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## **Scientists' Warning to Humanity: Strategic Thinking on Economic Development, Population, Poverty and Ecological Sustainability in the Mediterranean and beyond**

### **Abstract**

At present, leading international agencies, such as the United Nations Environmental Programme, are largely focused on what they claim to be 'win-win' scenarios of 'sustainable development' rhetoric. These combine social, economic and environmental objectives. However, as noted by the 'Scientists' Warning to Humanity', environmental integrity is the essential precondition for the healthy functioning of social and economic systems, and thus environmental protection needs to be prioritized in policy and practice. Ecological sustainability cannot be reached without realizing that population growth and economic growth, with attendant increased rates of depletion of natural resources, pollution, and general environmental degradation, are the root causes of *unsustainability*. This article argues that to strategically address ecological unsustainability, the social, economic and political barriers to addressing the current economic model and population growth need to be overcome. Strategic solutions proposed to the current neoliberal economy are generic – namely, degrowth, a steady-state economy, and a 'circular economy'. Solutions to demographic issues must be sensitive to the countries' cultural, social, political and economic factors to be effective as fertility differs from country to country, and culture to culture. As discussed here, Mediterranean countries have the lowest fertility in the world, while many countries in Africa, and some in Asia, South America have stable but consistently high birthrates. This is discussed using three case studies - Tanzania, Italy, and Cambodia, focusing on the "best case" policy practice that offers more realistic hope for successful sustainability.

**Keywords:** Circular economy; overproduction; overconsumption; population growth; sustainability

**Introduction:** What constitutes *unsustainability*

Several studies have charted a long history of 'growth criticism' (Hayes 1976; Kassiola 1990; Smith 1979). The problems of endless growth on a finite planet were recognized as long ago as Marsh (1864) and repeated by Vogt (1948), Boulding (1966), and Ehrlich (1968). However, in the 1970s, Meadows et al (1972) pushed the 'limits to growth' perspective into the public arena, which has been revisited many times since (Wallich 1982; Turner 2008 and 2014). Several scholars, perhaps most of all Georgescu-Roegen (1971) and Herman Daly (1991, 1996), critiqued, in particular, the fundamental assumptions shared by otherwise rival 'schools' of economic thought, ranging from Marxism to Monetarism.

Such analysis specifically spotlighted increases in the human population as the critical driver of environmental impact, normally as part of the so-called 'I=PAT' formula (Ehrlich and Holdren 1972 and 1991). In it, human numbers multiplied the impact of the other two variables of per capita consumption (or 'affluence') and technology (Ryerson 2010). Several studies have vindicated the fears expressed by 'limits' authors that the combination of these forces would generate a global crisis of unsustainability that could threaten the very viability of human society, as well as the survival of a myriad non-human species (e.g. MEA 2005; Turner 2008, 2014). While some authors argue that population growth in poor countries is not a problem, as the poor consume less than the rich in Western countries (Wijkman and Rockstrom 2012) such assumptions do not take into account the fact that the world is no longer divided into the "rich" and "poor" countries - middle classes (and associated consumption patterns) are growing especially rapidly in the developing countries (Cafaro and Crist 2012). While Malthus did not predict that developments in medical and food production technologies would help sustain billions of people on Earth, the ultimate limits to growth on a finite-resource planet can by no means be discounted (Ehrlich and Holdren 1991). Also, people from developing countries increasingly (attempt to) migrate to richer countries, which is certainly understandable from human rights/social justice perspectives (Cafaro and Crist 2012). Beyond Malthusian concerns about potential conflict and starvation, the link between population and sustainability is also apparent for one biological reason – *Homo sapiens* is a relatively large omnivore, whether rich or poor, consuming other plant or animal species on a much larger scale than, for example, ants – which are more numerous than humans, but are no threat to the rest of the world's species. Simply put, this Earth is not able to support 8 billion omnivores indefinitely without endangering (wild) species, or enslaving domestic ones (through intensive feeding operations or intensive feeding operations (Crist 2012).

The radical measures suggested to address the limits to growth gave way however to a more optimistic belief in what described itself as a 'balanced' approach to the economic, social

and environmental dimensions of ‘sustainable development’ in ‘Our Common Future’ report (WCED 1987). The report described sustainable development as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 4). However, the optimistic balancing of economic, social and environmental objectives has not worked. Climate change and biodiversity loss, as testified by the Millennium Ecosystem Assessment (MEA 2005), the Intergovernmental Panel on Climate Change (IPCC 2019), and the IPBES (2019) report on extinction - demonstrate worsening conditions.

Following the First Warning to Humanity issued by a group of concerned scientists in 1992 (UCS 1992), the Second World Scientists’ Warning to Humanity signed by thousands of academic researchers in 2017, states:

We are jeopardizing our future by not reining in our intense but geographically uneven material consumption and by not perceiving continued rapid population growth as a primary driver behind many ecological and even societal threats ... (Ripple et al 2017).

One of the central issues is that of endless growth – particularly economic and population growth. Besides growth, the current size of both our population and our global economy is the root cause of unsustainability. As Engelman (2016) has argued, even if could stop growing now, our present production and consumption pattern is unsustainable. Thus, we should stop growing—and then recede, demographically and economically. The question of population growth is a crucial one, simply because the more consumers there are, the more pressure there will be on the Earth’s life support systems. In the case of economic growth, suggested solutions include degrowth (e.g. O’Neill 2012) and the steady-state economy (Daly 1991, 2014). However, the population issue requires *country-level* solutions. This article will canvass the idea that understanding different countries’ barriers to addressing population growth might build on a generic “warning to humanity”. In the Warning, Ripple et al (2017) wrote that they:

... believe that prospects will be greatest if policymakers and the rest of humanity promptly respond to our warning and declaration of a climate emergency, and act to sustain life on planet Earth, our only home.

