



# Vallentyne was right: achieving sustainability requires accounting for all relevant factors

William N. Ryerson\*

Population Institute and Population Media Center, PO Box 547, Shelburne, Vermont 05482, USA

**ABSTRACT:** Population has waxed and waned as an issue of public consciousness and action by policymakers. The issue is on the ascendancy again in part because of climate change and food crises caused by escalating food prices, the energy crisis and growing shortages of fresh water. In the face of these problems, attempts of some governments to stimulate higher birth rates, over concern with aging populations, are misplaced and counterproductive. Vallentyne's long-neglected 'demotechnic index' holds new promise for considering both population numbers and consumption rates when evaluating the impact of humans on the environment. Its appearance in publication now is all the more important because of the failure of political leaders to act on the numerous expert warnings issued over several decades regarding the impact of human population growth and expanding utilization of resources. Thus, the world community needs to act urgently to utilize the demotechnic index of Jack Vallentyne to look holistically at ways to achieve a sustainable society.

**KEY WORDS:** Population · Sustainability · Demotechnic index · Aging concerns

*Resale or republication not permitted without written consent of the publisher*

## INTRODUCTION

This paper, along with Hurlbert (2012, this issue) and Mata et al. (2012, this issue), form a triad of papers appraising the work of Jack Vallentyne. The latter paper was originally presented by Vallentyne at the 1994 International Conference on Population and Development in Cairo. The publication of this third paper for the first time here is a result of the dogged efforts of F. J. Mata, L. J. Onisto, and S. H. Hurlbert. It is an important contribution to the cause of achieving global sustainability.

Indeed, achieving global sustainability has been a central concern of many ecologists and other scientists during the last 50 yr. The pillars of sustainability—population, consumption, waste patterns, and technology—have waxed and waned in the public consciousness. In the 1970s, population was often seen as the central issue, but Jack Vallentyne also called on scientists to recognize the importance of

consumption. His work today calls on the global community not to forget the population factor and to take a balanced approach in looking at all relevant factors that will ultimately determine whether human civilization is sustainable over many more millennia or is a short-term experiment gone awry.

Indeed, the number of people on the planet would not matter if we were ethereal beings. Our economic activity, i.e. our consumption of resources and our production of wastes, makes our numbers matter.

### At one time, population was a visible issue

In the 1970s, the concern with the number of humans focused on developing countries in part because of the evidence that large family size was a leading cause of poverty and thus that rapid population growth would prevent economic development. Environmental concerns centered on deforestation

\*Email: ryerson@populationmedia.org

and loss of the biodiversity found in many developing countries.

Because developed countries had the resources to address pollution problems and since most had undertaken significant pollution abatement efforts starting in the 1960s, there was relatively little concern in the 1970s about population growth in developed countries. In part, this was the case because many developed countries had achieved very low fertility rates. Migration from developing to developed countries was relatively small as a contributor to population growth of the latter and was seen by many as having zero net environmental impact. In addition, since the goal of most societies was, first and foremost, economic growth, migration was often viewed as an unmitigated positive because of the impact it had on the economic status of migrants and, more broadly, on corporate profits.

### **How population became taboo**

President Reagan declared that population was, at worst, a neutral factor. That position, plus the backlash against legalized abortion in the United States, made concern with population issues politically incorrect (Ryerson 1999). By the time of the second world population conference in Mexico City in 1994, discussion of population had all but disappeared from consideration by those working in the environmental sustainability arena.

More recently, concern about climate change, combined with the prospect of peak oil and fresh water shortages, has led some environmentalists to conclude that the only environmental concern of merit was high (read 'excessive') consumption and waste by developed countries. Reducing the ecological footprint of individuals in developed countries, but not the number of footprints, became a new mantra that still dominates the materials produced by many environmental organizations. This concern was expressed in ways that steered clear of 2 important sustainability factors: population growth and economic growth. The 1994 International Conference on Population and Development held in Cairo reinforced the belief by some that concern with population per se could lead to loss of a rights-based approach to women's reproductive health (Campbell 2005).

