

## 522: Contemplating sustainability

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### Abstract

This paper puts forward a number of questions on various issues associated with sustainability framework. Starting from Ehrlich's formula as an index of environmental impact by population, consumption, and technology, it highlights contradictions that undermine progress in tackling environmental problems and impede long term sustainability. Sustainability is not a purely technical issue separated from politics, and the same applies to architecture which manifests social structures and priorities through material means.

Keywords: environmental sustainability Ehrlich consumerism

### 1. Introduction

The environmental crisis of today has been a growing concern for a couple of decades, ever since its first symptoms were noticed by various researchers. Yet it was only recently that the negative side effects of human activities were widely acknowledged, leading to pressure for effective action by the public and private domain. At the same time, fast rising economic development based on eternal growth intensifies the environmental burden, offsetting the positive achievements of green initiatives. How longer can we follow that road? Can our materialistic objectives coexist with natural limitations, or it will be inevitable to re-adjust our priorities at some point? This paper examines current trends in order to find out where they might lead us in the future.

### 2. The IPAT equation

Paul Ehrlich introduced IPAT formula in the 1970s to portray the key actors that contribute to environmental degradation due to human activities. It describes conceptually the multiplicative effects of population (P), affluence (A) and technology (T) to environmental impact (I):

$$I = P \times A \times T \text{ or } I = PAT.$$

Environmental impact (I) may refer to resource depletion, pollution, or waste accumulation; population (P) refers to the number of human population; affluence (A) denotes the per capita level of consumption by that population; and technology (T) refers to the processes involved in acquiring resources and converting them into goods or junk per unit of consumption.

#### What IPAT implies

The simple IPAT relationship highlights certain interrelated necessities; in brief, it shows that, in order to limit our harmful impact on the environment, we should reduce our numbers and/or our affluence; if we want these quantities to keep rising at low environmental cost, then we should improve proportionally the environmental efficiency of our technology.

It also reminds us that technical advances in tackling environmental problems can be offset by growing population numbers or by higher individual consumption.

### 3. Current trends

Population, economy, standard of living, future expectations, are all on the rising, increasing our impact on the environment. Can they continue being so without testing the biocapacity limits of our planet? Current statistics do not portray a rosy outlook for the future:

#### Population

World population stands currently at 6.7 billions, growing annually by 1.16% [1]. With such pace, human numbers will almost triple at the end of the century, reaching 19 billion (Fig. 1).

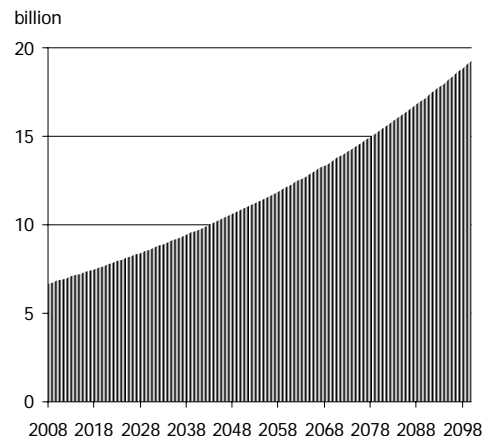


Fig. 1: World population growing annually by 1.16%.

The trend is supported by the rising life expectancy at birth: the global average is around 66 years today and rising, exceeding 80 years in several countries [ibid].

Most future population scenarios foresee a slowdown, but it is not quite clear *how* this will be achieved. Will a breakdown of health services drive global life expectancy back to 30-40 years as in 1900? Will birth rates decline in spite of religious objections against birth control, as it is already happening in certain developed regions? Will famines, epidemics, and wars keep human numbers under control as they did in the distant past?

#### Affluence

People in the future, living perhaps shorter lives in cramped conditions, or longer lives with less children around, will be *wealthier*. At the dawn of 21<sup>st</sup> century, global Gross Domestic Product is

growing at a rate of 3.6% [2], doubling every 20 years or so. If such rate continues, at the end of the century global GDP will be 25 times more than today (Fig. 2).