However, humanity seems to have been largely unable to act. Part of the difficulty is the fact that population growth is not the same in all locations. For example, some Mediterranean countries (Cyprus, Italy, Spain, Greece and Portugal) have the lowest fertility in the world, while many countries in Africa, and some in Asia, South America, and some countries in the Middle East, have stable but consistently high birthrates (above the replacement level of a total fertility rate below 2.1) (The World Bank n.d. a). Campbell (2012: 46) points out that the issue of political correctness regarding population growth has resulted in the very discussion becoming a *taboo*, with derogatory terms such as "Malthusian" and even "demographic" being used. Thus, the population topic has become very politically loaded (Kopnina and Washington 2016; Washington et al 2019). Why is it such a contested topic?

This article explores both questions, economic growth, and population growth. We reflect on how we can best address environmental unsustainability and poverty through an effective, non-coercive population policy that is sensitive to social and cultural context. We propose a more nuanced, and culturally/socially tuned-in reflection on how sustainable population levels may be reached. As this article will argue, demographic solutions must certainly be voluntary and non-coercive, but cultural issues need also to be considered regarding how to reduce population growth.

### **Economic growth and industrial development**

The mantra of endless economic growth underpins neoclassical economics (e.g. Daly 1991; Washington 2014; Victor and Jackson 2015; Rees 2019). However, as noted above, many scholars have questioned the physical feasibility and social desirability of this. The fundamental alternative to growth-focused economics has been the 'steady-state economy', developed by Daly (1991, 1996, 2014). A steady-state economy features three characteristics:

- Sustainable population size for the carrying capacity of its region (Daly 1991)
- A distribution of wealth, which is fair and equitable on an intergenerational basis (Daly 1991, 2014).
- Low resource use (Daly 2014).

Czech (2013), Dietz and O'Neil (2013), Washington and Twomey (2016), and Victor (2019) have variously discussed the steady-state economy, ecological economics, and the degrowth. In reflecting on degrowth, O'Neill (2012) proposes that society can sustainably improve wellbeing, but only by discarding GDP growth as the key goal, in favor of more comprehensive measures of societal wellbeing.

It seems that '100% decoupling' may just be wishful thinking that allows 'business-as-usual' growth to continue (Wallich 1982; Turner 2008; Bithas & Kalimeris 2016 and 2018; Washington and Twomey 2016; Kopnina 2019). There is also a debate on whether "isms" such as capitalism, socialism or communism are compatible with meaningful sustainability, as these political systems remain committed to further economic growth (Washington 2015; Kopnina 2016).

Other ecological-economic models relate to growth, or how growth might be carried out. Chief among these is UNEP's (2011) green economy, the circular economy (building on the 'Cradle to Cradle' approach) and "doughnut economics". As promoted by the Ellen MacArthur Foundation (EMF 2014), the circular economy supports further growth via absolute decoupling. However, this is impossible in cases of material resources (Rammelt and Crisp 2014; Washington and Twomey 2016; Kopnina 2019).

The 'Cradle to Cradle' framework (McDonough and Braungart 2002) poses that the current industrial system of production is unsustainable, but also argues that the focus on eco-efficiency and "cleaning up the debris" does not look at the root cause of unsustainable production. Most products and packaging currently used are not made to be biodegradable or even recyclable, let alone infinitely reusable in a circular system in which no new raw material input is needed.

Raworth (2017) in her book 'Doughnut Economics' acknowledges the problems of growth, but then states she is 'growth agnostic'. However, as endless population and economic growth are the root causes of unsustainability (Daly 2014), an ecologically sustainable economy needs to operate within ecological limits (e.g. Rees 2019). This would require an overall strategy of degrowth (O'Neill 2012) to a steady-state economy, with an ecologically sustainable population and low resource use (Daly 1991). But not only is it true that growth itself cannot be sustained indefinitely on a finite planet, but even if we have a steady-state economy and population that overwhelm the capacity and resilience of natural resources, ecosystems and species, these two influences are unsustainable at their then-current scale.

### **Overproduction, overconsumption, and poverty**

Following the devastation of the Second World War, the USA, and Western Europe specifically focused on the expansion of a consumer economy as well as job creation (Assadourian 2013). The growth in population, consumption and resource use have caused pollution, and rapid

climate change and biodiversity loss. Critical scholars have noted that the idea of poverty alleviation through economic growth serves as a euphemism for a transition to an industrial, consumerist monetary economy which is entirely unsustainable in the long-term (Daly 1991; Crist 2012). In the context of decolonization and “developing” countries, it was assumed that economic growth would solve poverty as a “rising tide will lift all boats” (Johnson et al 2011). This assumption has been used to justify the excesses of overproduction and overconsumption (e.g. McDonough and Braungart 2002; Daly 1991).

However, although “promoting growth appears almost costless”, the recurring issue is whether this growth reaches the poorest and most vulnerable sectors of society (Johnson et al 2011). It is often seen that economic growth seems to benefit the rich, or the corrupt as there is little “trickle-down effect”, thus does not reduce overall poverty (Ravallion 2001). Poverty due to unemployment is not going to be solved by economic growth – rather unemployment is due to the improvement of technology, automation, and the increased need for fewer but more highly skilled professionals (Johnson et al 2011).