Within the last few years, the Center for the Advancement of the Steady State Economy (CASSE), the Gund Institute for Ecological Economics at the University of Vermont, the Institute for Sustainable Solutions at Portland State University, and other

groups have attempted to draw the public's attention to the fact that resource limitations must lead to a state of non-growth of the global economy, even as developing countries struggle to increase per capita incomes. Selling the idea of global economic stagnation is certainly an uphill battle, but these organizations are trying to force those who lament 'overconsumption' to look at the drivers of such consumption found within economic systems.

### **Resurgence of the population issue**

Simultaneously, the food crises of 2008 and 2011 have helped to spark a resurgence of interest in the population factor. The IPAT (impact = population × affluence × technology) formula (Ehrlich & Holdren 1972) and the ecological footprint concept have continued to point to the fact that population, consumption (or affluence), and technology are all factors in environmental impact and that omitting any one from consideration is a recipe for failing to take the steps necessary to achieve national or global sustainability.

### **False concern with aging populations**

Despite growing evidence of global overshoot, many developed countries have acted as if there were no limits to growth of numbers or economic activity, offering financial incentives to people to have babies and increasing flows of immigration while simultaneously rationing use of water or other resources because of growing shortages, urging employers to stagger working hours because of worsening traffic jams, and taking extraordinary steps to obtain increasingly scarce, risky, and expensive energy resources.

Indeed, many economists try to scare the public in developed countries into thinking that aging populations are a problem (Wong 2010, Heinberg 2011, Spies-Butcher 2011). They describe how aging will make a nation's populace less innovative and vibrant. They wring their collective hands over the impact on the working population of having to care for so many retirees. Ultimately, they urge incentives for population growth, both to increase the birth rate and net immigration. These arguments are based on a view of the future that is, in reality, a Ponzi scheme. Endless growth of the population is impossible, and additional young people and working age immigrants will grow older and need support.

Instead, we should be celebrating aging societies, not trying to find ways to stimulate higher birth rates. Since the world's population growth must stop at some point, each country should move toward a system that does not rely on ever-increasing numbers of people to support the elderly or to maintain economic welfare. In fact, incentive programs like those in Australia, France, and Germany, if they are successful, will only make the 'dependency ratio' worse by adding babies (who are 100% dependent) to the burden on the working population. Many of the elderly in most developed countries have savings that make them able to live independently for many years of retirement. More important, raising retirement ages to reflect greater longevity and working capability of the elderly and making adjustments to pension program formulas are a much faster fix for the pension burden than trying to add more children, who likely won't become productive economically for a couple of decades. In addition, paying incentives to people to have babies has 2 major flaws as a use of public funds:

(1) Those who would have children without such incentives benefit from a subsidy that will not influence their childbearing decisions; and

(2) Those who only have children in response to the incentives are responding to a payment that is far below the cost of raising children to adulthood. This means that the state is providing incentives to those with the worst motivations for becoming parents.

In short, we need to plan for non-growing and probably shrinking populations and not try to postpone the day when those goals are achieved. Otherwise, we face serious environmental and social problems. Indeed, if we have a climate crisis, a biodiversity crisis, a water crisis, an energy crisis, and a food crisis, no country should be trying to stimulate higher birth rates.

### Vallentyne to the rescue

The demotechnic index (or D-index) of Vallentyne (Mata et al. 2012) is a useful contribution to the field of sustainability because it helps one to focus on the fact that both numbers of people and their economic activities are important factors in determining whether a society can achieve sustainability. It allows quantification via energy use rather than the less easily quantified concepts of affluence, technology, and consumption.

Vallentyne's writings in the area of population and consumption were fewer and not nearly as well

known as those of Paul and Anne Ehrlich, John Holdren, Dennis and Donella Meadows, and Garrett Hardin. Yet his D-index is a useful improvement on the IPAT formula. Thus, Hurlbert's (2012) paper introducing us to the man behind this innovation will be of interest to those in the population and sustainability field.

By the 1990 D-index values presented by Mata et al. (2012), we find that the USA is the most planet-damaging country and Canada is close behind India as the sixth and fifth most damaging, respectively, when population numbers are adjusted by energy consumption.

