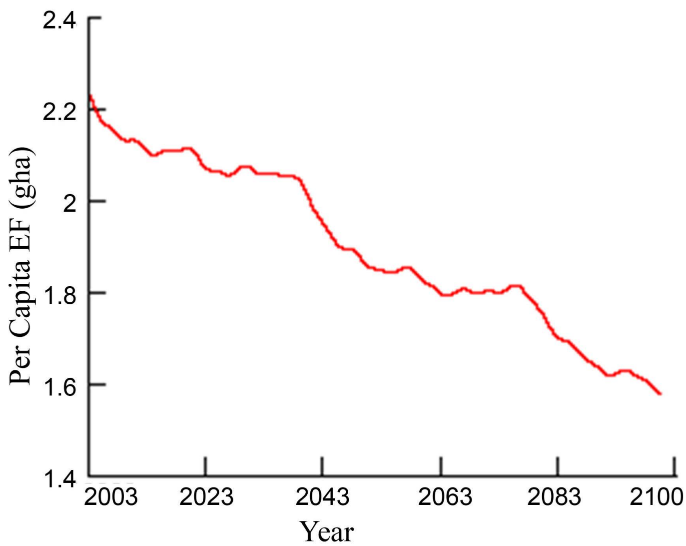

Figure 5. Simulative chart of global per capita EF from 2003 to 2100 when $r = -0.00447$.

be about 14% of the planet's biological productivity. This is only possible, if the global per capita biocapacity is 1.397 gha in 2080 and 1.368 gha in 2100.

4.5. Simulation of Rapid-Reduction Scenario

The rapid-reduction scenario in *Living Planet Report* 2006 shows that humanity's footprint in 2100 would be 40% less than that in 2003. It depicts that, by the mid-century, Earth's biological productivity will be eight years ahead of ecological debt. So that 30% of biocapacity would be allowed for the use of wild species by then. According to [22], in 2100, nearly 30% growth is expected which will increase resources in forest cropland and fisheries. That is, the ecological overshoot would end if global per capita EF falls to 1.348 gha and per capita, biocapacity falls to 1.461 gha in 2050. Wild species share 30% of global biocapacity, when global per capita EF falls to 1.053 gha and per capita, biocapacity falls to 1.474 gha in 2100.

The annual decreasing rate of global per capita EF should be 0.842% ($r = -0.00842$) if it drops from 2.23 gha in 2003 to 1.348 gha in 2050. The simulative results of global per capita EF from 2003 to 2050 are shown in Table 5 and Figure 6 according to Model 9, if its average annual decreasing rate is 0.842% with an initial value of 2.23 gha in 2003.

Table 5 and Figure 6 show that global per capita EF would be 1.414 gha in

Table 5. Simulative values of global per capita EF from 2003 to 2050 when $r = -0.00842$ (gha).

Year	2004	2005	2010	2015	2020	2025	2030
Per Capita EF	2.145	2.029	1.990	1.928	1.950	1.831	1.856
Year	2035	2040	2045	2050			
Per Capita EF	1.820	1.723	1.504	1.414			

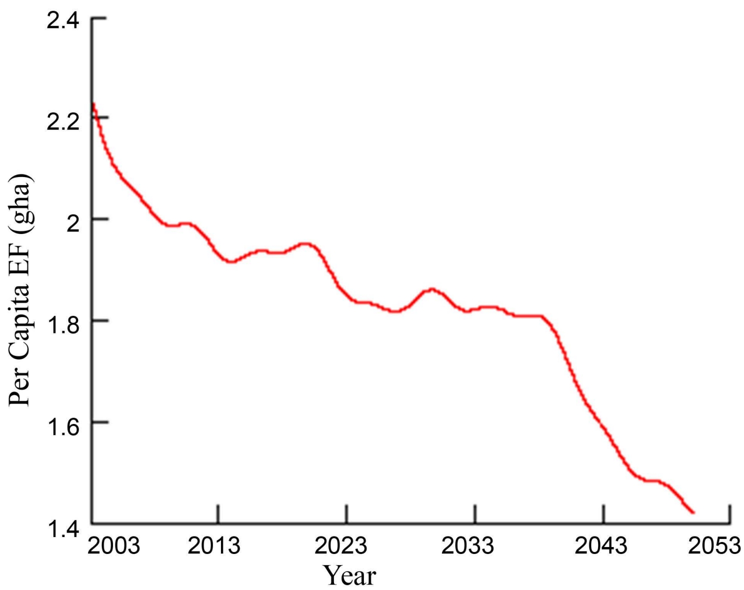

Figure 6. Simulative chart of global per capita EF from 2003 to 2050 when $r = -0.00842$.

2050 if its average annual decreasing rate would be 0.842%. By then global ecological overshoot would have been concluded if global per capita biocapacity is 1.461 gha. While global ecological surplus would be 0.047 gha in 2050.