Critics have also noted that economic growth cannot solve the root causes poverty, especially considering that population growth makes poverty challenges all the greater (Washington and Twomey 2016; Washington and Kopnina 2018). Economic growth has resulted in rising income disparities, ignoring the disadvantages women face in many societies (Babacan 2010). Simultaneously, the disadvantaged position of women also meant no access to family planning, resulting in unwanted pregnancies and population growth (Engelman 2016; Crist et al 2017; Lamme et al 2017). This is not to suggest that gender equality should supersede, or lead, the other barriers to demographic change or actions for environmental management. However, as the literature examined here suggests, women’s reproductive rights and limits to freedom to terminate unwanted pregnancies are crucially important for understanding population growth, as will be further expanded on in this article.

Hence we argue that governments should rather focus on and address the drivers of both population and economic growth. That means reducing overproduction and overconsumption as these degrade the Earth’s life support systems that all of us (especially the poor) rely on (Washington 2015).

### **The population question**

The population issue was raised by Thomas Malthus more than 200 years ago (Malthus 1826 [1798]). Paul Ehrlich (1968) pushed the issue back into the public arena, generating renewed

controversy. What is new is the resistance *against* the idea that population pressure causes social and environmental problems (Kopnina and Washington 2016; Washington et al 2019). Some critics have argued that Malthus and Ehrlich have underestimated human ingenuity, especially regarding technological innovation in medical, food production and pollution prevention. They suggest that Earth is presently able to support over 7.7 billion people, and possibly can support 10 billion by 2050 (e.g. Lam 2011; UN's World Population Prospect 2019). There is a general assumption that the population question will 'solve itself' through a demographic transition (critically discussed in Campbell 2012). Hence most countries seem to ignore or deny the connection between environmental damage and population.

However, as many scholars note (e.g. Catton 1982; Ehrlich and Ehlich 1991; Daly 1991; Brown 2011), the Earth does not have unlimited resources if both the growth economy and population keep expanding. Demographic and population expansion, in today's world, add to the risk of destructive interactions with these limits, many of which are already being felt at current population and economic scales. While medical and food production technology support a large and growing population, these have their limits on a planet of finite resources (Meadows et al 1972; Mavrommati et al 2006; Rees 2010). Currently, refugees are moving out of areas that cannot sustain them, as local environmental tipping points have been exceeded due to a convergence of decades of higher-than-world-average population growth, and a climate crisis that limits local food production and water supply. One could argue that there is evidence that actual unsustainability is a driver of emigration, as in the case of climate refugees. This is overlaid on local political and societal systems that have long histories of ethnic or religious rivalries (Holland 2019).

Population growth has been linked to multiple social and environmental issues, including poverty and environmental devastation due to the increased demand for natural resources (Meadows et al 1972; UNFPA 1994; MEA 2005; Wijkman and Rockstrom 2012; IPCC 2019). However, only limited government action on population has been undertaken since the International Conference on Population and Development (ICPD) held in Egypt in 1994. Little action has been taken because it was assumed that a demographic transition would take place universally and decrease fertility rates across the world, so the population issue would solve itself (Campbell 2012). This theory posits a transition as societies become wealthier from high birth rates and high infant death rates to low birth rates and low death rates. The lack of governmental concern about population growth and unwillingness to spend money on a controversial arena of health care that some powerful political constituencies object to prevented further action (Engelman 2006).

However, although the shift has occurred in many industrialized countries, and global mortality rates of mothers and infants have decreased, as reported by the World Health Organization (WHO 2018), demographic transition theory does not appear to apply globally. This is due to specific social, political and economic factors (Campbell 2012). While medical advancements have become universal, saving millions of lives, and GDP has risen across the world, including poorer countries (The World Bank n.d., a), not all countries demonstrate lower birth rates. We discuss some possible reasons.

Some governments provided access to family planning information and services as recommended by the ICPD's Conferences' resolutions (UNFPA 1994). However, the statistics indicate a population increase of more than two billion people between the time of the Conference and the time of writing this paper - population was around 5.5 billion in 1994, exceeding 6 billion around 1998 or 1999, with 7.7 billion today (The World Bank a). We point out that it is significant that influential international agencies, such as the United Nations, and global financial institutions, such as the International Monetary Fund or IMF (e.g. Kunmakara 2017) and the World Bank (2019) assume that population increase is connected to economic growth, which in turn, is also seen as a 'good thing' (Kopnina and Washington 2016).

While recently some of these same international agencies seemed to have realized that population growth might not so much be a boon but a curse (The World Bank n.d. a) even for economic growth, the global rhetoric of the population question remains overwhelmingly optimistic, and thus there is no concerted effort to address population growth as a problem (Kopnina and Washington 2016; Washington et al 2019).

It has been argued that it is part of human nature to increase numbers when food and medicine are readily available (Rees 2010; Salmony 2019). However, not all humanity or for that matter all cultures behave the same in the age of effective contraception. Another significant factor for increasing population is the lack, or poor availability, of contraceptives, or knowledge of how to obtain or use them, particularly developing countries (Chipeta et al 2010; Wijkman and Rockström 2012), and also in developed nations in the case of lower economic status communities (Kelly and Fernandez 1993; Lamme et al 2017). In some cases, one can speak of the lack of basic human/women's rights (e.g. Ratcliffe 2018) that could protect against child bride marriage (Ezer et al 2006). This occurs at a remarkable level of 39,000 a day (UN 2013) and often results in millions of unwanted pregnancies (Wijkman and Rockstrom 2012; Engelman 2016; Crist et al 2017; Lamme et al 2017). Other factors concern cultural or religious taboos against using contraception and favoring having large families (Chipeta et al 2010; Sultan 2018).