### FAILURE OF POLITICAL LEADERSHIP

However, because of the profits realized by some corporations as a result of population growth and high consumption levels, especially those in the construction industry, the politicians that they support will likely continue to duck these issues. Indeed, they have been doing so for decades. They have been enabled in their neglect of these issues by news media and environmental nongovernmental organizations (NGOs) that are too timid to challenge the 'business as usual' approach.

The failure of political leaders to address population and consumption issues over the last half century has generally not been the result of lack of access to information about the problem. Indeed, there have been a series of high-level warnings to global leaders that many have heard but have chosen to ignore, hoping to duck the controversy or extend the profits of population growth realized by a few business leaders who were contributors to their political campaigns. Here is a sampling of the warnings given to American leaders and to the world.

#### (1) The work of Paul and Anne Ehrlich, including *The Population Bomb*

In 1968, the Sierra Club and Ballantine Books published *The Population Bomb*, which was a joint effort of Stanford biologists Paul and Anne Ehrlich (Ehrlich 1968). It became an instant bestseller. Combined with speeches given by Paul Ehrlich all over the USA and extensive media interviews (including more than 20 interviews on the *Tonight Show* with Johnny Carson), the 'Bomb' was responsible for launching the modern population movement and for making population a central focus of the first Earth Day in 1970.

Ehrlich, Yale biologist Charles Remington, and Connecticut attorney Dick Bowers founded Zero Population Growth (ZPG) following a talk Ehrlich gave at Yale in 1968. The organization (now called Population Connection) grew at its height to 60 000 members and 600 chapters. In the mid-1980s the national board of ZPG decided it did not want to advocate for lower immigration levels and so gave up advocacy for US population stabilization. The board of the California chapter dissented, however, and split off to form Californians for Population Stabilization (CAPS), for which Stuart Hurlbert has served as board secretary since 2001.

The Ehrlichs' book was attacked when it was published and has regularly been ridiculed since that time. However, the warnings it contained were all couched in hedged terms common to scientific authors, indicating that the possible outcomes of overpopulation were not so much firm predictions as they were likely to occur if population growth remained at 1968 levels. The alarm raised helped to move the US government and other donor countries to invest large sums in making family planning services available around the world, which led to reductions in fertility rates and slowed the growth of world population. At the same time, the Green Revolution of the 1970s led to dramatic increases in grain production in countries like India and China, averting the immediate threat of massive starvation. However, Nobel Peace Prize laureate Norman Borlaug stated clearly that the Green Revolution he led would only buy the world community 30 yr in which to stop the 'population monster' or the developing world would face even greater famines than the one he had helped to avert.

In retrospect, the Ehrlichs believe *The Population Bomb* was too optimistic (Ehrlich & Ehrlich 2009, Turner 2009). For while the Green Revolution averted a global catastrophe at the time, about 300 million people have died of malnutrition since then. The Green Revolution crops, depending as they do on petroleum-based pesticides and fertilizers and large quantities of fresh water, face an uncertain future as all 3 of these resources become less available.

## (2) Publication of *The Limits to Growth*

Many corporate leaders and politicians scoffed when *The Limits to Growth* was published (Meadows et al. 1972). A careful analysis of the trends in utilization of resources, the Club of Rome-sponsored publi-

cation gave clear evidence that humanity was on a collision course with resource exhaustion. In 2009, Dennis Meadows, one of the co-authors of the report, said that human civilization is following the projections the authors forecast in 1972 (also see Turner 2008). However, except for the scientific community, the report generated no discernable action by world leaders.

## (3) President's Commission on Population Growth and the American Future

In July 1969, President Nixon proposed the creation of a Commission on Population Growth and the American Future (CPGAF). At the time, he stated, 'One of the most serious challenges to human destiny in the last third of this century will be the growth of the population. Whether man's response to that challenge will be a cause for pride or for despair in the year 2000 will depend very much on what we do today' (CPGAF 1972, p. 3)

In 1972, the Commission released its final report urging the country to move quickly toward population stabilization (CPGAF 1972). Headed by John D. Rockefeller III, the 'Rockefeller Commission' strongly urged that America give up its addiction to growth. While many Americans heeded the message and the fertility rate fell to replacement level within a year of the report's presentation, policy makers did not pay much attention. The President had other things on his mind, and 2 yr later, he resigned from office because of the Watergate scandal. Since that time, the US population has grown by over 100 million people, in significant part because of immigration.

