K4D | Knowledge, evidence and learning for development

The linkages between population change and climate change in Africa

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Question

What is the evidence base of the linkages between population change in Africa and climate change mitigation, adaptation, and resilience?

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Key findings

- Connections between climate change and population are complex and controversial. There are diverse viewpoints amongst scholars, and debates are ongoing, especially around population ethics and modelling of population dynamics in climate change models. Many sensitivities remain, especially around links to “population control.”
- Rapid population growth in Africa is seen as having a big effect on human development, provision of basic services, food security and poverty eradication. Climate change is thought to amplify these issues. Non-climatic drivers (especially population change) are likely to have a stronger impact overall on current and short-term future vulnerability risks in Africa than climate change (such as to food and water security and land degradation).
- Areas of high population growth, high fertility, and high unmet family planning needs in Africa overlap with regions of high climate vulnerability in places. For example, in parts of the Sahel, the Horn of Africa, and central Africa. Rapid population growth has a negative impact on the resilience of communities and their ability to adapt to climate change (as acknowledged in some country’s Nationally Determined Contributions and National Adaptation Plans). Climate vulnerability reflects existing gender inequalities and exacerbates existing socially constructed power relations, norms and practices.
- It is generally argued that key population-related policy levers (women’s empowerment, girls’ education, family planning and reproductive health services) would be beneficial alongside a suite of other climate policies in Africa.
- Scholarly, empirical evidence on the effectiveness of family planning and reproductive health initiatives on climate change is relatively scarce. There is a burgeoning literature on the theorised benefits and connections. Case studies from grey and donor literature are more apparent for adaptation, resilience and environmental protection. This is particularly true for population-health-environment (PHE) initiatives supported by USAID. Furthermore, there is some evidence that family planning improves the likelihood of beneficial environmental outcomes regardless of its impact on population trends.
- There is some agreement within the literature that girls’ education (both access to and quality of) is positive for both adaptation and mitigation. Education can positively affect adaptive capacity, increasing resilience. Girls’ education (especially to secondary level) has also been put forward as one of the most cost-effective mitigation strategies, alongside family planning – with these being seen as complementary.
- Fertility reduction is unlikely to be an adequate core approach to climate mitigation globally, but may have an impact in sub-Saharan Africa (SSA) due to its high enough fertility rates. However, SSA currently has low emissions per capita, making policies around fertility reduction unlikely to be a promising use of scarce political capital and policy attention. It may be more appropriate in resilience-building and adaptation efforts.
- Existing climate frameworks have largely ignored the role of population dynamics and the potential for girls’ education, family planning and better reproductive health care to contribute to resilience and adaptation (and to a lesser degree emissions reduction). Growing opportunities for family planning and education to be included as part of multisectoral adaptation programmes.
- Scholars in favour of family planning as being beneficial to climate action, emphasise the sexual and reproductive health and rights (SRHR) rhetoric and call for voluntary family

planning and sexual health services based on women's right to choose whether and when to have children. The need for increased investment and priority of family planning and their wider benefits ought to be emphasised in a sensitive way.

1. Summary

Population ethics[1], especially in relation to climate change, is a very complicated and sensitive area with ongoing debates, and it is important to bear this in mind during this report. There still remains some foundational questions in population ethics, which concerns how we should evaluate future scenarios in which the number of people, their welfare, and their identities may vary (Bowman & Berndt Rasmussen, 2020). There are also climate justice issues in relation to population change and climate change, which concerns the just distribution of the burdens and benefits of climate change and climate policy, both intra- and intergenerationally. Then there are further issues around how to apply normative theories into practice with the circumstances of climate change, in light of both uncertainty and practical constraints (see Bowman & Berndt Rasmussen (eds), 2020 for in depth discussions of climate ethics). This rapid review is unable to explore these areas in detail given the breadth and complexity of issues. The review touches on some of these ethical issues and the linkages between population change and climate change generally, it focuses in on Africa, highlighting where "hotspots" of climate impacts and population change are predicted to coincide across the continent. The areas of climate mitigation, adaptation and policy responses in relation to population change are then touched on, with focus on women's empowerment, girls' education and family planning.

This rapid review utilised both grey and academic literature. There is a large and growing literature on the linkages between population change and climate change (mitigation, adaptation, resilience and policy); although robust, empirical evidence remains lacking. Given the rapid nature of this review and the complex nature of the subject, only a snapshot of the literature could be given.

Other key findings in addition to those highlighted above include:

- Climate change ''hotspots'' (i.e. strong climate change signal and high concentration of vulnerable people) in Africa include arid/semi-arid regions, low-lying deltas and cities in Africa. Regions with severest projected climate change impacts often coincide with regions of high population density and poverty rates (Müller et al., 2014). For example, low-lying deltas and cities are typically heavily populated and face climate vulnerabilities from sea level rise, extreme heat, and natural disasters. Kampala, Dar-es-Salaam, Abuja, Lagos, Addis Ababa and Luanda all have high projected population growth and are among the African cities most at risk from climate change (Verisk Maplecroft, 2018).
- There is a general lack of well-documented, empirical evidence for the specific impact of family planning and sexual health on climate change adaptation. One reason for this is because the evidence is difficult to collect. However, there is much literature in this area more generally supporting the theoretical linkages (and logics) between the two fields.

[1] Population ethics "asks when and whether an increase or decrease in the size of the population is a social improvement, or would be a good goal for policy to pursue" (Budolfson & Spears, 2020, p. 200).