Additional reasons are identified in the volume *Life on the Brink: Environmentalists Confront Overpopulation* (Cafaro and Crist 2012). This volume has many thoughtful contributions to the question about population and underlines the realization that human expansion seems to have resulted in denial of population growth. This is expressed in a crisis of perception in which humanity seems so:

ill-informed of its actual situation, so mesmerized by the imperative of infinite expansion, so deeply in denial of its suicidal trajectory, that it celebrates hitting seven billion ... and looks forward to adding another two or three billion by the end of the century (Hawkins 2012: 202).

The chapter authors in Cafaro and Crist (2012) are correct to point out that population growth is a major force behind our most serious ecological problems. However, the question of policy in various countries, or the fact that in some countries the birth rates have not declined – is not discussed in detail in that book. One of the issues is that, simply put, population growth is not *even in nature* across the globe. In some countries - notably most of some Sub-Saharan countries, where women have more than 7 children (World Population Review n.d.; UN's World Population Prospect 2019). As predicted by demographic transition theory (Campbell 2012), there are also countries below replacement level), which include Albania, Bahrain, Belarus, Bosnia and Hercegovina, Georgia, Iran, Italy, Japan, Korea (South), Lebanon, Macau, Malta, Portugal, Qatar, Russia, and Australia (World Population Review n.d.). The fertility rate in Niger, West Africa, is 7.1, but on the Mediterranean island of Cyprus, women are having just one child (Gallagher 2018; UN's World Population Prospect 2019).

In discussing population growth it is important to pay more attention to exactly what it is that differentiates countries with high fertility rates. This subject is particularly sensitive in developing countries, as accusations of racism and Western colonial 'meddling' are commonly made, especially when it comes to limiting childbirth (even when non-coercive measures are explicitly proposed). A dialogue is thus especially important since the issue of population growth has recently become a taboo charged with political correctness (Campbell 2012; Koprina and Washington 2016). Some types of policy, such as the one-child policy in China (The Economist 2016) and the former sterilization policy in India (Biswas 2014), have caused protests by human rights groups (Biswas 2014; The Economist 2016). Clearly, from almost *any* moral/ethical standpoint, *coercive* population measures can be seen as inhumane. Yet, the issue is not so much about misguided coercive policies but a total lack of *any* – voluntary, humane,

non-coercive, positive – policy at all. Some countries, in fact, actively stimulate greater population growth. One can argue that historically most coercion has been in the direction of forcing women to have more children than they wanted, due to limitations on birth control and abortion restriction.

In some countries having children is seen as a great investment in the economy, the military, etc. In many countries, high fertility is seen as a "good thing", as demonstrated by the pro-natalism policies evident such nations as: France (DW 2005); Scandinavian countries (The Local 2019); Spain (BFSC 2007); Germany (Reuters 2007); Russia (Telegraph 2017); Canada (MG 2018); and Chile (BAT 2019). Generally, higher population growth is seen as good for economic growth (which in itself is a problem if sustainability challenges are to be addressed). A young labor force is perceived as supporting pensioners or providing more people for the army to enhance military advantage over other countries.

It is important to get around this problem in stimulating non-coercive measures of family planning that can benefit both the planet and future generations of humans and nonhumans. One suggestion is provided by Eileen Crist (2012: 146) who has looked at the “best case studies” of policies in countries like Iran:

In numerous countries where such measures have been spearheaded by governments, backed financially and implemented competently, fertility rates swiftly declined. Iran is perhaps the most striking case of the results of a successful population policy: from an average of 5.5 children per woman in 1988, fertility declined to 1.7 in 2009. The catalyst of this transition was the reinstatement of Iran’s family planning program in 1989, coupled with an educational, cultural, and healthcare crusade to encourage and enable the choice of smaller families. Among other measures, this all-out effort included the creation of fifteen thousand health clinics to service rural populations, a campaign to raise women’s literacy, media programming to raise consciousness and disseminate information, and the provision of all forms of birth control free of charge (Brown 2011 in Crist 2012:146).

When looking at this type of successful policy, it is useful to understand what type of existing social and cultural climate existed in Iran prior to the introduction of this policy, what type of motivation was used by local politicians, the media, how was it translated into a publicly shared understanding and actual practice, and how the policy was received (to ensure its long-term effects). In the well-documented case of Iran, there was a concerted approach that included education at all levels, the provision of family planning advice and contraceptives, the removal

of financial incentives for large families and even the inclusion of religious leaders to avoid a perception that limiting family size was inconsistent with the teachings of Islam (Derer 2019a).

A similar concerted approach was successful in reducing the rate of population growth in Tunisia to replacement level (Derer 2019b).

**[figure 1 Tunisia]**



As in Iran, education of women, provision of family planning services and the enlistment of the support of religious leaders for what was described as a modern version of Islam were critical to the success of the program. These concrete examples show that culturally-sensitive, intelligent policy that incorporates a long-term vision of both ecosystem and human wellbeing can succeed in stabilizing the human population in a developing country.

