



The Journal of Population and Sustainability

ISSN 2398-5496

Article title: Population, climate change, and global justice: a moral framework for debate

Author(s): Elizabeth Cripps

Vol. 1, No. 2, (Spring 2017), pp.23-36

Population, Climate Change, and Global Justice: A Moral Framework for Debate¹

ELIZABETH CRIPPS

Elizabeth Cripps is a Senior Lecturer in Political Theory at the University of Edinburgh. She is the author of Climate Change and the Moral Agent: Individual Duties in an Interdependent World (2013) and has published research papers on climate change ethics, collective responsibility, justice to non-human animals, parental duties, and population and justice.

Abstract

This paper outlines a moral framework for the debate on global population policy. Questions of population, climate justice and global justice are morally inseparable and failure to address them as such has dangerous implications. Considerations of population lend additional urgency to existing collective duties to act on global poverty and climate change. Choice-providing procreative policies are a key part of that. However, even were we collectively to fulfil these duties, we would face morally hard choices over whether to introduce incentive-changing procreative policies. Thus, there is now no possible collective course of action which is not morally problematic.

Key words: Population policy, climate justice, global justice, tragic choices, hard choices, procreative rights.

1. This paper draws extensively on material originally published in *Global Justice: Theory, Practice, Rhetoric* (Cripps, 2016a) and the *Oxford Handbook of Environmental Ethics* (Cripps, 2016b). I gratefully acknowledge the permission of Oxford University Press to reproduce arguments from the *Handbook*. The earlier articles benefited from the critical input of numerous colleagues, including the editors of both publications. This version has benefited from written comments from Harry Cripps, as well as discussion at the Cumberland Lodge Colloquium on Population Ethics and with the Edinburgh Politics and International Relations Research Group.

The United Nations Population Division predicts that there will be 9.7bn humans by 2050 and 11.2bn by the turn of the century (UNDESA, 2015b). That's on the medium variant, but it may err on the low side (O'Sullivan, 2016). The IPAT equation makes it clear that population, along with affluence and the limits of technology, is a factor determining our collective impact on the environment (Ehrlich and Holdren, 1972). That deleterious impact includes climate change, which threatens human lives, health, and community (IPCC, 2014).

Given this, it is unsurprising that increasing (though still limited) airspace is being given to the question of limiting global population growth. The topic is gaining some traction among some academics and campaign organisations, although still generally eschewed by policymakers. This paper will outline a much-needed moral framework for this debate, in two ways. Firstly, it is morally crucial that we address the population question but equally crucial that this be done in the right way. I will argue that considerations of global and particularly gender justice must remain centre stage in any policy proposals. Secondly, the paper will clarify the morally deplorable situation in which, as a generation, we find ourselves. To avoid morally terrible policies or outcomes, we must make morally hard choices. The global affluent must face up to their obligation to make these choices, as well as their responsibility for bringing the situation about.

Let me begin with a few clarificatory remarks. Firstly, my normative starting point is a basic view of justice: one so minimal that I hope few would deny that we human beings owe each other this much. The basic requirement is that everyone be given a genuine opportunity to secure central human interests such as life, health, and some form of community. In other words, it is unjust for anyone to be denied the opportunity for a basically decent human life. Basic global justice demands this for everyone now living; basic intergenerational justice requires that the opportunity be preserved for future generations. Securing the latter requires, but is not limited to, effective action on climate change mitigation and adaptation.

Secondly, I will refer to morally hard options and to hard or tragic choices. A morally hard option involves doing something against which, other things being equal, there is a significant moral presumption. Although not morally terrible or outrageous, it should provoke significant moral concern. The distinction might be

brought out at the individual level by the difference between breaking a promise and killing somebody. A choice is tragic if all options are morally terrible; it is morally hard if, although not all options are terrible, there is none which is not at least morally hard.

Thirdly, this paper focuses on the impact of population growth and climate change on central *human* interests. I do not deny moral significance to the interests or survival of non-humans. However, enough hard questions are raised without extending the moral sphere in this way.

Fourthly, I will often refer to collective policy options. These, in practice, would almost certainly have to be implemented at state level. Moreover, as will become clear, the case for permissible introduction of some policies will depend on background circumstances which are often state-specific. However, the collective challenge is ultimately a global one and is addressed here as such.