- The value of gender equity and women's empowerment in environmental outcomes is generally recognised.
- Education can positively affect the adaptive capacity of an individual, increasing their resilience. Education (particularly girls' education and to secondary education level) is found to be the most important socio-economic determinant to reduce vulnerability to natural disasters (Streissnig et al., 2013). Girls' education (especially to secondary level) has also been put forward as one of the most cost-effective mitigation strategies, alongside family planning – and these are seen as complementary.
- Combined population-health-environment initiatives appear to provide synergies above and beyond more traditional singular efforts, especially in maternal and child health. Effective collaboration with health partners, cultural sensitivity and local buy-in are key to PHE success. However, there is scant scholarly evidence on the effectiveness of integrated PHE initiatives (Lopez-Carr & Ervin, 2017).
- There is little attention by the international community to the potential of population-related policies to reduce risks from climate change (Arrhenius et al., 2020; Dodson et al., 2020). It is generally excluded from the UNFCCC discourse. O'Sullivan (2018) highlights that discussions of the risk population growth poses to heightened climate change impacts is considered taboo by the UN and development community since the adoption of the Cairo Agenda (i.e. the UN Programme of Action) at the 1994 International Conference on Population and Development, which called for the emphasis of reproductive health and rights over demographic aims. Although there is widespread agreement among governments and international organisations that family planning programmes are a valuable investment, they are often given low priority.
- There is a recognised need for further research (Dodson et al., 2020), especially basic and applied research around the efficacy of national population-related policies in the context of climate impacts. Donors are starting to react to this (for example Denmark). More detailed modelling of the impact of different population trajectories within countries on expected climate impacts is also needed. Need for cross-sectoral collaborative research between climate experts and family planning and SRHR professionals.
- A key sensitivity is that voluntary family planning programmes are largely aimed at high-fertility low and middle income countries, with relatively low per capita emissions, while people in high income countries, which are primarily responsible for causing the climate to change, continue their excessive emission of greenhouse gases (Bongaarts & O'Neill, 2018, p. 652). The call for a human rights–based approach (i.e. for women everywhere to have the right to freely choose when and how often to get pregnant) helps with these concerns to a degree.

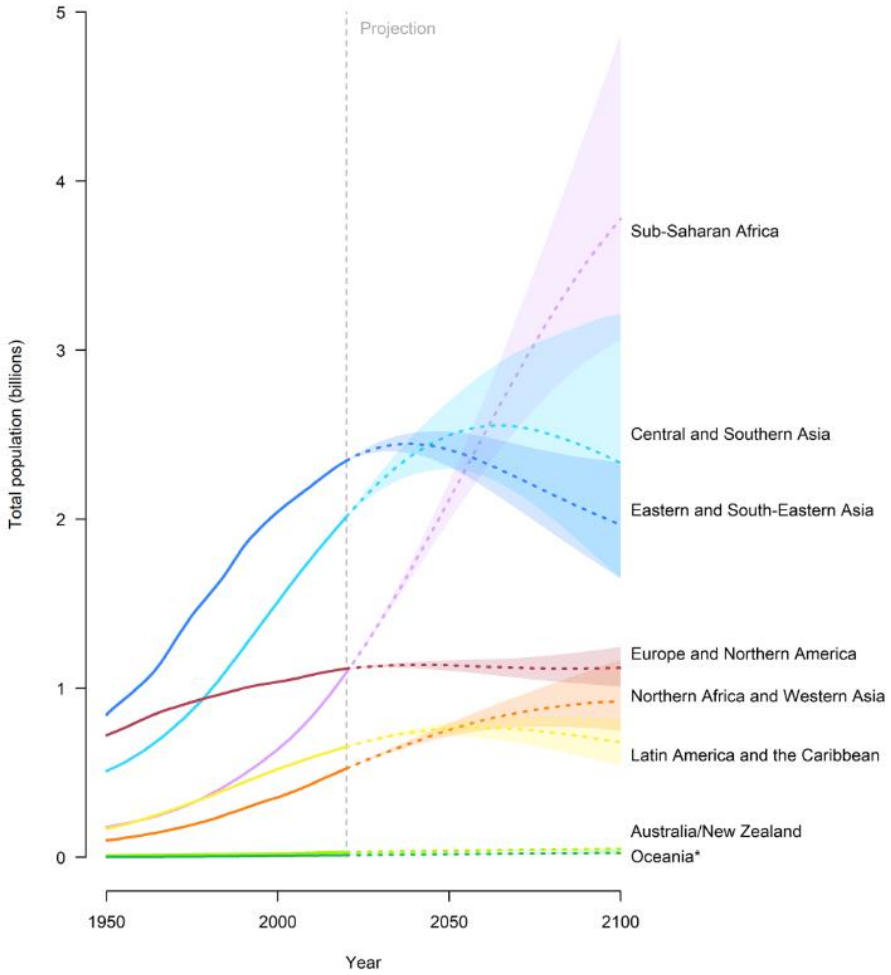
2. Population ethics and climate change

Projected population changes in Africa

The population of Africa is projected to double from 1.2 billion in 2020 to 2.4 billion by 2050 (Population Council, 2020). Sub-Saharan Africa (SSA) continues to have a high fertility rate (although this has fallen between 1990 and 2019). UN DESA (2019) estimates that the countries of SSA could account for more than half of the growth of the world's population between 2019 and 2050 (over one billion people) and continue growing through the end of the century. The

Northern Africa region is also projected to continue growing through the end of the century, although at a slower rate to SSA. By contrast, populations in Eastern and South-Eastern Asia, Central and Southern Asia, Latin America and the Caribbean, and Europe and Northern America are projected to reach peak population size and to begin to decline before the end of this century.

Figure 1: Population by SDG region: estimates, 1950-2020, and medium-variant projection with 95% prediction intervals, 2020-2100



Source: UNDESA, Population Division (2019, p. 7). Available under CC BY 3.0 IGO. *excludes Australia and New Zealand

With a total fertility rate of 4.8 births per woman, Africa is the fasted growing continent at 2.7% per year (Beegle & Christiaensen, 2019). Its demographic transition is slow compared to other regions, although fertility rates have started to fall – in some countries much more than others.[2] As a result, SSA is projected to become the most populous of the eight geographic regions around 2062 (UNDESA, Population Division, 2019, p. 6 – see Figure 1 above). Several of the world's largest countries will drive much of the anticipated global population change between 2019 and 2050, including Nigeria, Democratic Republic of the Congo (DRC), Ethiopia, Tanzania,

2 See Quak, E. & Tull, K. (2020). Evidence of successful interventions and policies to achieve a demographic transition in sub-Saharan Africa: Ethiopia, Rwanda, and Malawi. K4D Emerging Issues Report No.30, Brighton, UK: Institute of Development Studies. https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/15426

and Egypt. Almost 60% of Africa's population is under the age of 25 (Population Council, 2020). Such young age structures mean that populations will continue to grow for some time, even after attaining replacement level fertility. Recent reductions in fertility in SSA mean that the population at working ages (25 to 64 years) is growing faster than in other age groups, providing an opportunity for accelerated economic growth (i.e. "demographic dividend") (UN DESA, 2019).