There are some other positive signs. Even those organizations previously only interested in stimulating economic growth and industrial development in developing countries are starting to be more population-conscious (Gates Foundation n.d. - however, we note that Gates Foundation remains primarily focused on human welfare, as their slogan "all lives have value" does not extend to billions of nonhuman beings.). These include the World Bank n.d. a), the IMF, and some NGOs formerly only concerned with improving health and the economic

position of poor people. However, we suggest that greater consideration of the cultural background of countries with high population growth rates is needed.

**Non-coercive, voluntary solutions to reduce population growth**

Robert Engelman (2016) has proposed several excellent non-coercive solutions to reduce population growth:

1. Assure universal access to a range of safe and effective contraceptive options and family planning services for both sexes.
2. Guarantee education through secondary school for all, with a particular focus on girls.
3. Eradicate gender bias from the law, economic opportunity, health, and culture.
4. Offer age-appropriate sexuality education for all students.
5. End all policies that reward parents financially if they are based on the number of their children.
6. Integrate teaching about population, environment, and development relationships into school curricula at multiple levels.
7. Put prices on environmental costs and impacts.
8. Adjust to population aging rather than trying to delay it through governmental incentives or programs aimed at boosting childbearing.
9. Convince leaders to commit to ending population growth through the exercise of human rights and human development.

A key question is how have these proposed solutions been received? Similarly, to what extent are these policies applied by governments? Table 1 below indicates whether the solution is being applied in the three countries researched.

**Considering Engelman’s nine solutions for three case studies (Tanzania, Italy, Cambodia)**

**Table 1** summarises the status of the nine suggested Engelman’s solutions for three countries, Tanzania, Italy and Cambodia (source: compiled from internet research for these countries, see Appendix 1).

Solution	Tanzania	Italy	Cambodia
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1) Assure universal access to a range of safe and effective contraceptive options and family planning services for both sexes.	No	Yes	No
2) Guarantee education through secondary school for all, with a particular focus on girls.	No	Yes	Debatable
3) Eradicate gender bias from the law, economic opportunity, health, and culture.	No	Mostly	Debatable
4) Offer age-appropriate sexuality education for all students.	No	No	Debatable
5) End all policies that reward parents financially if they are based on the number of their children.	Debatable	No	Debatable
6) Integrate teaching about population, environment, and development relationships into school curricula at multiple levels.	No	Debatable	No
7) Put prices on environmental costs and impacts.	No	Unlikely	No
8) Adjust to population aging rather than trying to delay it through governmental incentives or programs aimed at boosting childbearing.	No	No	No
9) Convince leaders to commit to ending population growth through the exercise of human rights and human development.	No	No	No

The explanation of the responses for each case study is shown in Appendix 1.

### **Discussion of case study results**

The three countries discussed above are interesting examples to test Engelman's (2016) nine solutions. In regard to Tanzania, the environmental outlook for Tanzania is clearly

unsustainable (World Bank 2019), exacerbated by a high birth rate (5.2 babies per woman) leading to an annual population growth rate of 3% (Worldometer 2019a) with 63 percent of the population aged 24 or below (Omondi et al 2019; UN's World Population Prospect 2019). Tanzania fails in 8 of the 9 suggested solutions, and only solution five has been marked as 'Debatable' since while the government encourages more births it doesn't provide actual financial assistance. However, the 'bride price' system encourages child marriages and associated high birth rates (Girls Not Brides 2017) and would seem to be a cultural practice strongly supporting ongoing population growth. Notably, only 32 percent of the country's households use any form of contraception, though many women express a desire for this that remains unmet. It is projected that by 2050 the population of Tanzania could rise from 58 to 138 million (World Bank 2019). Population growth in Tanzania is out of control, and while NGOs struggle to assist, the government is failing to seek to stabilize this.

An obvious problem is the attitude of the government. Fertility rates have come down from almost 7 in the 1960s to the present level of 5.2 (The World Bank b) n.d.; UN's World Population Prospect 2019). However, in 2018, Tanzanian President Magufuli said that Western governments with "their family planning" should not meddle in population affairs, and actually urged its citizens to have more children (BBC 2018). As is clear from news articles, the Tanzanian President assumes that having more children is not counter-productive to reducing poverty but in fact, a larger population will serve the economy the way he thinks it did in China and Nigeria (Ng'wanakilala 2019). Ironically, he forgets about China's one-child policy, which has only recently been altered, and about the fact that Nigeria with its population of over 175 million is one of the world's poorest and most unequal (The World Bank n.d. b). Magufuli seems to believe that having a larger population will help stimulate economic growth and lift people out of poverty (Ng'wanakilala 2019). He re-assures citizens that they are 'safe' to have more children in his supposedly 'healthy' economy – by denying free access to contraception (Ratcliffe 2018), despite the data from the U.N. Population Fund (UNFPA) that shows Tanzania's population is growing by about 2.7 percent a year while most public hospitals and schools are overcrowded and many young people lack jobs (Ng'wanakilala 2019). Tanzanians' own perceptions (prior to the present Presidents "stimulus package") (e.g. Mosha et al 2013) as well as limitations to access to health care (Mbeba et al 2012), perceptions of early marriages (Mosha et al 2013), or social acceptability of certain sexual behaviors (Stark 2013) might all be contributing to relatively high birth rates.