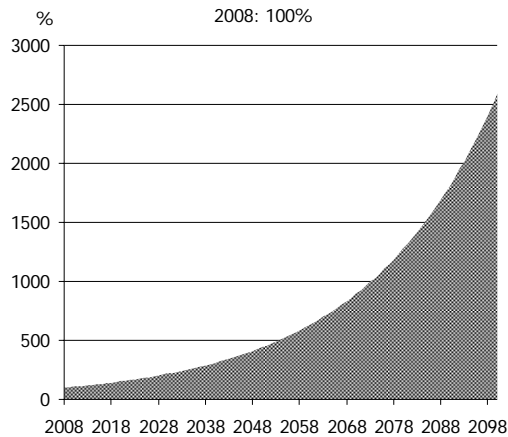


Fig. 2: World GDP growing by 3.6% annually.

But GDP implies production and consumption. Therefore demand for energy, water, food, and raw materials, as well as waste production, should closely follow the rise of GDP. In other words, if economic development keeps growing like today, the ensuing environmental stress in year 2100 might be up to 25 times stronger than today.

In spite of such astonishing trends, we keep promoting a materialistic model at global scale. Consumerism is the driving force of nearly all economies and a guiding beacon for billions of people, rich and poor. Material goods are the yardstick of success, personal and social. We officially measure affluence by the number of cars per 1000 persons, of TV sets, of DSL connections. We scorn Cuba for lack of mobile phones, yet we bypass her low infant mortality rate. We add pharmaceutical production and even coffins to GDP, as if their increased use means a better off society. And the high levels of suicides or incarceration does not diminish the appeal of the globally advertised 'model societies'.

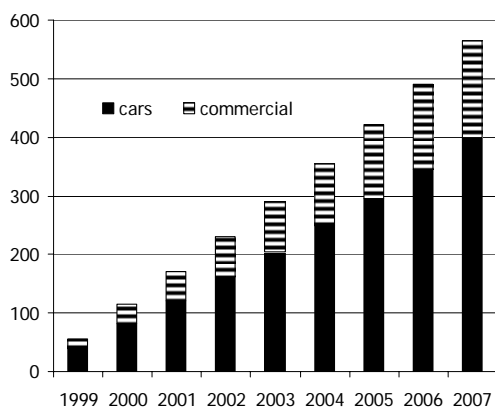


Fig. 3: World new vehicles sum after 1999 [3].

If we assume that the materialistic obsession conquers the entire planet and we project that into the future, we arrive at incredible numbers. For instance, China and India with their 2.3 billion population are two fast-developing examples that

the rest of the developing world aspires to follow suit; in 2002 they shared about 15 million cars or about 6 per 1000 people [4]; if they achieve the 2007 US ratio of 468 cars per 1000 people [5], then they should have more than a billion cars, i.e. twice the cars they have been produced in the entire world during the last 9 years (Fig. 3).

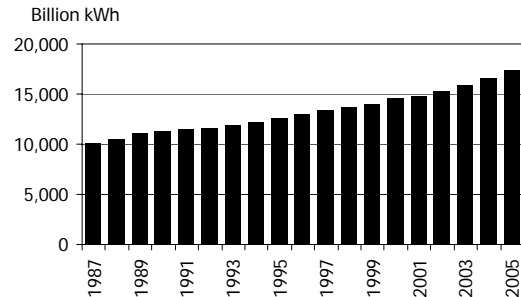


Fig. 4: World total net electricity production [6].

Electricity consumption points to another future snag. During the last 20 years, global electricity production grows annually at an average rate of 3% (Fig. 4). That means that every 23 years we should double the capacity of our power stations; by the year 2100 we should produce 15-times more electricity than today, with or without renewable energy.

### Technology

There are many signs that our impact to the planet is too high already. Therefore it is difficult to expect that the environment will be able in the future to cope with 25 or 15-times higher pressure than today –perhaps not even double that. Naturally we have started looking for technical solutions to counterbalance the damaging impact of our mounting numbers and consumerism.

A growing R&D effort is aiming to that direction: efficient engines, recycling, emission control, smart materials, GMOs, renewable energy, etc. So far the results are more promising than effective. We are still hoping that major breakthroughs in several vital fronts (energy, agriculture, waste disposal, etc.) will enable us to sustain our materialistic way of life at a limited environmental price. And we keep looking for eco-friendly ways to comply with the growing demand rather than to curb it.