Poverty remains a major issue in Africa. The World Bank's report Accelerating Poverty Reduction in Africa (Beegle & Christiaensen, 2019), finds that the share of Africans living in extreme poverty has fallen substantially (from 54% in 1990 to 41% in 2015), but due to high population growth during the same period, the number of poor people in Africa has actually increased from 278 million in 1990 to 413 million in 2015. Given current conditions, the poverty rate is expected to decline to 23% only by 2030 and global poverty is estimated to become increasingly African, rising from 55% in 2015 to 90% in 2030. 82% of people living in extreme poverty in Africa live in rural areas and earn money primarily from farming. Fragile and conflict-affected states have notably higher poverty rates (Beegle & Christiaensen, 2019).

Dodson et al. (2020, p. 2) highlights that fertility rates can be influenced by policies, but that there are many factors that influence fertility rates indirectly (e.g. average education level, economic growth, urbanisation, child mortality, cultural factors, social norms on ideal family size) and directly (e.g. presence of family planning programmes, availability of modern contraception and contraception use rates). Collectively these factors determine fertility levels of a country. However, the use of improved family planning programmes to reduce population growth remains controversial in many countries – with key issues often being the belief that "women's reproductive decisions largely should remain under the control of men (MacQuarrie et al., 2015), and that children are "up to God" (May, 2017)" (Dodson et al., 2020, p. 2). Dodson et al. (2020, p. 2) put forward the need for "rights-based family planning, which enables all individuals to have the information, education and means to decide the number and spacing of their children responsibly." Emphasising the need for voluntary measures.

Climate change hotspots in Africa

Africa has been identified as one of the most vulnerable parts of the world to the impacts of climate change (IPCC, 2014). There has been a plethora of studies into the variety of potential impacts of climate change on physical systems and human systems in Africa, and the complex connections between these, acknowledging that changes are not uniform across the region (see for example, Serdeczny et al., 2017 for a summary of these changes). Serdeczny et al. (2017, p. 1596) summarise that generally:

> *"East Africa is at higher risk of flooding and concurrent health impacts and infrastructure damages. West Africa is projected to experience severe impacts on food production, including through declines in oceanic productivity, with severe risks for food security and negative repercussions for human health and employment. South Africa sees the strongest decrease in precipitation with concurrent risks of drought. Sea-level rise puts at risk a growing number of densely populated coastal cities, whose population is set to increase and may receive yet more in-migration as a result of rural livelihood degradation."*

All these potential impacts are further complicated by variations across different sectors and population dynamics and localities, all of which are associated with great uncertainties, further complicating adaptation planning and decision-making (Serdeczny et al., 2017, p. 1596).

INFRAS (Steinemann et al., 2020) produced a climate change foresight analysis for the Swiss Agency for Development and Cooperation (SDC) on short- and medium-term climate-related risks (of 1–3 years). The climate-related hotspots[3] and risks highlighted are a result of a combination of climate change and variability, exposure and vulnerabilities of people and ecosystems and their ability to address those risks (readiness, adaptive capacity, etc.). The analysis is based on the ND-Gain Index, which measures vulnerability including exposure in life supporting sectors on the one hand, and economic, governance and social readiness on the other hand.

The analysis highlights hotspots with high climate-related risks in large parts of Africa – particularly the Horn of Africa and the Sahel region, which are amongst the countries with highest fertility rates (see Figure 17 in UNDESA, Population Division, 2019, p. 26 for global map of total fertility). **The analysis highlights that non-climatic drivers (including population change) have a stronger effect on current and short-term future vulnerability risks than climate variability and change** (Steinemann et al., 2020, p. 8). Particularly vulnerable areas for climate change include[4]:

- **Arid and semi-arid areas** are extremely vulnerable to climatic trends (especially reduced, erratic or heavy precipitation and increased drought frequency and intensity). In these water scarce areas, for example North Africa and the Sahel, agriculture (crops or livestock) dependent on water or rain-fed irrigation are at risk (Steinemann et al., 2020, p. 7). It is thought that climate change will amplify the existing stress on water resources from population growth, urbanisation, agricultural growth and land use change, which will remain key drivers to water scarcity in the future in North Africa, the Sahel, Horn of Africa, and South West Africa (Steinemann et al., 2020, pp. 12-13, 20). Although there is uncertainty over water resource projections. In West Africa in particular, there remains great uncertainty about future rainfall projections (Steinemann et al., 2020, p. 24).
- **Low-lying coastal areas and cities** are prone to coastal hazards and sea level rise. Given the high population densities in many coastal areas and growing urban populations, exposure and hence the risks are particularly high and increasing. This is the case for parts of East and Southern Africa (Mombasa, Dar-es-Salaam, Maputo – the population in the region is expected to grow by more than 2% per year in the next 10 years) and North Africa (where the highest (growing) population densities and the major cities are concentrated along the Mediterranean coast, in particular the Nile delta in Egypt) (Steinemann et al., 2020, p. 7).
- **In regions affected by compound or sequential events** – such as severe drought followed by extreme rainfall or the sequential occurrence of several hurricanes – risks are particularly high both in human and natural systems. Droughts followed by floods were

[3] Hotspots are usually defined as areas where strong climate signal and high concentrations of vulnerable people are present.

[4] It is important to acknowledge the uncertainties and complexities around climate change projections and downscaling to country/local levels. The impacts highlighted by Steinemann et al (2020) draw on a large array of sources, but provide quite high-level, regional overviews of risks.

reported in the last two years in parts of East and Southern Africa (Sudan, Somalia, Burundi, Madagascar, Mozambique, Malawi, Eswatini, Djibouti, Zambia and Zimbabwe). Mozambique was hit by two major tropical cyclones in the same season (*Idai*, *Kenneth*) in 2019 (Steinemann et al., 2020, p. 7).

- **Countries with persisting conflicts** often have high climate-related risks, given that climate has complex interaction with various drivers of conflicts and instability (water scarcity or food insecurity). High political instability may further affect people's ability to cope with possible future climate shocks. Conflicts persist to minor extents in parts of the Sahel (Lake Chad Basin, Central Mali) (Steinemann et al., 2020, p. 7).
- **Regions with long-term unsustainable resource management practices**, overuse of scarce land and water resources, environmental degradation and increasing demand due to population growth are putting pressure on natural systems and are strongly influencing current climate-related risks. In almost all regions with high climate-related risks, non-climatic drivers have a stronger effect on current risks than climate variability and change. Examples include the depletion of aquifers in the Middle East and North Africa (MENA) region (Steinemann et al., 2020, p. 8).