Regarding Italy, it is an interesting case study as officially its population is in slow decline, though this may reflect poor statistics about the extensive influx of illegal

immigrants. Indeed, the Italian government is seeking to boost childbirth (Independent 2018). However, despite government policy, the TFR of Italy remains one of the lowest in Europe at 1.34 children per female. Regarding the nine Engelman strategies, the most interesting thing is that *only the first three* are actually in place (and the third not fully so). This suggests that these first three solutions are key to slow, then stabilize, population. As Engelman (2019) has suggested in personal communication, non-strategies are most strongly behind low fertility in Italy and some other countries – especially the lack of housing, women’s awakening to the unfairness of male refusal to bear childrearing and housekeep burdens, etc. Thus, access to contraception (and safe and legal abortion) is essential, but it must combine with a strong interest by women not to have more pregnancies and births than they want to have (Engelman 2019). It should be noted for solution six about environmental education that this is improving, but it would seem clear that the low TFR is not due to this (as it has only been in place for a few years). The same applies to the repricing of environmental costs, where change is happening but it is hard to say how serious this is. It clearly has not caused the low TFR. Regarding adjusting to population aging, while society may be doing this, it seems clear that the Italian government has no formal programs (at least at this stage). Resolution nine, the Italian Department of the Environment is encouraging green growth and the green economy, both arguably dubious in terms of accepting environmental reality (Twomey and Washington 2016; Washington and Maloney 2019). Overall, as a case study, Italy suggests that the first three of Engelman’s solutions are the most critical, with the other solutions assisting Italy to become more sustainable as a society, without necessarily being essential to stabilize the population.

Regarding Cambodia, the horrendous genocide of the Khmer Rouge regime claimed two million Cambodian lives out of a population of just over 8 million between 1975 and 1979 (Fitch 2015). Cambodia’s population has been recently on the rise, reaching over 16.5 million in 2019 (World Population Review 2019). In 2016, its youth aged between 10 and 24 comprised 35% of the population (UNFPA 2016a; UNFPA 2016b). Population recovery and rise are still greeted as a sign of political, economic and social success in overcoming the recent traumas of war, and also as a boon, a “demographic dividend”, the term, which is also used in relation to low fertility reducing dependence ratios, but in this case referring to high birth rates, and what is (wrongly) perceived as a driving force for financial development (Kunmakara 2017).

Without talking about country differences in birth rates, but also various policies and cultural differences, the generic recommendation to curb population for the ‘sake of future

generations' (not to mention the environment), we suggest will not work. Tanzania has a 3% growth rate (Worldometer 2019a) while Cambodia has a 1.46% growth rate (Worldometer 2019c) and Italy, in contrast, has a slightly negative growth rate (Worldometer 2019b). It is clear that family planning and contraceptive use is low in Tanzania and Cambodia (not being strongly supported by the government) and that child bride marriage is common, with its bride price driving the practice. Italy has virtually no child bride marriage (legally) and has excellent access to contraceptives and family planning, plus guaranteed access to female education. Italy has also largely addressed the worst aspects of gender bias, while Tanzania has not done so, and Cambodia only partially.

From these case studies, it seems clear that there are major cultural barriers in Tanzania and Cambodia that keep population growth rates high. The key cultural practice is child bride marriage, and one can only wonder what a difference it would make if this was made illegal? The other obvious problem in Tanzania and Cambodia is poor access to contraceptives and family planning, in part due to the failure of their governments to support these. The failure of education for girls in Tanzania and Cambodia is also clearly a major problem, along with a failure to eradicate most gender bias. It is notable in both Tanzania and Cambodia that NGOs seem to represent the positive path for change to reduce cultural barriers. Understanding such cultural barriers is essential to successfully implement Engelman's (2016) nine non-coercive solutions to overpopulation.

Additionally to these solutions, the cases above warn us to be sensitive to social and cultural contexts. There can be traditional or religious taboos against using contraception or historical and political background that influences the positive perception of having a large number of children. In Cambodia, for example, that has suffered war and genocide, having children can be also seen as a symbol of literal "revival" or "regeneration". In the case of Tanzania, a complex interplay between what can be seen as a Western idea of basic human/women's rights may be opposed to a traditional practice of child bride marriages and teenage pregnancies.

The cases of Italy, Iran, and Tunisia, which may in some way be considered "best practices" of lowering fertility, require an understanding of the role of local politicians, the media, and public perceptions in motivating smaller families. We suggest here that intelligent and humane policy, sensitive to country and cultural contexts, is needed to achieve a global reduction in population growth. The successful case studies listed above reinforce Lowe's conclusion (2016) that the birthrate is low where women are well educated, secure and in control of their fertility.

## **Conclusion**

We note that past and present growth in population, consumption and resource use and the economy are the key drivers of unsustainability. We have also noted that degrowth, the steady-state economy and the circular economy (and Cradle to Cradle vision) offer solutions for reorienting our economy to being one that is ecologically sustainable because it operates within ecological limits.

Regarding population, we praise Engelman (2016) for his nine non-coercive solutions to population growth. His strategies, arranged by own perceptions of descending effectiveness, however, still require more evidence in measuring their strength and testing which matter most (Engelman 2019). However, the case study of Italy suggests that the first three are most critical for stabilizing the population. This is consistent with Lowe's (2016) criteria. The cultural practice of child bride marriage in Tanzania and Cambodia is clearly a key barrier to reducing population growth. This could be addressed by a government ban, or perhaps more successfully by a change in society regarding what is deemed 'acceptable', catalyzed by the education of girls to at least to full secondary level. Education for girls (and their families) thus remains essential (Crist et al 2017). However, there remains a clear political block in Tanzania and Cambodia in regards to support for readily available contraceptives and family planning, and seemingly to eliminating the worst aspects of gender bias. The UN and international organizations can play a role, but national governments and educational campaigns, as well as local media, need to be leaders in such change.