Finally, population – or more specifically procreative – policies can be categorised as follows. *Choice-providing* policies include education and empowerment of women, and provision of family planning and reproductive health. As will become apparent, they also include provision of basic social security and health care to minimise infant mortality. *Incentive-changing* policies are designed to influence the procreative decisions of individuals and couples by changing their pay-offs. ‘Harder’ options within these are negative financial incentives (fines, taxes) or modifications to the ways in which many societies externalise the cost of child-rearing. For example, child benefit might be cut or limited to one or two children. ‘Softer’ options include small positive financial or economic incentives for small families, or educational and campaigning initiatives to cultivate a social norm of small families. *Directly coercive* measures, such as forced sterilisation or forced abortions, constitute abuses of central human rights. As such, they are not considered here except as a morally terrible alternative to be avoided.

How not to talk about population...

It is morally crucial to discuss population in the right way. One ‘wrong way’ is to limit the scope of debate to population and environment or population and climate change, ignoring considerations of global justice. Given rising population

figures in less developed countries (LDCs) and often below-replacement birth rates in more developed countries (MDCs) (UNDESA, 2015b), there is an apparently straightforward temptation to put the onus for action (and impose the costs of so acting) on LDCs and their citizens.² However, this is morally pernicious: it is not only highly unfair but also very dangerous.

This inference is unfair because human numbers do not bring about climate change or other environmental damage on their own. As the IPAT equation spells out, they do so in combination with per capita carbon footprint (or other ecological impact) and the limitations of technology. Many areas where human numbers are growing fastest are also those where per capita emissions are lowest (UNDESA, 2015b, WWF, 2014). To quote Stephen Gardiner: 'The raw numbers suggest that the climate problem would not be much affected by many more Indians, Bangladeshis, and Africans living as they currently do' (2011). Nor should the correlation between high population growth and other indicators of environmental destruction – such as plummeting biodiversity – be taken as reason to push responsibility onto LDCs. Again, population is only part of the equation: comparatively high biodiversity rates in more developed world countries are also the result of MDCs 'outsourcing' environmentally destructive production and waste disposal to poorer parts of the world (WWF, 2012).

Shifting responsibility to LDCs and their citizens also has dangerous implications for basic justice. Consider what it means to say that the global poor 'ought' to have fewer children? If couples lack access to and information about family planning, they may not have that option. Women in some traditional societies, uneducated and subject to the will of their husbands, may be deprived of choice even if contraception is in principle available. In some cases, a large family may be a woman's only route to social status. Where adult children are one's only means of security in old age and infant mortality is high, a large family can be necessary to protect against destitution.

2. The most morally outrageous conclusion – now fortunately widely discredited – is the 'lifeboat ethics' view that it would be justifiable to cut off aid to the global poor to put an end to this growth (Hardin, 1974). A more recent argument turns the fact that developed states are outstripping their resources into an environmental case for curbing immigration (Cafaro and Staples, 2009). I also find this morally problematic but will not address it in this paper.

Nor can the onus for action simply be shifted to state level. Without considerable resource transfers, the poorest states may be unable to provide the family planning, education, and social security without which individual change would be either impossible or involve extreme sacrifice. Moreover, international policies which incentivise states to reduce population growth could, against the current status quo, have terrifying human rights implications: they could incentivise coercion. Consider the catalogue of abuses already seen in many parts of the world: forcing, bribing, intimidating or humiliating men or women to be sterilised, pressuring women to have late abortions, and mass-level contraceptive injections carried out by the military (Nair et al., 2004).

The full moral force of these observations comes when we combine them. Many in LDCs lack female empowerment, family planning, education and basic security for old age. These, *which earlier effective action on global justice by the global affluent might have secured*, leave many in the global poor unable to have smaller families, or to do so without huge personal sacrifice. In addition to other per capita-resource level problems, the resulting population growth has negative environmental impacts. The global affluent often outsource the environmental costs of their own luxury lifestyles to LDCs, further exacerbating these local environmental problems. This in turn makes life tougher for the local population, pushing them still further from the level of affluence and empowerment at which women are genuinely free to choose to have fewer children. Given this, it would be morally outrageous for the policy and academic elite – in which MDCs dominate – to talk of the ‘irresponsibility’ of the global poor in having larger families.