An earlier study by Müller et al. (2014) modelling climate change hotspots, highlights large river catchments of Congo, Niger, Nile, and Zambezi as being hotspots for water-related climate change impacts. The study highlights Malawi, Mozambique, Zambia, Zimbabwe, and the Lake Victoria region as climate change hotspots of high relevance for adaptation planning due to high exposure to climate change impacts, high population density and high poverty rates.

Analysis by Verisk Maplecroft (2018) combined new UN projections on rates of annual population growth in over 1800 cities with subnational data from their Climate Change Vulnerability Index (CCVI) to assess the threat from climate change over the next 30 years. Their data found that of the 100 fastest growing cities by population, 84 are rated 'extreme risk', with a further 14 in the 'high risk' category. Africa has 86 of the 100 fastest growing cities in terms of population; with 79 of these rated 'extreme risk' in the CCVI (including 15 African capitals and many of the continent's key commercial hubs). Among the most at risk of climate change include: Kampala in Uganda, where the annual population is set to grow by 5.1% a year on average between 2018-35; Dar-es-Salaam in Tanzania (4.8%), Abuja (4.5%) and Lagos (3.5%) in Nigeria; Addis Ababa (4.3%) in Ethiopia; and Luanda (3.7%) in Angola.

Population distribution and movement

The displacement of people is generally projected to increase under continued climate change (IPCC, 2014). Serdeczny et al. (2017, p. 1594) highlight that drivers of migration are complex and multiple, including cultural, economic, and political factors as well as non-climatic environmental factors. Local context is key and responses to the same type of climatic driver can vary considerably. In particular, SSA is expected to be "affected by migration associated with climate change-related drivers, including sea-level rise and declining or disrupted availability of resources" (Gemenne, 2011 cited in Serdeczny et al., 2017, p. 1594). Most forced migration due to environmental factors happens within countries.

Africa has a high rate of rural-urban migration and urbanisation, and the trend can be exacerbated by the impacts of climate change. It is projected that half the population in SSA expected to live in urban areas by 2030 (UN-HABITAT, 2010 cited in Serdeczny et al., 2017, p.

1594). Migration itself can be seen as an adaptive response to local environmental risks, but is associated with other risks for both the migrant (such as high level of poverty and unemployment, dangerous living conditions, dependency on food sources) and the host community (pressure on natural resources).

Differential vulnerability across Africa

Climate vulnerability reflects existing gender inequalities and exacerbates existing socially constructed power relations, norms and practices (Kwauk et al., 2019). This includes gender roles and responsibilities that limit women's activities and mobility to the home; traditions that constrain women's access to land, financial credit and social capital; and women's reduced access to information, knowledge and life-saving skills; all of which limit their ability to confront and adapt to climate shocks (Kwauk et al., 2019, p. 3). For example, intersecting vulnerabilities of age and gender shape the impact of climate change on girls and young women. There is not scope in this review to do justice to the differential vulnerabilities of different population groups to climatic impacts across Africa or the rich literature on multi-dimensional poverty and its effects on vulnerability.

FAO (2018, p. 3), in an information booklet on tackling climate change through rural women's empowerment, highlights how there are big differences in climate change impacts, vulnerabilities, responses and adaptive capacity between women and men depending on "individuals' access to resources, assets, information, services and decision-making power." The brunt of climate change impacts in poor countries are more often felt by women and girls. Gender-differential impacts of climate change in rural areas include greater food insecurity, as women are more likely to be food insecure then men. The burden of collecting of water and firewood in low-income countries usually falls on women and girls, having to travel long distances and putting them at risk of physical and sexual violence. Increased water scarcity impacts on household water provision meaning more time collecting water. Limited land ownership rights for women in many low and middle income countries also means limited user rights such as rights to plant trees and build soil control methods – important in helping to build resilience to climate change impacts. Women and children are 14 times more likely to die during natural disasters than men (FAO, 2018, p. 7).

"Vulnerable groups" is often used in climate change policies to indicate those most vulnerable to climate change impacts. Those most vulnerable can vary across countries and regions. Women in particular are recognised to be disproportionately impacted by climate change in Africa. Key institutions have made this recognition through various legislative, policy and strategic frameworks on climate change, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the African Union. A CCAFS working paper by Aura et al. (2017) undertakes a gender review of climate change legislative and policy frameworks and strategies in East Africa (focusing on the areas of climate-smart agriculture, food security, water, health, human rights and security). The review finds that all four East African countries reviewed (Kenya, Uganda, Tanzania, and Ethiopia) include gender terms within their various policies, programmes, and plans. Within these there are a variety of groups identified as being vulnerable to climate change, these include:

- **Kenya:** The Climate Change Act, No. 11 of 2016 identifies these just as "vulnerable people." The National Climate Change Action Plan (2013) focuses on the urban poor

living in flood-prone slums and the rural poor, women, and children. The National Adaptation Plan (2016) identifies women, orphans and vulnerable children, the elderly, and persons with disability as vulnerable groups. The (I)NDC (2015) generally acknowledges vulnerable groups and youth (Aura et al., 2017, p. 24).

- **Uganda:** The National Climate Change Policy (2012) identifies, women, older persons, and people with disabilities as vulnerable persons. The Agriculture Sector Development Strategy and Investment Plan (DISP) (2010) acknowledges internally displaced people, neglected children, orphans and refugees as being vulnerable groups. Women and youth are identified in the Climate Smart Agriculture Framework (2015) (Aura et al., 2017, p. 33).
- **Tanzania:** National Climate Change Strategy (2012) identifies marginalised groups, including women. National Adaptation Plan (2016) identifies youth and women groups. The Agriculture Climate Resilience Plan (2014) identifies women and girls as vulnerable. Climate Smart Agriculture Framework (2015) identifies women and youth (Aura et al., 2017, p. 42).
- **Ethiopia:** Climate Resilient Green Economy strategy (2011) identifies women as being vulnerable. The (I)NDC identifies vulnerable groups as being women, children farmers, pastoralists, elderly, persons with disabilities and refugees. Ethiopia's Programme of Adaptation to Climate Change identifies women, children, elderly, disabled and poor people (Aura et al., 2017, p. 50).

This demonstrates the array of vulnerability recognised in one country's climate change policies. All the documents identified gender, vulnerable groups, and youth as the target groups most vulnerable to the impacts of climate change. The documents also included gender mainstreaming and supported the enhancement of education, training, and capacity building for women. However, despite this, **none of the documents mention direct benefits to women and youth or budget allocations for gender specific actions** (Aura et al., 2017).