In the case of population growth, we have outlined the fact that birthrates are not equal throughout the world. While the Tanzanian and Cambodian governments might be convinced that having more children is good for the country, if the citizens themselves can be educated and assisted to change, the birthrates may reduce markedly. We believe that statistics of poverty, mortality, and unemployment do not lie, and that smaller families *do* indeed tend to be healthier, wealthier, and certainly much better for the environment. In this regard, some of the countries in the Mediterranean present a good example of "best practices". We thus suggest that greater consideration of the cultural background of countries with high population growth rates is needed. Translating the Scientists' Warning to Humanity into culturally acceptable rhetoric is however an ongoing challenge.

## **Appendix 1 Details of case studies**

## A) Tanzania

[Figure 2 Tanzania]



### **1. Assure universal access to a range of safe and effective contraceptive options and family planning services for both sexes.**

**No.** Tanzania's President has urged women to stop taking birth control pills, saying the country needs more people (BBC 2018). Currently women have more than 5.2 children, one of the highest in the world (TG 2016). Pesacheck (2018) states only 32 percent of the country's households use any form of contraception. Sixty-one percent of married women ages 15-49 want to avoid pregnancy, but of these women, 22% are not currently using family planning, and the percentage of women who want to avoid pregnancy but are not using contraceptives has remained constant, around 22-24% since 1999 (Vital 2018). The availability of contraception remains problematic (Moshia et al 2013; Ratcliffe 2018).

### **2. Guarantee education through secondary school for all, with a particular focus on girls.**

**No.** Secondary school enrolment rate in Tanzania is as low as 31 percent, and the percentage for girls in Tanzania is even lower. An estimated 5.1 million children aged 7 to 17 do not attend school. Only 52 percent of the children in Tanzania are enrolled in secondary school

and even fewer complete it. World Bank Data reports that less than one-third of all girls in Tanzania graduate. One of the greatest obstacles to girls' education is that a child may have to walk up to 2 hours to attend school (Borgen n.d.). Another obstacle to girls' education is *child bride marriage*. Two out of five girls in Tanzania are married before they turn 18. This inevitably leads to young pregnancies and thus the necessity to drop out of school (Ibid).

**3. Eradicate gender bias from law, economic opportunity, health, and culture.**

**No.** The FAO (2014) notes that Tanzania is primarily a rural nation, and women in rural areas, are often disadvantaged in terms of decent work and income-generating opportunities owing to limited access and control over resources. USAID (2019) notes that Tanzanian women and girls remain among the most marginalized and underutilized citizens in sub-Saharan Africa.

**4. Offer age-appropriate sexuality education for all students.**

**No.** Tanzania has one of the youngest populations in the world, with 63 percent of the population aged 24 or below (Omondi et al 2019). Young people in Tanzania are interested to learn about topics such as sexual decision-making, sexual pleasure and contraception, but only the topic of HIV and AIDS and sexually-transmitted infections is covered by the Tanzanian school curriculum (Ibid).

**5. End all policies that reward parents financially if they are based on the number of their children.**

**Debatable.** While the Tanzanian President encourages more births (BBC 2018), there does not appear to be 'financial' reward for doing so *from the government*. However, 37% of girls in Tanzania are married before their 18<sup>th</sup> birthday, largely because of family poverty and the fact that the *bride price* helps families economically (Girls Not Brides 2017).

**6. Integrate teaching about population, environment, and development relationships into school curricula at multiple levels.**

**No.** Makundi (2003) notes that the school curriculum is not adequately implemented due to poor definition of environmental education in early policy documents. Pallangyo (2007) points out that environmental laws do refer to 'environmental education' but that these laws do not adequately address environmental issues. Beatus and Mzingira (2008) note that education authorities have failed to integrate environmental education into the formal education system. There is no reference to 'population' in the above references. While good work is being done by environmental NGOs, there is little integrated teaching about population and environment in the curricula (AAEA 2017).

**7. Put prices on environmental costs and impacts.**

**No.** The World Bank Group (2019: 16) notes that Tanzania might be shifting toward an unsustainable development trajectory’, but there is no reference to environmental pricing being used in Tanzania, other than ‘The Equitable Payments for Watershed Services’ scheme in the Uluguru Mountains.

**8. Adjust to population aging rather than trying to delay it through governmental incentives or programs aimed at boosting childbearing.**

**No.** The Tanzanian President is promoting higher birth rates (BBC 2018) and Tanzania has a TFR of 5.2.

**9. Convince leaders to commit to ending population growth through the exercise of human rights and human development.**

**No.** Tanzania’s President is encouraging further population growth (BBC 2018). Also, the poor record of Tanzania in regard to gender equity indicates it is not promoting human rights (nor considering its environmental degradation, the ‘rights of nature’).

**B). Italy**

**1. Assure universal access to a range of safe and effective contraceptive options and family planning services for both sexes.**

**Yes.** The World Bank (2013) reported in 2013 that 65% of women age 15-49 use contraceptive methods. However, it has been reported by Statista (2019) that in 2018 this was 95%.

**2. Guarantee education through secondary school for all, with a particular focus on girls.**

**Yes,** secondary education for all, though there is no specific focus on girls. 96% of women in Italy undertake secondary education, and 72.4% undertake tertiary education (WEF 2018: 188).