The CPGAF recommended, among other things, that America act to end illegal immigration and to set legal immigration at 400 000 people per year. The CPGAF determined that 'the health of our country does not depend on [population growth], nor does the vitality of business, nor the welfare of the average person.' (J. D. Rockefeller, letter to President Nixon, available at [www.population-security.org/rockefeller/001\\_population\\_growth\\_and\\_the\\_american\\_future.htm](http://www.population-security.org/rockefeller/001_population_growth_and_the_american_future.htm)) Since the report was issued, annual legal immigration has quadrupled, and illegal immigration has mushroomed.

In the opening paragraph of its first chapter, the CPGAF (1972) report said,

In the brief history of this nation, we have always assumed that progress and 'the good life' are connected with population growth. In fact, population growth has frequently been regarded as a measure

of our progress. If that were ever the case, it is not now. There is hardly any social problem confronting this nation whose solution would be easier if our population were larger. Even now, the dreams of too many Americans are not being realized; others are being fulfilled at too high a cost. Accordingly, this Commission has concluded that our country can no longer afford the uncritical acceptance of the population growth ethic that 'more is better.' And beyond that, after two years of concentrated effort, we have concluded that no substantial benefits would result from continued growth of the nation's population.

Perhaps the CPAFG most widely cited recommendation read, 'Recognizing that our population cannot grow indefinitely, and appreciating the advantages of moving now toward the stabilization of population, the Commission recommends that the nation welcome and plan for a stabilized population.' The CPAFG report goes on to state, 'In short, we find no convincing economic argument for continued national population growth.'

#### (4) The 'Warning to Humanity'

If we don't halt population growth with justice and compassion, it will be done for us by nature, brutally and without pity—and we will leave a ravaged world.  
Henry Kendall

In 1992, 1700 of the world's scientists, including the majority of Nobel Laureates in the sciences, signed a 'Warning to Humanity' written by the late Henry Kendall, chair of the Union of Concerned Scientists (Kendall 1992). For the full text, see [www.ucsusa.org/about/1992-world-scientists.html](http://www.ucsusa.org/about/1992-world-scientists.html).

The 'Warning to Humanity' stated clearly the need to stabilize population numbers and change the course of human civilization. The 'Warning' identifies a range of critical stresses on the environment, including the atmosphere, water resources, oceans, soil, forests, living species, and population. Following are the highlights of the statement on population and the conclusion:

##### Population

The earth is finite. Its ability to absorb wastes and destructive effluent is finite. Its ability to provide food and energy is finite. Its ability to provide for growing numbers of people is finite. And we are fast approaching many of the earth's limits. Current economic practices which damage the environment, in both developed and underdeveloped nations, cannot be continued without the risk that vital global systems will be damaged beyond repair.

Pressures resulting from unrestrained population growth put demands on the natural world that can over-

whelm any efforts to achieve a sustainable future. If we are to halt the destruction of our environment, we must accept limits to that growth.

No more than one or a few decades remain before the chance to avert the threats we now confront will be lost and the prospects for humanity immeasurably diminished.

##### Warning

We the undersigned, senior members of the world's scientific community, hereby warn all humanity of what lies ahead. A great change in our stewardship of the earth and the life on it is required, if vast human misery is to be avoided and our global home on this planet is not to be irretrievably mutilated.

#### (5) Statement by the National Academies of Sciences of 58 nations

In 1994 the scientific academies of 58 nations came together to warn that humankind must stop looking to science alone to solve problems caused by overpopulation (Science Summit on World Population 1994). The full statement can be found at <http://dieoff.org/page75.htm>. Highlights of the academies' statement follow:

##### Population growth, resource consumption, and the environment

[...] As human numbers further increase, the potential for irreversible changes of far reaching magnitude also increases. Indicators of severe environmental stress include the growing loss of biodiversity, increasing greenhouse gas emissions, increasing deforestation worldwide, stratospheric ozone depletion, acid rain, loss of topsoil, and shortages of water, food, and fuel-wood in many parts of the world. [...]