3. Population ethics and modelling climate change

A paper by Scovronick et al. (2017) looks at the "Impact of population growth and population ethics on climate change mitigation policy." It asks how different population scenarios change the rationale for mitigation policies and vice versa. The paper highlights that it is not clear cut, and the answers importantly depend on ethical questions around how future populations are valued: namely, whether the goal is to increase the number of people who are happy (i.e. maximise total utility (TU)) or rather to increase the average level of people's happiness (i.e. maximise average utility (AU)). This highlights the ethical difficulties that come with linking climate change and population change (for example, contentious ethical issues around family planning, abortion, and immigration), and the (unresolved) contradictions that inhabit the field of population ethics.

As explained by Lutz (2017), the TU view indicates "a world with many more people, who on average have a lower level of wellbeing than today, would be better, if it results in a higher TU" (Lutz, 2017, p. 12103). This unsatisfactory conclusion has led to the proposing ways of dealing with it, with a focus on average welfare (AU) being the most popular alternative (i.e. need to improve the wellbeing of people alive rather than hypothetical larger populations). This AU approach has also received criticism among scholars.

Lutz (2017) highlights that most climate-economic models use a TU approach, this implies that "a much bigger future world population would be better (unless this is associated with much lower welfare per person), but also implies that damages caused by climate change to a bigger future population are more serious, and thus justify more costly mitigation action now than in the case of low population growth. Under an AU approach, population growth would be less relevant for mitigation costs."

Scovronick et al. (2017) shows that the difference in results of climate-economic models due to the TU vs. AU choice is as significant as that of the highly debated choice of discount rates. Questions on the suitability and usefulness of climate-economic models have also been raised in relation to real-world policy implications and priority setting. Lutz (2017) raises questions over other assumptions used in climate-economic models, including the use of gross domestic product (GDP) and income (GDI) as equating with human wellbeing and equity issues around this, and the treatment of humans as passive victims of climate change (ignoring human agency, adaptive capacity and the influence of factors such as better education).

Lutz (2017) summarises the evidence showing that empowerment of women (and others) through education can actively contribute to raising their standards of living (better health and incomes) and adaptive capacity. Education of women is also key in voluntary fertility declines in high-fertility countries. "Hence, human agency associated with empowerment through education matters greatly for population growth, as well as for economic growth and for adaptive capacity to climate change" (Lutz, 2017, p. 12104). To represent this view of human agency quantitatively necessitates accounting for population heterogeneity in models (using age, gender, and education level).

Over the past years, this view has been translated by scientists into alternative scenarios in the form of so-called shared-socioeconomic pathways (SSPs), which examine how global society, demographics and economics could evolve over the next century, and were used in the IPCC Fifth Assessment Report. Different population growth and human capital formation trajectories are associated with different pathways, and show that "future population growth is clearly not independent from the other socioeconomic trends that matter for climate change mitigation and adaptation" (Lutz, 2017, p. 12104). The "sustainability" scenario (SSP1 – see Figure 2 below) shows a rapid education expansion with a world population peaking at 8.5 billion around mid-century, and is associated with higher average human wellbeing and likely lower mitigation and adaptation costs. Although most modelling currently goes to 2100, recent model calculations that go beyond 2100 (assuming that during the second half of this century all parts to the world will have fertility levels of 1.5–1.75) find that, "depending on life expectancy having a ceiling at 90 or 120 years, world population in 2200 would come to lie within a range of 2–6 billion. But this would only be possible if Africa experienced a rapid education expansion followed by economic growth" (Lutz, 2017, p. 12104). There is criticisms of the SSPs, for example, that that they do not reflect adaptive capacity well due to the lack of inclusion of governance measurements (Andrijevic et al., 2020).

O'Sullivan (2018) explains that, although population projections are embedded, population growth is not a parameter included in projections of future greenhouse gas (GHG) emissions and in the anticipated impacts of climate change. She argues that population growth (and uncertainty around this) has been largely ignored in the literature as a factor affecting outcomes. Instead, population growth is assumed to be "governed by economic and educational advances"

(O'Sullivan, 2018, p. 103). For example, this is the case for family size outcomes in the "shared socioeconomic pathways" (SSPs) described in the IPCC's Fifth Assessment Report, which tend to hide the role explicit policies will play in determining future fertility rates, such as family planning and girls' education/empowerment (Dodson et al., 2020). In contrast, "sensitivity analyses have demonstrated population to be a dominant determinant of emissions" and "the assumption that population growth is determined by economic and educational settings is not well supported in historical evidence" (O'Sullivan, 2018, p. 103). Worryingly, O'Sullivan (2018, p. 107) highlights the inconsistencies of the population projections used in the SSPs compared to the UN's current population projections, with the majority of the SSPs using a projection well below the UN's medium population projection (i.e. below the 95% probability range of the UN's 2015 probabilistic projections).

Figure 2: A conceptual map of the five families of IPCC Shared Socioeconomic Pathways (SSPs), in relation to the strength of mitigation and adaptation challenges posed by each scenario (after van Vuuren et al., 2014). Approximate trends in population outcomes and emissions per capita outcomes are superimposed. Population growth is most strongly related to adaptation challenges. Source: O'Sullivan (2018, p. 106).[5]

Another paper by Arrhenius et al. (2020, p.170) in a collection of essays on climate ethics, looks at the ethics and issues around choosing an effective policy response to climate change given the unresolved nature of population ethics (i.e. the view that "we do not know what to do about intergenerational policy until we know what to do about population ethics" (Arrhenius et al., 2020, p.170). This view is held by e.g. the IPCC. Arrhenius et al. (2020, p.171) argue that enough may already be known to make good choices about climate policy even without further progress in population ethics.

4. General evidence base on the benefits of family planning to environmental sustainability

A literature review by Engelman et al. (2016) from the Family Planning and Environmental Sustainability Assessment (FPESA) project of the Worldwatch Institute, explored peer-reviewed scientific literature published between 2005 through early 2016 to explore the hypothesis that family planning benefits environmental sustainability. Note that the project was broader than just climate change and was looking at environmental sustainability. The paper found that:

- There was generally a lack of direct consideration of this hypothesis, and so no "scientific consensus is apparent in the literature." Therefore, the paper could not confirm the hypothesis; however, the majority of the evidence from the papers reviewed supported it (Engelman et al., 2016, p. 1).
- **The overwhelming majority of researchers who explore relationships between population growth and environmental degradation or resource scarcity either find empirically or assert that the former is an influential factor in the latter,** although

[5] "Synergy between Population Policy, Climate Adaptation and Mitigation" - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/A-conceptual-map-of-the-five-families-of-IPCC-Shared-Socioeconomic-Pathways-SSPs-in_fig1_320632925 [accessed 12 November 2020].

often interacting in complex ways with other factors. A handful of papers argue that the role of population is exaggerated or insignificant (Engelman et al., 2016, p. 1).