The annual decreasing rate of global per capita EF should be 0.438% ($r = -0.00438$), if it drops from 1.348 gha in 2050 to 1.053 gha in 2100. Table 6 and Figure 7 show the simulative results of global per capita EF from 2050 to 2100 according to Model 9, when its average annual decreasing rate is 0.438% with an initial value of 1.348 gha in 2050.

Table 6 and Figure 7 show that global per capita EF would be 1.054 gha in 2100 if its average annual decreasing rate is 0.438%, and the global ecological surplus would be 0.42 gha if global per capita biocapacity is 1.474 gha in 2100. Therefore, about 28.5% of the planet's biological productivity would have been spared for the use of wild species by 2100, which coincides with the results in *Living Planet Report* 2006.

5. Conclusions and Discussion

A nonlinear dynamic simulative model has been discussed with variable cycles of entire world per capita ecological footprint taken from 1961 to 2003. The model was further classified and decomposed and extracted by the empirical

Table 6. Simulative values of global per capita EF from 2050 to 2100 when $r = -0.00438$ (gha).

Year	2050	2055	2060	2065	2070	2075	2080	2090	2095	2100
Per Capita EF	1.348	1.275	1.249	1.252	1.221	1.218	1.214	1.128	1.086	1.054

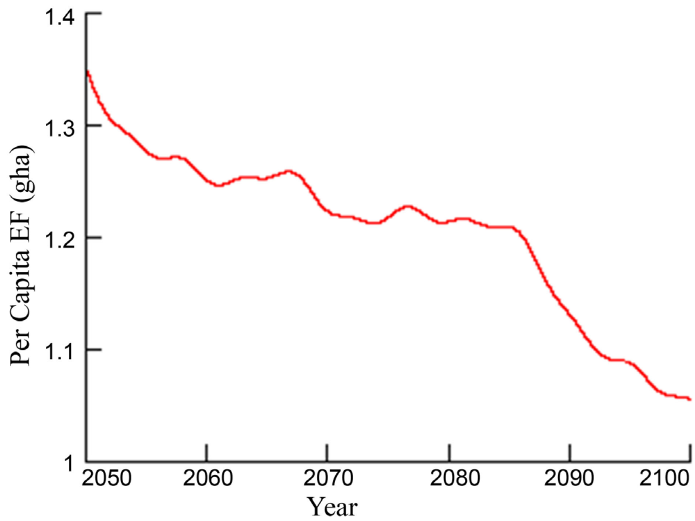

Figure 7. Simulative chart of global per capita EF from 2050 to 2100 when $r = -0.00438$.

mode decomposition (EMD) method. Simulative numerical values of the three global per capita ecological footprint scenarios are analyzed based on the simulative model. The results show that:

1) The obvious undulation cycle of global per capita EF growth is 4.6 years, 9.5 years, 19.5 years and 41 years respectively over the last 42 years.

2) Global per capita EF would be 3.262 gha in 2050, if the business-as-usual scenario and the positive annual change rate remain constant. Assuming the global per capita biocapacity (BC) to be 1.236 gha, the global per capita ecological deficit (ED) would increase from 0.4 gha in 2003 to 2.026 gha in 2050.

3) The slow-shift scenario shows global per capita EF would fall from 2.23 gha in 2003 to 1.619 gha in 2080 and 1.406 gha in 2100 if the negative annual change rate of it is 0.447% constantly. Assuming the global per capita BC to be 1.397 gha, the global per capita ED would decrease from 0.4 gha in 2003 to 0.222 gha in 2080 and 0.038 gha in 2100. Overshoot would end in 2080 and the allocation portion for the wild species will be about 14% of the planet's biological productivity. We think it needs more deliberations.

4) The rapid-reduction scenario depicts global per capita EF would fall to 1.414 gha in 2050, if the negative annual change rate remains 0.842% from 2003 to 2050. Assuming the global per capita BC to be 1.461 gha, then the global per capita ecological reserve (ER) would be 0.047 gha, and overshoot would be eliminated in 2050. The global per capita EF would fall to 1.054 gha in 2100, if the negative annual change rate is 0.438% from 2050 to 2100. Assuming the global per capita BC to be 1.474 gha, global per capita ER would be 0.420 gha,

and about 28.5% of the planet's biological productivity could be allocated for the use of wild species, which coincides with the results of *Living Planet Report* 2006.

The nonlinear dynamic simulative model proposed with the cycles and multiple scenarios simulation is analyzed in this paper. The purpose is to offer access to the prediction study on the Ecological Footprint Method. It is meaningful in reducing humanity's EF for policy-makers by simulating the parameter. The variation of EF could be simulated if the values of r and T are appropriate. Theoretical references could be offered for those policy-makers from the public, government, and environment departments. Of course, the multiple scenarios simulation of this paper needs to be improved since their values are calculated at various hypothesis premises (e.g., the annual change rate of global per capita EF would be consistent). In fact, the variation of EF is very complicated as it is influenced by social, economic and natural factors such as population, consumption, land use, climate, technology, management and etc. Solutions to these questions will provide further perception into Ecological Footprint Method prediction.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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