##### The earth is finite

The growth of population over the last half century was for a time matched by similar world-wide increases in utilizable resources. However, in the last decade food production from both land and sea has declined relative to population growth. The area of agricultural land has shrunk, both through soil erosion and reduced possibilities of irrigation. The availability of water is already a constraint in some countries. These are warnings that the earth is finite, and that natural systems are being pushed ever closer to their limits. [...]

But time is short and appropriate policy decisions are urgently needed. [...] In our judgment, humanity's ability to deal successfully with its social, economic, and environmental problems will require the achievement of zero population growth within the lifetime of our children. [...]

Reducing fertility rates, however, cannot be achieved merely by providing more contraceptives. The demand for these services has to be addressed. Even when family planning and other reproductive health services are widely available, the social and economic status of women affects individual decisions to use them. The ability of women to make decisions about family size is greatly affected by gender roles within society and in sexual relationships. Ensuring equal opportunity for women in all aspects of society is crucial. [...]

#### Action is needed now

Humanity is approaching a crisis point with respect to the interlocking issues of population, environment, and development. Scientists today have the opportunity and responsibility to mount a concerted effort to confront our human predicament. But science and technology can only provide tools and blueprints for action and social change. It is the governments and international decision-makers ... who hold the key to our future. We urge them to take incisive action now and to adopt an integrated policy on population and sustainable development on a global scale. With each year's delay the problems become more acute. Let 1994 be remembered as the year when the people of the world decided to act together for the benefit of future generations.

### **(6) The President's Council on Sustainable Development**

In 1993, President Clinton established the President's Council on Sustainable Development (PCSD) to advise him on sustainable development and create 'bold, new approaches to achieve our economic, environmental, and equity goals'. The Council served from 1993 to 1999. Among the recommendations of the PCSD was a move toward the stabilization of the US population (PCSD 1999).

In the 1990s, the USA was the only major industrialized country experiencing significant population growth. The PCSD (1999, Ch. 1, p. 3) report stated:

Annual growth figures of ... 1.0 percent may seem small, but they are not. Persistent 1.0 percent growth translates into a doubling time—the time it takes a population to double in size—of 70 years. This is an enormous increase when the population that is doubling is the United States, the third largest country in the world. Also, given the numeric size of the country, even apparently small percentage increases produce large increases in numbers.

The PCSD's recommendations about immigration policy included the development of comprehensive and responsible immigration and foreign policies that reduce illegal immigration and mitigate the factors that encourage immigration. The report stated (PCSD 1999 Ch. 1, p. 4):

Continued population growth in the United States, particularly on the scale envisioned by the medium and high projections, has enormous implications. Coupled with the technologies and resource consumption patterns that underlie the U.S. standard of living, population growth in America produces an environmental impact unparalleled by any other country at this time.

Continued population growth also has the potential to overwhelm efficiency and productivity gains, negating technology-based efforts to reduce U.S. environmental impact. Population growth also challenges industry's best efforts to provide new, higher quality jobs for all Americans and to improve real wages for American workers—which have been stagnant for 22 years. It similarly adds to the nation's needs to reduce poverty, improve education, and provide health care for all Americans. In short, the United States is already severely challenged by the need to provide better opportunities for millions of disadvantaged citizens, and continued population growth will exacerbate those challenges.

The PCSD's final report to the President in May 1999 added a paragraph on the desires of the American public with regard to population (PCSD 1999, Ch. 1, p. 5):

For decades, Americans have not had a desire for an ever-larger population. This is suggested by polls over the years. In 1974, 87 percent of respondents to a Roper poll said they did not wish the country had more people. A 1971 poll by the US Commission on Population Growth and the American Future found that 22 percent felt US population should be smaller than it was then, which was close to 200 million. As long ago as 1947, when U.S. population was 140 million, Gallup found that 55 percent of Americans believed the country would be 'worse off' with more people.

The PCSD (1999, Ch 1, p. 20) report concluded with a series of recommendations, the first of which read,

Stabilize U.S. population as early as possible in the next century as part of similar worldwide efforts, by providing universal access to a broad range of information, services, and opportunities so that individuals may plan responsibly and voluntarily the number and spacing of their children. These include: high-quality family planning and other basic and reproductive health services; equitable educational, economic, social, and political opportunities, particularly for women; reduction of infant mortality; and the increase of male responsibility for family planning and childrearing. This goal also entails targeted actions to eradicate poverty. While fertility is the largest contributor to U.S. population growth, responsible immigration policies that respect American traditions of fairness, freedom, and asylum will also contribute to voluntary population stabilization in the United States.