... and why we must not ignore it altogether

Basic justice must stay centre stage in any debate on population. So much, I hope, is clear. However, that debate must take place. For precisely those who are motivated to tackle climate change and secure ongoing basic justice, population must be part of the equation. To assume that population growth among the global poor can continue to be ignored because of their low per capita emissions is, effectively, to assume that these emissions will continue to be negligible. This means either assuming continued severe poverty or that it is possible to end such poverty, for increasing numbers, without worsening environmental impact. The former is incompatible with basic global justice. The latter, as I will come back to, is a gamble with a terrible legacy at stake.

There is a real danger that population growth over the next few generations will make it impossible to do both basic global and basic intergenerational justice: that our children's, grandchildren's or great-grandchildren's generation will no longer even have the option of securing a basically decent human life for all without undermining the ability of future generations to do the same. Since it would be morally terrible to sacrifice the basic interests of either current or future humans, they would face a tragic choice at the collective level.

The point isn't simply that current resource use and emissions are unsustainable. It is that the more people there are the lower the average per capita lifestyle must be for sustainability. Even if those now living more affluently reduced their consumption to the average, at some point the sustainable lifestyle would fall below what is needed for basic justice. For the 2010 population (a 'mere' 6.9bn) the per capita biocapacity was 1.7 global hectares (gha) (WWF, 2014). Other things being equal, this would mean a per capita biocapacity of only 1gha for a population of 11.2bn (predicted for 2100). I make no claim to draw precisely the line at which a given global per capita footprint is compatible with a decent human life, but would be willing to hazard that this is dangerous territory. Countries with 2010 footprints as low as this also tend to rank 'low' on the Human Development Index (UN Development Programme, 2014, WWF, 2014).

There are two related responses to this argument. The first acknowledges the danger of reaching a point where sustainability and basic justice become impossible but denies that this justifies any specific *population* policy. The argument goes like this: birth rates drop with development, so all we (collectively) need do is secure global justice by boosting development in LDCs.³ Of course, development also worsens climate change, so this must be accompanied by extra efforts on mitigation and adaptation. Yes, all this is a 'big ask' but if we (collectively) can pull it off, then no anti-natalist policies will be required.

A more nuanced second response picks up on my reference, above, to 'other things being equal'. It argues that I have overlooked the crucial role played by technological development in achieving sustainability. On this view, even if global justice fails to stabilise population at a level that could be sustainably maintained

3. For a fuller discussion of the *population-scepticism* discourse, driven by demographic transition theory, see Coole (2013).

on current resources, any 'gap' can – and must – be plugged by technology. So the case is made for massive upscaling of technological investment but not for anti-natalist policies (Heyward, 2012).

Both these arguments have true and important elements. The danger of bequeathing our grandchildren a tragic choice between their own generation and the next adds further urgency to the already compelling moral case for urgent, effective action to challenge global injustice whilst also mitigating and enabling adaptation to climate change. This requires MDCs, and the global affluent in general, to make emissions cuts, invest in 'green' technology, transfer such technology to LDCs, and make the further resource transfers needed for basic global justice. It also requires action *by* LDC governments to use those resources to secure basic justice, including gender justice, for their citizens. So much is morally clear-cut, although (alas) very far from happening.

Moreover, some policies are not only morally required for basic justice but will also impact directly on birth rates. These include provision of family planning and reproductive health care, basic security for old age, education and empowerment of women. They are, in fact, exactly what I categorised above as 'choice-providing' population policies. In 2015, at least 10 per cent of married or in-union women globally wanted to avoid or delay childbearing but were not using contraception. In sub-Saharan Africa, this figure was 24 per cent (UNDESA, 2015a).

However, the UN medium projections already factor in considerable family planning improvements (UNDESA, 2015b). Moreover, the triple challenge - securing basic global justice and reversing population growth through development, whilst also reversing our collective negative impact on the environment – would be extremely demanding even given the political will. Even for 2010 population levels, countries with a sustainable average per capita footprint tend to score medium to low on human development and to have birth rates above (sometimes well above) replacement rate (UNDESA, 2015b, UN Development Programme, 2014). Thus, even assuming dramatic lifestyle and emissions cuts by the global affluent, it may not be possible to *increase* living standards elsewhere sufficiently to reduce birth rates to below replacement rate by that alone, whilst keeping the global average footprint sufficiently *low* to remain within biocapacity limits.