### Contradictions

Yet there are signs that these efforts are undermined by our inexorable appetite for *more*:

- We develop fuel-efficient and cleaner motors, but we produce cars in ever growing numbers.
- As urban areas sprawl, we drive those cars for longer journeys; and as our everyday activities multiply, we drive them more frequently.
- We build dwellings that require less energy *per square metre*; but we build them in bigger size and numbers -and for less people each, since average household size is shrinking. Do we really reduce energy *per occupant*?
- We construct more efficient boilers, but we raise the thermostat: comfort temperature used to be about 18°C some decades ago, but nowadays it is often over 22°C.

- We have economy light bulbs now, but we use millions of them just to brighten our empty streets at night.
- Air condition systems are multiplying fast since simple fans are not enough to cool our glass towers; and we frequently set the thermostat very low, with windows open or when we are away.

These are just a few examples showing that economy *per unit* may be offset by higher *total quantity*; or that technical advances are cancelled out by our new sense of *comfort*. To use Ehrlich formula terms, progress in 'T' can easily be bypassed by higher 'A'.

#### 4. Escape routes

But the fact is that we live on a round planet, and by expanding we will eventually reach our back. If we insist upon higher life expectancy and no birth control, plus a 3.6% annual growth of GDP, then our technology by the end of the century must be vastly more eco-friendly than today, and that in order just to keep our impact *at current level*.

How confident one can be that we will successfully meet that challenge? Isn't that blind faith on technology similar to an overweight person that insists on losing weight just through special pills without eating less? And what if such technical miracles do not finally materialize and the 'T' factor of IPAT cannot cope with a threatening ascent of 'P' and/or 'A'? What are the alternatives and how feasible they might be?

#### Reducing 'P'

Up to now, we follow the divine command "*Be fruitful and multiply and replenish the earth and subdue it and have dominion over the fish of the sea and over the fowl of the air and over every living thing*" [7]? Can we find a systematic way to reduce our numbers before causing the extinction of "*every living thing*" other than us?

Reducing life expectancy is not an acceptable option of course. Rather than resorting to wide-scale *euthanasia* (man-inflicted or nature-imposed), *birth control* is the obvious choice. Countries like China have persistently adopted effective policies in that direction; and in several developed countries births are in decline, mostly for economic reasons. Yet, in many parts of the world the issue is still unresolved, for practical or ethical reasons.

#### Reducing 'A'

Nevertheless, the speed of population increase (1.16%) is only one third of our economy (3.6%). Therefore the damaging environmental impact of our affluence will escalate much faster than of our population size in the next decades. Maybe we better stop confusing 'growth' with 'development' and consider starting a 'diet'.

But is it easy to accept a lifestyle based on *less* consumption when we are being persistently indoctrinated for *more*? Consumerism is a widespread addiction that supports our growth-based economies. And any slowdown of the growth rate alarms economists as a sign of totally undesirable and dangerous 'recession'.

As consumerist growth is like oxygen for our prevailing economic system, it is rather hard to go

after a zero-growth path. On the contrary, the 'Spend More' brainwashing seems that has been advanced into a valuable tool of social engineering, and consumption has been transformed silently into a major human right, perhaps more important than others. 'Consumers' have replaced 'citizens' and 'comrades', and rationing is an evil 'anti-freedom' idea. And we just let market laws to regulate goods production and distribution for the benefit of few and to the dismay of 'hoi polloi'.

#### Green travesties?

Then again, 'sustainability' and 'climate change' have become catchwords in headlines, making more and more people aware of the threats triggered by the 'affluent society'.

So the market readjusts itself by adding a 'green' aura to consumerism. Now we have bioclimatic villas and skyscrapers, green oil companies and environment-friendly SUVs, air travel carbon offsets and emission right trading, earth-friendly products and organic vegetables flown-in by jumbos, power-rated appliances and non-CFC air conditions, eco-friendly shopping bags and trade catalogues on recycled paper, in short anything that demonstrates environmental concern to soothe our eco-guilt but without harming 'business as usual'. Nice deeds -if only the ultimate goals were to contain consumerism instead of getting hold of the growing green market.

Furthermore, it seems that we overlook the fact that *not* all our problems are solely related to energy or CO<sub>2</sub>. For instance, will free and clean energy stop traffic congestion in our cities? Will it reduce Amazon deforestation? Will it refill Lake Aral with water? And will it make easier for landfills to digest our zillions of plastic bags?