Of course, looking forward to 2050, immigration and births to immigrants are expected to exceed natural increase by 4-fold as a driver of US population growth, as projected by the Pew Hispanic Center (Passel & Cohn 2008).

### (7) 2011 Population Institute report

In September 2011, the Population Institute (PI) issued a landmark report 'From 6 billion to 7 billion: how population growth is changing and challenging our world' that showed how many trends in per capita resource availability at the time of the world's population reaching 6 billion in 1999 had reversed in deleterious directions by the arrival at 7 billion in 2011. As the report stated (PI 2011, p. 2):

When world population crossed the 6.0 billion mark in October of 1999, there was little apparent reason to believe that the march of human progress would be slowed any time soon by population growth. Indeed, chronic hunger and severe poverty were in a prolonged decline, and despite an accelerated rate of resource consumption, commodity prices for minerals and fossil fuels—measured in constant dollars—were at or near historic lows. A rising middle class in Asia spurred hopes that the advance of industrialization would bring prosperity to all. And while there were concerns even then about issues like water scarcity, climate change, biodiversity, and environmental degradation, they were tempered by a widely held belief that technology and human know-how could overcome all obstacles. Moreover, there was a strong conviction that fertility rates would continue a steady descent, and that population growth would level off and decline before these environmental problems could reach a crisis stage.

Indeed, as the report summarizes, in 1999, oil prices were at \$10 USD barrel<sup>-1</sup>, and the *Economist* magazine speculated they could fall to \$5 USD barrel<sup>-1</sup>. The report continues, 'The International Energy Agency (IEA) projected that oil prices would remain essentially flat, at \$21 USD barrel<sup>-1</sup>, until 2010 and then rise steadily to \$28 USD barrel<sup>-1</sup> through 2020.' As a result of cheap oil, food prices in 1999 were at or near record lows. The PI (2011, p. 4) report continues:

Looking ahead to 2020, the International Food Policy and Research Institute's (IFPRI) 1999 report [Pinstrup-Andersen et al. 1999] predicted that food prices would 'remain steady or fall slightly.' While forecasting a 'continued slowdown in crop yield increases,' IFPRI indicated that real cereal prices would increase only slightly through 2010, and that after 2010 declining population growth and other factors would 'reduce demand growth enough to cause cereal prices to resume their long-term downward trend.'

The PI (2011) report summarizes the low prices of many minerals and metals in 1999 and the efforts made by the world community to address global warming. By 2011, many of these optimistic trends had reversed. As noted by the report (PI 2011, p. 5):

In 2010, the world produced 87.4 million barrels per day (mb d<sup>-1</sup>) of oil, sharply lower than the 96 mb d<sup>-1</sup>

forecast in 1999. Much of the increased production came from tar sands and other unconventional oil sources rather than conventional crude oil. In a sharp reversal from earlier forecasts, the International Energy Agency last year projected that crude oil output would reach 'an undulating plateau' of around 68 to 69 mb d<sup>-1</sup> by 2020, but it would never again regain 'its all-time peak of 70 mb d<sup>-1</sup> reached in 2006.'

The US Energy Information Agency (EIA) earlier this year projected that the average price of imported low-sulfur, light crude oil will rise from an average of \$83 USD barrel<sup>-1</sup> in 2011 to \$100 USD barrel<sup>-1</sup> in 2017 and \$125 USD barrel<sup>-1</sup> by 2035 (EIA 2011).

When asked to comment on the global energy situation, Fatih Birol, Chief Economist of the International Energy Agency, said in a BBC interview (One Planet, 'Peak Oil and Happy Cows' broadcast 5 September 2010; [www.bbc.co.uk/programmes/p009hq8g#synopsis](http://www.bbc.co.uk/programmes/p009hq8g#synopsis)), 'It is definitely depressing, more than depressing, I would say alarming...'