Equally, it would be a mistake to assume static technology levels. However, a massive upscaling of technological development and transfer is *already* essential for securing basic global justice without worsening climate change. Technology is not some 'magic bullet' on which we can automatically rely to accommodate larger and larger populations at the same time. Although 2015 was a record year for investment in renewables, they still only accounted for 10 per cent of global electricity generation (excluding large hydro-electric projects) (Frankfurt School of Finance and Management, 2016). Moreover, technological change is uncertain by its very nature, it carries heavy infrastructure costs, and the time required for previous technological revolutions (70 to 100 years) simply isn't available now (UNDESA, 2011).

Where, then, does this leave the argument that current generations should focus on tackling climate change and global poverty, invest heavily in technology, but eschew any population-specific policy? Such a policy – although morally many times better than what we are currently doing – amounts to taking a gamble. The hope is that this would be enough to avoid bequeathing a tragic choice to one of the next few generations. However, it is only a hope. There is a clear moral presumption against such gambles, especially when the severe suffering associated with losing them would be borne by others. The precautionary principle dictates, at the very least, not taking them unless there are no less morally problematic alternatives (Shue, 2010).

There is a further reason against eschewing all population-specific policies: one which makes it, again, a morally hard option. It is a widely shared moral view that institutional arrangements should not impose additional costs on some people as a result of the free choices of others. If I neglect to repair my fence and it falls onto my vegetable garden, destroying the crop, that's my look out; if my neighbour fells his tree carelessly and *it* crushes my vegetables, fairness dictates that he should compensate me. Population growth will, at the very least, increase the costs of securing basic global and intergenerational justice. If these costs go up for everyone then those who have small families are, in effect, landed with additional burdens because others have had bigger ones. Such fairness considerations make a case for internalising the environmental and global justice costs of children (or above replacement rate children) by, as far as possible,

assigning them to parents.⁴ Such a policy would be likely to overlap with the ‘harder’ end of the incentive-changing policy spectrum.

However, this argument has two important caveats. Firstly, it applies on the assumption that the environmental costs of other lifestyle choices (flights for holidays, for example, or eating meat) are also internalised as part of a just policy of climate change mitigation. Otherwise, it could be unfair to pick out the decision to have many children in this way. Secondly, the reference to a ‘free’ choice, above, is crucial. The case for internalising assumes that the decision to have a large family is genuinely free and informed. As we have seen, this is not the case in many parts of the world, especially for women. The point is not that policies to internalise the environmental and basic justice costs of large families could be justified globally under anything like current circumstances. Rather, it is that against a background of basic justice, *including genuine choice-provision*, internalisation could avoid one specific kind of institutional unfairness.

Incentive-changing policies and hard moral choices

We have seen that, where basic justice is already in place, there are moral reasons to pay serious attention to incentive-changing policies, including those which go some way towards internalising the environmental and global justice costs of large families. Failure to do so would amount to choosing a morally hard option. Unfortunately, however, such policies *also* represent morally tough options. They all have implications against which, other things being equal, there are significant moral presumptions. Harder incentive-changing policies – including fully internalising policies – give rise to greater moral concerns. However, hard moral choices are faced even with the softer policy options.

This is because children are usually brought up by their own parents. We generally regard this as a very good thing. In practice and in political philosophy the family is treated as a unit important in itself and worthy of protection. However,

4. This is at odds with the view that children are a public good at the national level, a claim used to offer a moral defence of policies which externalise the costs of child-rearing. The idea is that parents deserve extra support for producing the next generation which will pay our pensions, provide public services, and care for us in old age. I will make only two quick points on this. Firstly, it is perfectly possible that children could be a public good nationally, at least in the short term, and a ‘public bad’ globally (Casal, 1999). Secondly, there is difference between having some children – at the collective level, bringing a next generation into being *at all* – and having many of them.

this way of doing things makes children's prospects contingent on the resources and inclinations of their parents. Thus, any policy designed to change parents' incentives by changing their pay-offs runs the risk of penalising children, or rewarding some relative to others. This is problematic because if anything in this emotive and perplexing field can be agreed on it is, I hope, that the children themselves are not to blame. They are entitled to the same moral consideration however many siblings they have.