Fig. 5: Opposed eco-strategies: consume lots of environmentally safe products, or simply consume less?

#### Reducing equity

Obviously, the environmental stress does not originate equally from all countries and social classes. Third World people have a much smaller environmental footprint than Europeans or North Americans (Fig. 6); and in all countries, low income groups exert less harmful effects to our biosphere due to lower affluence and lower technology.

Therefore, a method to reduce total environmental stress is to sustain the current *two-speed world*, where the high environmental cost of a minority is environmentally compensated by the much lower affluence and technology of the majority. That would amend Ehrlich relationship to:

$$I = pAT + Pat$$

where capital & small letters indicate respectively high & low magnitudes of **P**opulation, **A**ffluence, and **T**echnology as in the original formula.

It seems that we are already witnessing such strategy as a way out of the ecological nightmare. Income inequality is widening, both between countries, as well as within societies. So the poor majority keeps having a low environmental impact, allowing a rich minority to continue ravaging the planet.

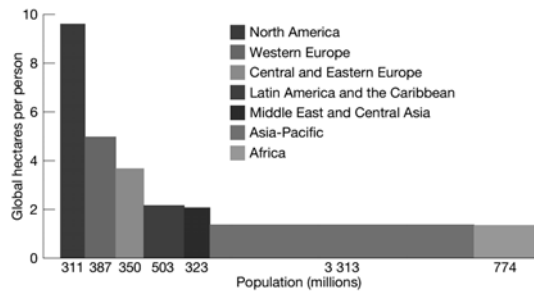


Fig. 6: Ecological footprint by region, 1999 [8]; the size of each box depicts regional demand for biocapacity.

The problem is that most developing countries follow the very same materialistic course that has brought us here. Even with wide internal gaps between rich & poor, even with green industries, and even at low pace, their overall impact on environmental stress will eventually surge: the consumerist model adopted by 4-5 billions hardly allows for an alternative.

Is it easy to persuade those billions that they shouldn't strive to jump on the glittering consumerist train because the seats are limited and already taken? That seems feasible only through measures that undermine *equity* – the basis of our democracy. Would we be comfortable with the Classic Greek model of democracy alongside slavery?

### 5. The role of architecture

In the context of environmental crisis, the role of architecture is a major one: buildings require a large share of energy & other resources, and cities have a major effect on the total energy bill through their layout.

Since the built environment reflects its socio-political background, it is questionable whether we can really have sustainable architecture in our non-sustainable societies. Of course it is a good sign to see demand and supply of green buildings on the rise. But so far green architecture is by and large a sporadic endeavour, frequently on a voluntary base like vegetarianism or sports. Administrative and professional bodies promote green issues, schools readjust their curriculum, and as environmental concern becomes fashionable, even big architectural names join in. Yet, a large part of building professionals and the public are trapped in the extravagance of the architec-

tural 'haute couture'. Examples like Dubai, Potsdamer Plaz, or Shanghai, indicate that the road to sustainable architecture of decisive weight is still rather long.

### 6. Conclusions

Looking at today's conditions and future trends, there is a number of questions to be answered:

- Can we base our actions on quarterly outlooks like corporations or from election to election like politicians? Or we need much longer perspectives in order to assess our course?
- Plain numbers indicate that our current lifestyle, based on addictive consumerism and eternal growth, cannot last for long on this planet. So when we talk about 'sustainability', what exactly we mean to 'sustain': is it our freewheeling lifestyle and socio-economic system? Or is it perhaps our own biosphere?
- It seems that we have invested all our hopes on technical solutions; but will just technology be able to cop with *all* our greed?
- There is no doubt that vital steps towards environmental sustainability are on the way. Will they be enough in number and scope? And, in the effort to maintain current status-quo intact, could they just be half-hearted delay *tactics* rather than a truly effective *strategy*? Furthermore, are they fast enough to address the soaring problems *on time*, i.e. before a major environmental and social breakdown?
- As for architecture, when will it be able to escape from ephemeral and alluring fashions, and to rediscover its role as the key mirror of meaningful social objectives and vital priorities? Because until then, it might resemble Nero fiddling over blazing Rome.

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