As a result of higher energy prices, the global food markets have driven food prices to near record levels. In turn, many more people around the planet have become impoverished, and about a billion people were chronically hungry. As stated in the PI (2011, p. 5) report:

On average, the prices of basic food commodities have more than doubled in recent years. In February of 2011 the Food and Agricultural Organization's (FAO) Food Price Index of basic food commodities (grains, meat, dairy, sugars, oils and fats) reached a record high of 238 (2002 to 2004 = 100). The FAO's latest report, issued in September, showed only slight moderation in food prices. The index for August stood at 231, just below the record.

There is a growing consensus that food prices will trend even higher in the years ahead. The Organisation for Economic Co-operation and Development (OECD)-FAO's 'Agricultural Outlook 2011–2020' reports that, 'A period of high volatility in agricultural commodity markets has entered its fifth successive year. High and volatile commodity prices and their implications for food insecurity are clearly among the important issues facing governments today.'

In June of 2011, Oxfam International released a research report, and predicting that the price of key food staples could increase '120 to 180% by 2030' warning that 'This will prove disastrous for food importing poor countries, and raises the prospect of a wholesale reversal in human development.' (Oxfam International 2011, p. 7)

The Oxfam International (2011) report summarized the near record levels of various commodity prices on the world market, including fertilizers, metals and minerals, and non-food agricultural products like cot-

ton, timber and rubber. It also summarized the state of paralysis of the global community with regard to taking meaningful action to stop climate change and the threat accelerating climate change has for global food security.

Finally, the Oxfam International (2011) report pointed out that previous population projections had been far too optimistic and that 2050 projections had been raised numerous times during the last decade by the United Nations (UN) Population Division. There is little capacity to convert remaining forest land to agricultural production, and what is converted threatens significant loss of the biodiversity that makes the planet inhabitable and accelerates climate change as large amounts of carbon stored in trees are released. Countries such as China and Saudi Arabia are buying and leasing large tracts of farmland in Africa and elsewhere to feed their own populations as water tables at home are depleted. Combined with falling agricultural and family planning aid from debt-ridden Western countries, the prognosis for the 1.2 billion people living on less than \$1 USD d<sup>-1</sup> is potentially catastrophic.

The continued loss of biodiversity is summarized by the report (Oxfam International 2011). Biodiversity is not just critical to the maintenance of a healthy ecosystem. According to the Convention on Biological Diversity, an estimated 40% of the global economy and 80% of the needs of the poor are supported by biological resources.

Millennium Development Goal 7 sought to achieve a significant reduction in the rate of biodiversity loss by 2010 (United Nations 2000), but the Convention on Biological Diversity's 'Global Biodiversity Outlook 3' found, on the whole, that there was 'no indication of a significant reduction in the rate of decline in biodiversity' (SCBD 2010, p. 17). It warned (p. 5) that 'the principal pressures leading to biodiversity loss are not just constant but are, in some cases, intensifying.' The report indicated that 42% of all amphibian species and 40% of bird species are declining in population. It concluded (p. 10) that 'There is a high risk of dramatic biodiversity loss and accompanying degradation of a broad range of ecosystem services.'

Despite the authoritative warnings from the scientific community and blue ribbon panels, political leaders have managed to avoid dealing with the very serious threats to sustainability of the human population and the loss of the biodiversity that makes the planet inhabitable by all species. This makes efforts like those of Vallentyne even more important in giving the scientific community ways to measure environmental impact of human activities and to help the

general public prepare for the coming crises. Without political leadership, it will be up to each individual and community to find ways to achieve resilience in the coming decades. Whether that happens will depend on many factors, one of which is having a clear understanding of the situation we face.

### **The need to act on Vallentyne's D-index for policy purposes**

The scientific evidence is clear. Humanity has a serious and complex problem. It is not just a problem of population, nor of consumption, nor of climate change, nor of peak oil, nor of fresh water scarcity, nor of food insecurity, nor of loss of biodiversity in the oceans and on land. It is all of these. Indeed, mankind's problem is that human activity has outgrown the capacity of the planet to provide the necessary resources in a sustainable way. We are drawing down capital instead of living on the interest generated by renewable resources, and we have built much of modern civilization on the basis of non-renewable resources. We now need to take steps to reduce human demands on the biosphere to sustainable levels. Vallentyne's D-index is a key tool to demonstrate the extent to which each nation must take immediate action to achieve national and global sustainability.