At the extreme, this danger could rule out some incentive-changing policies. Suppose that the effect of introducing harder incentive-changing policies was to force a collective-level choice between removing children from otherwise good parents and making those families so badly off that the basic interests of the children were threatened. This could happen if parents had large families despite the policies and were heavily penalised for it. Both options are morally terrible and this choice would be a tragic one.

Even assuming this could be avoided – whether by eschewing harder incentive-changing policies altogether or by developing nuanced versions – a morally uncomfortable choice would remain. Other things being equal, softer incentive-changing policies would make children in smaller families better off relative to those in larger ones. For an institutional scheme to influence children's relative resources and opportunities in this way would be unfair. The unfairness might be mitigated – by providing many goods directly to children – but only by taking away elements of childcare from parents, and so interfering within families. Given the moral presumption against either of these outcomes, states or other collective institutions would face hard moral choices in introducing soft incentive changing policies. Even educational and campaigning alternatives run the risk of leaving third or fourth children feeling like second class citizens.

A further moral presumption against incentive-changing policies, especially any negative ones, results from their implications for gender equality. Even if such policies are introduced only where there is already both choice provision and basic justice, unless there is *full* gender equality in terms of pay, parental leave, and social childcare norms, many negative incentive-changing policies will have a disproportionately negative effect on mothers. This would apply particularly to cuts to current benefits such as maternity pay, child benefit, or childcare tax credits.

This, then, is the moral predicament. Even given effective, immediate collective action on climate change and basic global justice, with extensive investment in 'green' technology – even if, as basic justice demands, family planning, reproductive health and other choice-providing policies are an integral part of this – morally hard choices on population would remain. Incentive-changing procreative policies force (at best) a choice between unfairly rendering some children better off than others and interfering with the family. *Not* introducing such policies means accepting institutional unfairness across adults. It also means taking a gamble which, if it comes up tails, will leave our children or grandchildren facing a tragic choice between their own generation and the next.

Population and the 'right' to decide family size

Before closing, one objection must be anticipated: that this paper has ignored an absolute moral right to determine family size which would overrule even incentive-changing anti-natalist policies. My response is as follows. It is true that a right to 'decide freely and responsibly the number and spacing of [one's] children' was upheld at the 1994 Cairo International Conference on Population and Development (United Nations, 1994). However, the moral philosophical case for an *absolute, unlimited* right to have as many children as one chooses is not compelling (Conly, 2015, Kates, 2004, Overall, 2012, Robeyns, Unpublished).

Parenting is an extraordinarily rewarding activity and a central part of a full life for many of us. This interest is so fundamental that it is plausible that the opportunity to be a parent should be protected by basic justice or, to put it another way, that this is a human right. However, it is not clear that this extends to a right to have many children of sufficient force to override all costs to others. Why should the aim of having a large family, important as it is to some, be treated differently from other aims and ambitions? Why should this goal be ring-fenced in a way that (say) the goal of climbing the world's highest mountains should not? Most accounts of justice accept that some of the costs of such ambitions should be borne by the individuals concerned. It is also accepted that it can be legitimate to limit the extent to which individuals can pursue their own ambitions if this is necessary to protect the basic rights of others (at least so long as individuals retain *some* scope to follow their own plan of life). Incentive-changing policies are thus not automatically ruled out, so long as they apply after one child.

However, context is everything. There are decisive human rights objections to many of the means that might – and have – been used to sway procreative decision-making. As indicated earlier in this paper, there are circumstances under which almost any incentive-changing policies are effectively coercive either for both potential parents or for mothers. An example of the former would be financial incentives for the extremely poor; the latter can too easily result given unequal power relations within the family. Misinformation or lack of information also undermines the idea of a genuine, free informed choice. Feminists rightly cite the frightening example of effectively coercive policies in India or south America (Nair et al., 2004). Such cases reinforce the crucial importance of choice-provision and basic justice, including education and empowerment of women, as a prerequisite for the morally permissible introduction of incentive-changing policies.

To conclude, this paper has argued that questions of population, climate justice and global justice are morally inseparable. It has pointed out that considerations of population lend further urgency to some existing duties of global justice: duties to act immediately and effectively to tackle both global poverty and climate change. It has stressed that choice-providing population policies must be part of that. Finally, it has pointed out that hard moral choices would remain *even were we collectively to fulfil these morally clear-cut duties*.

