

COMMENTARY:

Biophysical limits, women's rights and the climate encyclical

Paul R. Ehrlich and John Harte

The Pope has made a strong call for action on climate change, but it fails to address the complex linkages between sustainable development and demographic growth.

The Pope's recent encyclical on climate change is a passionate and compelling call for dramatic changes in society to match the global changes in the environment that threaten the future of human civilization as we know it (<http://go.nature.com/7IbiB5>). But it overlooks a crucial incompatibility at the heart of the climate change problem: marrying shared and sustainable development with demographic growth.

The encyclical's narrow perspective is revealed in the following excerpt: "Instead of resolving the problems of the poor and thinking of how the world can be different, some can only propose a reduction in the birth rate. At times, developing countries face forms of international pressure which make economic assistance contingent on certain policies of 'reproductive health'. Yet while it is true that an unequal distribution of the population and of available resources creates obstacles to development and a sustainable use of the environment, it must nonetheless be recognized that demographic growth is fully compatible with an integral and shared development. To blame population growth instead of extreme and selective consumerism on the part of some, is one way of refusing to face the issues" (§50).

A close look at the full complexity of the interconnected demographic, biophysical, economic, and social dimensions of the global environmental situation suggests that demographic growth is not compatible with either shared development or with a sustainable environment. The encyclical portrays a world in which a real choice exists between confronting population growth on the one hand, and avoiding that option by more equitably distributing resources on the other.

Attempts to frame the issue as solvable by either more equitable distribution or by restricting the number of people miss two essential factors that link these differing viewpoints. One is the ever-dwindling pool of

resources and ecosystem services as a result of the demands of a growing population on the environment. The second is the increasing difficulty of achieving the forms of governance needed to more equitably distribute resources on an ever more crowded planet.

Population growth

Demographic trends along with rampant consumption by the rich are the major drivers of environmental degradation. More people using more fossil fuels means more climate change; more people eating more food means more land conversion (with associated loss of biodiversity), more overdraft of groundwater for irrigation, and more pressure on threatened marine resources; and more people consuming more material goods potentially means more toxic waste products and more mining.

People today and their children, no matter where they are born, will put even more pressure on the environment than in the past due to demand for virtually every resource, from agricultural land and water to copper and oil. Human beings are smart and pick the low-hanging fruit first: they

farm the richest soils first, drink the cleanest and closest water first, and tap the shallowest pools of oil first. They exploit the resources that are cheapest and that generally result in the least environmental impact first.

As more people consume more resources, humanity is left with poorer quality, more expensive resources, the exploitation of which causes more harm. For example, when people first became interested in copper it was lying around on the surface — almost pure in some places. Now, using much more commercial energy, it is mined at depths of almost two miles where ores are three per cent copper or less, with greater consequent environmental impacts per pound produced.

Moreover, as population and consumption degrade air, water and soil quality, as well as climate and biodiversity, the damages act upon each other in a manner that reinforces the deterioration^{1,2}. Thus global warming threatens forests and biodiversity, while forest degradation and biodiversity loss alter climate and threaten water supply, air quality and soil fertility. Soil loss and desertification force farmers to exploit more marginal lands, resulting in yet more erosion, greater need for irrigation water, fertilizers, and herbicides, and more clear-cutting of valuable habitat, all contributing to further loss of biodiversity. More energy intensive methods of compensating for any of the above damage results in greater disturbance of the climate and pollutes the air and water.

But those kinds of destructive linkages arise not only from biophysical factors. Demographic, environmental and institutional factors are deeply interconnected, further adding to the dilemma. From villages to nations, egalitarian systems of governance and resource distribution do not flourish when communities lack basic resources. Great inequalities in wealth or income can affect governance systems, leading (for example), to the nutritional needs of the poor not being properly met. Well-financed attempts to



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reduce or terminate programs to feed the poor in the United States demonstrate how sound governance can be undermined by the rich.

Resource scarcity

Human numbers are overwhelming critical infrastructure, in many, if not most, areas, as ecological deterioration and even devastation is simultaneously reducing many peoples' means of subsistence. Under such circumstances people have less time to seek social justice because they must spend more time focusing on survival. Inundated island nations in the Pacific and Indian Oceans, and the rising flood of refugees crossing the Mediterranean, provide just a tiny preview of how these pressures will play out.