Because of his untimely death, Vallentyne's work is not widely known. Through this series of papers, the authors hope to change that situation.

#### LITERATURE CITED

- Campbell MM (2005) Why the silence on population? Keynote address to the population and sustainability network, 13 October 2005. London School of Hygiene and Tropical Medicine
- CPGAF (Commission on Population Growth and the American Future) (1972) Population and the American future. US Government Printing Office, Washington, DC
- Ehrlich PR (1968) The population bomb. Sierra Club/Ballantine, New York, NY
- Ehrlich PR, Ehrlich A (2009) The population bomb revisited. *Electron J Sustainable Dev* 1:63–71
- Ehrlich PR, Holdren JP (1972) A bulletin dialogue on 'the closing circle', critique. *Bull At Sci* 28:16–27
- EIA (Energy Information Agency) (2011) Annual energy outlook. EIA, Washington, DC
- Heinberg R (2011) The end of growth: adapting to our new economic reality. New Society Publishers, Gabriola Island, BC
- Hurlbert SH (2012) Tribute to an 'obnoxious' ecocatalytic demotechnician: Jack Vallentyne on population. *Ethics Sci Environ Polit* 12:21–34



- Kendall H (1992) World scientists' warning to humanity. Union of Concerned Scientists, Cambridge, MA
- Mata FJ, Onisto LJ, Vallentyne JR (2012) Consumption: the other side of population for development. *Ethics Sci Environ Polit* 12:15–20
- Meadows DH, Meadows DL, Randers J, Behrens WW III (1972) The limits to growth: a report for the club of Rome's project on the predicament of mankind. Universe Books, New York, NY
- OECD-FAO (Organisation for Economic Co-operation and Development-Food and Agriculture Organization of the United Nations) (2011) OECD-FAO Agricultural Outlook 2011–2020. OECD Publishing, Paris
- Oxfam International (2011) Growing a better future. Oxfam GB, Oxford
- Passel J, Cohn DV (2008) U.S. population projections 2005–2050. Pew Hispanic Center, Washington, DC
- PCSD (President's Council on Sustainable Development) (1999) Toward a sustainable America: advancing prosperity, opportunity, and a healthy environment for the 21st century. US Government Printing Office, Washington, DC
- PI (Population Institute) (2011) From 6 billion to 7 billion: how population growth is changing and challenging our world. Population Institute, Washington, DC
- Pinstrup-Andersen P, Pandya-Lorch R, Rosegrant MW (1999) World food prospects: critical issues for the early twenty-first century. Food Policy Report. International Food Policy and Research Institute, Washington, DC
- Ryerson WN (1999) Political correctness and the population problem. *Wild Earth Winter* 1998/99:100–103
- SCBD (Secretariat of the Convention on Biological Diversity) (2010) Global biodiversity outlook, 3rd edn. Secretariat of the Convention on Biological Diversity, Montreal
- Science Summit on World Population (1994) A joint statement by 58 of the world's scientific academies. *Popul Dev Rev* 20:233–238
- Spies-Butcher B (2011) The myth of the ageing 'crisis.' The Conversation blog, <http://theconversation.edu.au/the-myth-of-the-ageing-crisis-168>
- Turner G (2008) A comparison of the limits to growth with thirty years of reality. Socio-economics and the environment in discussion 19. CSIRO Working Paper Series 2008–2009. CSIRO, Canberra
- Turner T (2009) The vindication of a public scholar: forty years after the population bomb ignited controversy, Paul Ehrlich continues to stir debate. *Earth Island Journal* 24
- United Nations (2000) United Nations millennium declaration: resolution adopted by the General Assembly. Session 55/2. United Nations, New York, NY
- Wong V (2010) Shrinking societies: the other population crisis. Bloomberg Businessweek, Red Oak, IA

*Editorial responsibility: Darryl Macer,  
Bangkok, Thailand*

*Submitted: June 21, 2011; Accepted: October 6, 2011  
Proofs received from author(s): December 19, 2011*