I have not attempted to make these hard choices. For my part, I think a case can be made for adopting some incentive-changing procreative policies, where choice-provision is already established, rather than gamble on development and yet-to-be-developed technology to spare our immediate descendants a tragic choice. Morally uncomfortable though they are, trade-offs between maintaining equal opportunities for children and fully respecting the integrity of the family are already accepted in other contexts. However, I have not defended this view. Indeed, given how depressingly far the global affluent are even from doing what *is* morally clear cut, it is all too probable that the situation will be still starker – and the choices will have become truly tragic – before we face up to it.

References

- Cafaro, P. and Staples, W. 2009. The environmental argument for reducing immigration into the United States. *Environmental Ethics*, 31, 5–30.
- Casal, P. 1999. Environmentalism, procreation, and the principle of fairness. *Public Affairs Quarterly*, 13, 363–376.
- Conly, S. 2015. *One child: do we have a right to more?*. New York: Oxford University Press.
- Coole, D. 2013. Too many bodies? The return and disavowal of the population question? *Environmental Politics*, 32, 195–215.
- Cripps, E. 2016a. Climate change, population, and justice: hard choices to avoid tragic choices. *Global Justice: Theory, Practice, Rhetoric*, 8, 1–22.
- Cripps, E. 2016b. Population and environment: the impossible, the impermissible, and the imperative. In: Gardiner, S. & Thompson, A. (eds.) *Oxford handbook of environmental ethics*. Oxford: Oxford University Press.
- Ehrlich, P. R. & Holdren, J. P. 1972. A bulletin dialogue on “the closing circle”: critique. *Bulletin of the Atomic Scientists*, 28, 16–27.
- Frankfurt School of Finance and Management 2016. *Global trends in renewable energy investment 2016*. Frankfurt: Frankfurt School-UNEP Centre/BNEF.
- Gardiner, S. M. 2011. *A perfect moral storm: the ethical tragedy of climate change*. Oxford & New York: Oxford University Press.
- Hardin, G. 1974. Living on a lifeboat. *Bioscience*, 24, 561–568.
- Heyward, C. 2012. A growing problem: dealing with population increases in climate justice. *Ethical Perspectives*, 19, 703–732.
- IPCC 2014. Summary for policymakers. In: Field, C. B., Barros, V. R., Dokken, D. J., Mach, K. J., Mastrandrea, M. D., Bilir, T. E., Chatterjee, M., Ebi, K. L., Estrada, Y. O., Genova, R. C., Girma, B., Kissel, E. S., Levy, A. N., MacCracken, S., Mastrandrea, P. R. & White, L. L. (eds.) *Climate change 2014: impacts, adaptation, and vulnerability. Part A: global and sectoral aspects. contribution of Working Group II to the fifth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press.

Kates, C. 2004. Reproductive liberty and overpopulation. *Environmental Values*, 13, 51–79.

Nair, S., Kirbat, P. & Sexton, S. 2004. A decade after Cairo: women's health in a free market economy. *Corner House Briefing*. Amsterdam & Sturminster Newton, UK: Women's Global Network for Reproductive Rights, The Corner House.

O'Sullivan, J. 2016. Population projections: recipes for action, or inaction? *The Journal of Population and Sustainability*, 1 (1), 45–57.

Overall, C. 2012. *Why have children: the ethical debate*. Cambridge, Mass: MIT Press.

Robeyns, I. Unpublished. Is procreation special?

Shue, H. 2010. Deadly delays, saving opportunities: creating a more dangerous world? In: Gardiner, S. M., Caney, S., Jamieson, D. & Shue, H. (eds.) *Climate ethics: essential readings*. New York: Oxford University Press.

UNDESA (United Nations Department for Economic and Social Affairs) 2011. *World economic and social survey 2011: the great green technological transformation*. New York: United Nations.

UNDESA 2015a. *Trends in contraceptive use worldwide*. New York: United Nations.

UNDESA 2015b. *World Population Prospects: The 2015 Revision*. New York: United Nations.

UN DEVELOPMENT PROGRAMME 2014. *Human development index and its components*. New York: United Nations.

UNITED NATIONS 1994 *Programme of action adopted at the International Conference on Population and Development*. Cairo. UNFPA.

WWF 2012. *Living planet report*. Gland: World Wide Fund for Nature.

WWF 2014. *Living planet report*. Gland: Worldwide Fund for Nature.