- **"Access to and use of family planning—specifically effective modern contraception—reduces fertility and facilitates delayed and more widely spaced childbirths, slowing population growth"** (Engelman et al., 2016, p. 14)**.**
- **"Slowing population growth tends to lessen the risk of dangerous environmental changes and to enhance the potential for societal resilience to climate change, water scarcity, food insecurity, the loss of biological diversity, and related threats"** (Engelman et al., 2016, p. 14)**.**
- **"By reducing unintended pregnancy and facilitating personal choices on the number and timing of births, family planning expands opportunities available to women and girls.** This enables them to contribute more actively to environmental activities and to societal resilience" (Engelman et al., 2016, p. 14).
- **"A sizable minority of authors mentions family planning in relation to the population-environment connection, often calling for improvements in access or services as one way to slow environmental degradation or increases in resource scarcity.** This perspective is widely shared geographically, with African authors more likely than those of any other continent to call for improved family planning services" (Engelman et al., 2016, p. 2).
- "Some papers contribute evidence that **family planning improves the likelihood of beneficial environmental outcomes regardless of its impact on fertility and population trends.** The linkages in this case are multiple and complex, relating to life options for women that managing the timing of pregnancy may open up. A greater range of opportunities on which to spend their time and energy may then enable women so inclined to contribute more than would otherwise be possible to environmental sustainability and societal resilience. Separately, some literature documents ways in which women tend to be more concerned about the environment and to take action to protect it" (Engelman et al., 2016, p. 2).
- Another key finding was that population growth had a larger impact overall than climate change on water scarcity, land degradation, and food insecurity (Engelman et al., 2016, p. 2). Furthermore, f**ood security is undermined by high fertility, with 3** of the reviewed articles (all by African authors) finding strong correlations between household size and food insecurity in the areas of Africa that they studied (Engelman et al., 2016, p. 18).

Investigation into the empirical connections between the use of family planning and the environment have received more attention since 2016, but research is still limited in comparison to the potential size of the subject. The paper highlights a key point that "population policy must be based on women's right to choose whether and when to have children and that women and men should have equal rights and equal opportunities in every sphere of life" (Engelman et al., 2016, p. 2). They also highlight the complexity of the connections between population growth and environmental change, their association with disparate scientific specialties, and acute sensitivities related to population and contraception. The paper concludes that there are "a wide

array of findings and views that can support family planning education and advocacy" (Engelman et al., 2016, p. 2), although caution needs to be taken with this conclusion.[6]

5. Climate change mitigation

Women's empowerment and family planning

The connections between demography and climate mitigation is complex. Lutz and Striessnig (2015, p. S70) summarise analyses of demographic drives of future carbon emissions as being driven "not just by population size but also by the distribution of the population by age, sex, education, place of residence, household size, and other relevant characteristics. Future societies, by any account, will be much older than present ones, they will be more urban, and they will be more educated. All of this affects lifestyles and consumption patterns, and also innovative potential."

As starkly highlighted in a working paper by Gerlagh et al. (2019), a quarter of the historical increase in greenhouse gas emissions is attributable to the growth of emissions per person, whereas three-quarters are due to population growth. Historically industrialised countries contributed most to emissions; however, future emissions growth is expected to be mainly driven by low and middle income countries characterised by high income growth and significant population growth.

Although population growth is an important component of future emissions projections, population dynamics are not always well represented in climate-economic models, where they are typically taken to follow exogenous trends. The working paper focuses on the environmental impacts of individual's reproductive choices, and developed "an analytical model of endogenous fertility and embed[ded] it in a calibrated climate-economy model" (Gerlagh et al, 2019, p.1). The paper highlights that endogenous fertility choices generate an externality (i.e. parents do not consider the contribution of each child to emissions when deciding on family size). They recognise that the environmental externality to childbearing is but one of a wide range of impacts that could be studied, and that "a newborn child also contributes to production when grown up" through their embedded human capital (Gerlagh et al., 2019, p.2).

The paper investigate a number of scenarios to provide evidence on the size of the "population externality"; a social optimum scenario where both optimal carbon taxes and family planning policies are implemented and second best scenarios where only one tax at time is implemented. Their results point to the need for both carbon taxes and demographic policies (Gerlagh et al, 2019, p.25). The paper presents family planning as being an integral part of climate policies, as family planning contributes to reducing emissions. Optimal family policy not only reduces the family size but also stimulates the parents to invest more in the education of their children (which increases human capital, stimulates growth, and reduces fertility). According to their model, including family planning means that global population peaks at 9 billion instead of the business-

[6] The paper used a collaborative assessment network, and of the 495 authors of the (50) papers that were ranked as most relevant to their hypothesis, 133 were women and they estimate a similar proportion were authors based in or with roots in low and middle income countries. Furthermore, "Africans were the primary authors of nine out of 22 of the top-ranked papers that specifically called for better access to family planning in order to ameliorate environmental problems" (Engelman et al., 2016, p. 2).

as-usual 11 billion (Gerlagh et al, 2019, p.1). Their model is global and does not differentiate between regions, and is not detailed enough to explore differences between countries e.g. high income low-fertility countries.

Dodson et al. (2020) highlights the ways that population change can be linked to climate change mitigation. Low population projections throughout the 21st century in economic models (as noted previously) rather than the UN medium variant (from 2004 UN projections) could reduce global carbon emissions from energy use by 40% (O'Neill et al., 2010 cited in Dodson et al., 2020, p. 4). Dodson et al. (2020) highlight work by Van Vuuren et al., 2018 that shows that "Slowing population growth is broadly comparable with other emission reduction strategies, [such as] renewable electrification by the end of the century." Integrating efforts to lower population growth with other low-carbon strategies (such as renewable electrification, sustainable lifestyle changes) across multiple sectors is critical. Dodson et al. (2020) also highlight research that found prospective feedbacks in that "policies that reduce population growth could indirectly influence other emission drivers. For example, lowering fertility could stimulate economic growth, increasing per capita affluence and consumption, which could counterbalance some of the potential emission reductions" (O'Sullivan, 2013; Casey and Galor, 2017; O'Neill et al., 2010 all cited in Dodson et al., 2020, p. 7).