The prospects for future global food security exemplify this situation. Contrasting insufficient food versus inequitably distributed food may seem a caricature but as the encyclical reminds us, discussions on sustainability often polarize into these seemingly opposing viewpoints.

Despite the general agreement on many of the ecological challenges, discussions on sustainability often divide experts about whether the solution lies in dealing with population growth and consumption, or making food distribution more equitable. This is also true of those who argue that it is consumption alone that results in excessive carbon emissions. Focusing on only half the source of, or half the potential solution to, a complex problem can be nearly as ineffective as ignoring the problem altogether, when both factors jointly determine the outcome.

Policymakers and the academic community must recognize that equity issues make adequately feeding everyone extremely difficult. But they must also recognize that biophysical constraints limit our ability to feed more than a certain number of people, even under the most equitable of distributional arrangements. Most importantly, they must acknowledge that our biophysical and social dilemmas are tightly linked, and that as population grows the capacity of social systems to deal with the tightening biophysical constraints shrinks.

The basic task of supplying the population's needs for calories and nutrients is not being met now. Some 800 million of today's 7.3 billion people are undernourished and perhaps half of the world's people — most, but not all, in poor and middle-income nations — lack access to one or more essential nutrients^{3,4}. Even when adequate calories are available, diets are often far from ideal, increasing the burden of disease. Indeed, inadequate consumption of fruits, nuts, seeds, and vegetables makes a major contribution to ill health worldwide. In short, current struggles to feed humanity make the prospects seem slim for the expected 9.7 billion people in 2050 to be healthy and have adequate nutrition — and perhaps billions more beyond that^{5,6}.

As abhorrent as our current resource inequities are, they could pale in comparison with the impending inequity between those alive today and those who will be born tomorrow. Future populations,

under current trends, will inherit a rapidly deteriorating planetary life support system. We envision no quick fixes or shortcuts. Those who champion increased equality as a means of achieving global food security must team up with those who urge curbing over-consumption and humane transitioning to a much reduced and thus sustainable population. Otherwise, the new political and economic institutions desperately needed to redirect humanity toward sustainable food security and away from the fiction of perpetual growth will not evolve.

Pope Francis needs to heed his own comments⁷ on the Church's "obsession" with contraception and abortion, and assume a leadership position in support of women's rights and family planning. There is little chance that the existential challenge facing humanity will be met if the call for dramatic change in society is not expanded to embrace the global demographic dilemma. □

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References

1. Barnosky, A. *et al.* *Nature* **486**, 53–58 (2012).
2. Harte, J. *Biodivers. Conserv.* **5**, 1069–1083 (1996).
3. Myers, S. *et al.* *Nature* **510**, 139–142 (2014).
4. Tilman, D. & Clark, M. *Nature* **515**, 518–522 (2014).
5. Ehrlich, P. & Ehrlich, A. *Proc. R. Soc. B* **280**, 20122845 (2013).
6. Ehrlich, P. & Harte, J. *Int. J. Environ. Stud.* <http://dx.doi.org/10.1080/00207233.2015.1067468> (2015).
7. Goodstein, L. Pope says Church is 'obsessed' with gays, abortion and birth control. *The New York Times* (19 September 2013); <http://go.nature.com/JQqQaj>

COMMENTARY:

The Pope's encyclical as a call for democratic social change

Anabela Carvalho

The climate change encyclical represents a decisive democratic act. It calls on citizens to challenge dominant politics, power, and consumer culture in the name of tackling one of the world's great socio-environmental issues.

The Pope's climate change encyclical (<http://go.nature.com/7IbiB5>) injects democratic politics into the environmental crisis by showing how it is tied to wider sociocultural processes at the heart of modern societies. Through an integrative

critical analysis, the encyclical reclaims climate change from the exclusionary realm of technocracy and political-economic elites and calls for an "honest and open debate so that particular interests or ideologies will not prejudice the common good" (§188).

The words dialogue, debate and discussion are found throughout the document: from the Pope's expressed aim of inclusive conversation ("I would like to enter into dialogue with all people about our common home" (§3)), to his call for