**3. Eradicate gender bias from law, economic opportunity, health, and culture.**

**Mostly.** While the legal infrastructure to promote gender equality is in place in Italy, there is insufficient help for many women to be able to combine both paid work and caring for children, and wage gaps continue to be significant (up to 25%). The Italian fertility rate is one of the lowest in the world. Increasing accessibility to childcare, both in terms of affordability and regional availability is claimed will help mothers to enter the workforce earlier (WG n.d.).

#### **4. Offer age-appropriate sexuality education for all students.**

**No**, as Italy is one of the few EU member states where sex education is *not* compulsory, and to date there has been no law enacted on the matter. As such, sexuality education is still not formally part of any teaching and education ministerial program. The consequence is that initiatives and activities remain uneven across the country, and dependent on the willingness and financial availability of schools, associations and non-governmental organizations (GENPOL 2018). This does not mean that there is not significant sexuality education taking place, simply that it is not being promoted by government.

#### **5. End all policies that reward parents financially if they are based on the number of their children.**

**No**, as Italy's right-wing government is now offering plots of State-owned land to be managed by families for 20 years if they have a third child between 2019 and 2022 (Independent 2018).

#### **6. Integrate teaching about population, environment, and development relationships into school curricula at multiple levels.**

**Debatable.** Change does seem to be occurring, as environmental education became a compulsory subject, from nursery to upper secondary education, from 2017. It is said the program will range: 'From the recycling of waste to the protection of the sea and the territory, from biodiversity to sustainable food' (ANSA 2015). However, there is no mention whether it will teach about the relationship between *population* and the environment. A National System for Environmental Education, Information and Training (INFEA) has been established with 140 Environmental Education Centres (IMET 2015).

#### **7. Put prices on environmental costs and impacts.**

**Overall unlikely**, though some change may be in its infancy. In 2016 UNEP and the Italian Ministry for the Environment published a document 'Financing the Future', claiming: 'A shift towards sustainable finance is underway' (UNEP 2016), without focusing on population or focus on reducing consumerism (Twomey and Washington 2016). Its other focus is climate change and renewable energy. The report concludes that it is a: 'first milestone in what must become a robust ongoing process'.

#### **8. Adjust to population aging rather than trying to delay it through governmental incentives or programs aimed at boosting childbearing.**

No, the Italian government is lamenting what it sees as its flagging birthrate and seeking to boost childbirth by offering land to families if they have a third child (Independent 2018).

**9. Convince leaders to commit to ending population growth through the exercise of human rights and human development.**

No, the Italian government is clearly not trying to convince leaders in business or the community to end population growth. Rather it is seeking to reinstate more growth (Independent 2018).

**B) Cambodia**

**[Figure 4 Cambodia]**



1. Assure universal access to a range of safe and effective contraceptive options and family planning services for both sexes.

**No.** Despite the increase in contraceptive use in Cambodia in the last decade, Cambodia has the lowest contraceptive prevalence rate in Asia (PRB 2003), with the unmet needs of family planning among general population consistently high (Nakaie et al 2014; WHO 2017). Almost one in five girls in Cambodia are married before their 18th birthday and 2% are married before the age of 15 (Girls Not Brides n.d.).

**2. Guarantee education through secondary school for all, with a particular focus on girls.**

**Debatable.** While efforts at universal education has been made country-wise, there are high rates of (rural) school drop-outs, and gender inequality in access to education remains poor (Velasco et al 2004; No et al 2016; OECD n.d.; OECD 2018). The Cambodian government however has attempted to eliminate gender disparities in access to education (Open Development n.d.).

**3. Eradicate gender bias from law, economic opportunity, health, and culture.**

**Debatable.** Cambodia has made some progress in addressing women's rights and adjusting law (Licadho 2014), is striving towards gender equality in labor market (ADB 2013), providing more equal economic opportunities (ADB 2015), as well as greater access to health (WHO 2015). As far as "cultural services" are concerned, the situation is unclear, and gender bias in Cambodia and violence against women exists (Eisenbruch 2018).

**4. Offer age-appropriate sexuality education for all students.**

**Debatable.** Access to quality sexual and reproductive health education for adolescents and youth remains limited in Cambodia (UNFPA 2016a; UNFPA 2016b). This limited access to sexual education is compounded by other factors that restrict educational opportunities, as named above (Velasco et al 2004; No et al 2016; OECD 2018).

**5. End all policies that reward parents financially if they are based on the number of their children.**

**Debatable.** No such government policies seem to be in place. Intergenerational relations and financial support are still ad hoc and family-based (ILO 2006; OECD n.d., OECD 2017; OECD Development Centre 2017). However, child bride marriage is a cultural assister of population growth as it provides financial assistance to the girl's family

**6. Integrate teaching about population, environment, and development relationships into school curricula at multiple levels.**

**No.** Some progress on environmental education, but environment and population are not really discussed (Smith and Bunthan 2016).

**7. Put prices on environmental costs and impacts.**

No. Cambodian government seems mostly concerned with economic development (OECD n.d.; UN 2012 )

**8. Adjust to population aging rather than trying to delay it through governmental incentives or programs aimed at boosting childbearing.**

No. No indication of such a shift (OECD 2017)

**9. Convince leaders to commit to ending population growth through the exercise of human rights and human development.**

No. No indication in literature that population growth is linked to the issues discussed above.

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