O'Sullivan (2018) highlights the role of population-focused voluntary family planning programmes in attaining rapid fertility decline, even in poor communities. She argues that global peak population could peak below 9 billion if high-fertility nations adopted such programmes (rather than 13 billion by 2100 with current trends). She highlights evidence that economic advancement has not been a major driver of fertility decline, but rather fertility decline, driven by voluntary family planning programmes, has enabled economic advance (see also Schultz, 2015). For example, countries such as South Korea, Thailand and Costa Rica, where voluntary family planning was extended and promoted during 1970s-1990s, saw rapid fertility decline and subsequently accelerated broad-based economic development. Whereas, in other countries such as Indonesia, Bangladesh, Algeria and Ghana where family planning programmes were neglected before reaching replacement rate, the fertility decline stalled and, in some cases, reversed. She argues that rapid fertility decline has been associated with dramatic economic improvement. Presenting evidence that "reducing poverty as a population control strategy simply has not proven possible for most high-fertility countries" (O'Sullivan, 2018, p. 115).

However, family planning programmes have been neglected in recent decades. O'Sullivan (2018, p. 116) notes that voluntary family planning currently receives less than 1% of international aid and programmes continue to lack the scale and visibility needed to reach the majority of disadvantaged people and achieve rapid fertility decline. Furthermore, an avoided birth has more impact on future population if it occurs sooner rather than later. O'Sullivan (2018) puts forward other co-benefits as including gender equity, environmental protection, and conflict avoidance. Coherent cross-sectoral programmes (between family planning, livelihoods, health, environmental management) can greatly increase community acceptance of family planning, overcoming cultural resistance (PAI et al., 2015 cited in O'Sullivan, 2018, p. 118).

Wheeler and Hammer (2010) argued that avoiding unwanted births through investments in a combination of voluntary family planning and girls' education would avoid GHG emissions at considerably lower cost than renewable energy initiatives, and lower than most reforestation

initiatives. This was true even in countries where per capita emissions are very low (such as in SSA). In more than 60 countries, the cost was less than US$10 per tonne.

Dodson et al. (2020, p. 1) argue that “rights-based policy interventions [such as voluntary family planning programmes] could decrease fertility rates to levels consistent with low population pathways” and that these should be part of a multifaceted climate response.

A common and key theme in the sources in favour of family planning as being beneficial to climate action is that the authors **emphasise and call for voluntary family planning and sexual health services**. Voluntary family planning does not have decreasing fertility as a primary goal, but is seen as a tool to allow families (and women in particular) to determine the number, timing and spacing of their children. Although modern contraceptive practice is on the rise in SSA overall, there is much geographic variation and contraceptive discontinuation rates are also high. SSA's family planning situation remains challenged by weak and underfunded health systems which must address competing priorities (Tsui et al., 2017). Integrated policies will be key that harness synergies between women’s empowerment, girls’ education and family planning and reproductive health services.

Budolfson and Spears (2020, p. 199) as part of a set of essays on climate ethics, explore whether “fertility policy is likely to have a large effect on carbon emissions, and therefore on temperature change.” Their conclusion, given actual constraints on demographic change, governance, and policy-making attention, is that no it will not, as the effect of “fertility-reduction-as-climate-mitigation” is limited by population momentum. They show that between now and 2050 only a limited portion of world population growth can be influenced by policies that accelerate fertility decline (mainly concentrated in SSA). They modelled the possible effects of a hypothetical standalone climate fertility policy, and found that even if fertility rates change very quickly and mortality rates changed to replacement levels the world would still have a population level of over 9 billion by 2060 and temperature change would still peak at 6.4°C, relative to 7.1°C under the most likely population path.

Therefore, accelerated fertility reduction (through voluntary or incentive-based policies) is unlikely to be an adequate core approach to climate mitigation globally. However, they highlight that of all the global regions, SSA is the only one which has scope in principle, for potential faster decline in rates with policy interventions due to its high enough fertility rates. However, it currently has low emissions per capita, making policies aimed at speeding up the fall in fertility rates unlikely to be a “promising use of scarce political capital and policy attention, [or] as a focal near-term tool of climate mitigation” given the near-term timeline that is relevant for climate policy (Budolfson & Spears, 2020, p. 213). Although they recognise that reduction in fertility rates as a result of human development policy might be valuable for other reasons, and may play a part in the response to climate change, they conclude that rapid and aggressive decarbonisation is what is needed as a policy priority to address climate change.

Role of girls’ education

Lutz and Striessnig (2015) emphasise that the role of education in mitigation is more complex than its role in adaptation. They argue that in high-fertility contexts (such as much of SSA), education impacts on fertility and hence reduces population growth, “mediated by a desire for smaller family sizes” (p. S71). On the other hand, education can be associated with increased

consumption and carbon emissions due to improved economic growth, affluence and reduced poverty. Although behavioural differences at given levels of income and education with more "green choices" may negate this potential increase. These demographic and behavioural factors evolve only slowly and gradually, whereas sustainable technological innovations offer more near-term forces of successful mitigation. These technologies do not exist yet and "hope rests strongly on the future innovative potential of societies," where it is generally agreed that a high general level of education will enlarge the pool of potential innovators (Lutz & Striessnig, 2015, p. S72).

Wheeler and Hammer (2010, p.7) put forward girls' education as being one of the most cost-effectives strategies to mitigate carbon emissions. The econometric study drawing on data on carbon emissions, programme effectiveness and cost in low and middle income countries, estimated the costs of reducing carbon emissions via girls' education (increased enrolment) and family planning. Their cost estimates are much lower than the cost estimates of other carbon emissions reduction options such as solar, wind and nuclear power, second-generation biofuels, carbon capture and storage and comparable with cost estimates for forest conservation and improvements in agricultural and forestry practices. Girls' education (especially to secondary level) is connected to emissions reduction through an association between female schooling and three variables: life expectancy, income per capita and the total fertility rate (Wheeler & Hammer, 2010, p. 7). In comparing family planning vs girls' education, they find that abatement cost via family planning is generally lower in 70% of the countries studied. However, they emphasise that the two options are complementary rather than competitive.

Costs

Scovronick et al. (2017, SI Appendix, p. 9) highlights that quantitative comparison of costs between different climate policy options are also important. Although hypothetical future costs cannot be fully known, estimates from the literature can help us understand their general magnitude. Recent estimates put the spending shortfall for providing all women in Africa with access to modern Sexual and Reproductive Health care[7] at about US$21.6 billion per year[8] (in 2019 US dollars) (Sully et al., 2020, p.47). Africa accounts for 61% of the projected US$31.1 billion additional investment needed annually in low and middle income countries (Sully et al., 2020, p. 47).

The financing gap[9] projected in 2015 for providing all children in low and lower-middle income countries with a quality education (SDG4) between 2015-2030 was estimated at US$39.5 billion annually (at constant 2012 prices). However, recent data projected in 2020 from UNESCO has now put this funding gap at US$148 billion annually between 2020-2030, with the increase due in part to the shorter time-span of reaching SDG4, slow progress before 2020, and improvements in data and quality standards (UNESCO, 2020).

The COVID-19 pandemic has further aggravated education financing gaps, adding up to one-third to the annual funding gap to reach as much as US$ 200 billion (UNESCO, 2020). It is

[7] I.e. investment over current costs required to fully meet the needs for contraceptive services, pregnancy-related and new-born care, and treatment for the four major curable STIs.

[8] Costs for Western Africa: US$ 8.2 billion; Eastern Africa: US$ 6.2 billion; Middle Africa: US$ 3.6 billion; Northern Africa: US$ 1.9 billion; Southern Africa: US$ 1.7 billion.

[9] I.e. the difference between the estimated cost of achieving basic education and the estimated domestic resources available (AfDB, 2020).

thought that Africa will account for a large proportion of the education financing gap, due to its low GDP per capita and high population growth rate (AfDB, 2020, p. 102). Africa is among the highest spenders on education in the developing world, at an average of 5% of national GDP, putting many countries on track to meet UNESCO's target of providing universal primary education by 2030. And yet, Africa remains the world's least efficient region at utilising education spending (AfDB, 2020, p. 102).[10]

6. Climate change adaptation and resilience

Dodson et al. (2020) highlight evidence around higher population growth being connected with greater human exposure to climate-related risks such as flooding and water stress. People in low and middle income countries are more vulnerable to climate risks and impacts, and are disproportionately exposed compared to people in high income countries. Pressure from a growing population can weaken a country's adaptive capacity. With the interaction between climate and population "often the largest driver of future exposure, more important than changes in climate or population alone" (Dodson et al., 2020, p. 5). For some socioeconomic circumstance, "addressing population growth can be more effective than climate mitigation itself in minimizing climate-driven risks. For example, addressing population growth would be more effective than reducing emissions to minimize drought risk in developing African countries, since lower population paths reduce both socioeconomic vulnerability and exposure to drought" (Ahmadalipour et al., 2019 cited in Dodson et al., 2020, p. 5). As previously highlighted, some climate change ''hotspots'' have been identified in Africa where strong climate change signal, high population density and poverty rates (or vulnerability) coincide. These include arid/semi-arid regions, low-lying deltas and cities (Müller et al., 2014). Adaptive capacity within these areas are already often low. High rates of rural-urban migration and urbanisation in Africa, which are expected to increase in the future, may add to these vulnerabilities and increase pressure on adaptive capacity.

Some studies have argued that "future regional food security and global water security are driven primarily by population increase raising demand, and only secondarily by climate change" (Hall et al., 2017; Smirnov et al., 2016 cited in Dodson et al., 2020, p. 5). This is because the increase in food demand from population growth will likely enhance climate impacts, as it increases emissions from the second-most GHG intensive sector (agriculture, forestry and other land use), necessitating greater adaptation to address food insecurities (Conijn et al., 2018 cited in Dodson et al., 2020, p. 5). Again Dodson et al. (2020) emphasise that population-related policies would work in tandem with adaptation technologies that, for example, increase crop production, mitigate wasteful consumption and improve infrastructure and management practices.

Girls' education

Lutz and Striessnig (2015) highlight how adaptation and resilience to climate change that is unavoidable has been in sharper focus in recent years in the international community. Growing recognition has also been given to the need to consider demographic characteristics and

[10] See also Quak, E. (2020). The political economy of the primary education system in Tanzania. K4D Helpdesk Report No 710. Brighton, UK: Institute of Development Studies. https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/14998

capabilities in assessing vulnerability (i.e. differential vulnerability) rather than solely location. The role of educational composition of the population in affecting the future impact of climate change on humans and wellbeing has gained particular attention. Lutz and Striessnig (2015, p. S72) highlight that there is "strong evidence, both at the micro-level and the macro-level, of the risk-reducing potential of education, which enables individuals to acquire knowledge, skills, and competencies that can influence their adaptive capacity and thus reduce risk." Quality of education, and not just access to, is an important factor here.

It has also been found that education (particularly girls' education and to secondary education level) is the most important socio-economic determinant to reduce vulnerability to natural disasters. This was the finding of Striessnig et al. (2013) who used quantitative regression analysis covering data on past natural disaster fatalities from 125 low and lower middle income countries over the period 1980 to 2010 to investigate the effects of educational attainment on climate risk vulnerability. Using very rough, back-of-the-envelope calculations they estimated that if at least 70% of women between ages 20 and 39 achieved at least a lower-secondary education, disaster-related deaths in SSA could be reduced by 60% between 2040 and 2050 (Streissnig et al., 2013, p. 5).

Education (measured by the ratio of enrolment in tertiary education) is also an important social indicator included in the ND-GAIN index[11] (a measure of a country's resilience to climate disasters). Education is considered as an important strategy to build up adaptive capacity and identify adaptation solutions appropriate to local context. In particular, enrolment in secondary or tertiary education is a significant contributor, more than primary education, to adaptive capacity.[12] Kwauk and Braga. (2017, p. 18) using ND-GAIN Index data and UNDP data on the mean years of schooling for girls in 162 countries find that there is a strong positive association between average number of years of schooling a girl receives in her country and her country's ND-GAIN index. That is, girls with high levels of schooling are more likely to live in countries less vulnerable to climate disasters, and girls with very little schooling are more likely to live in countries that are more vulnerable. For every additional year of schooling for a girl, her country's ND-GAIN Index can be expected to improve by 3.2 points (Kwauk & Braga, 2017, p. 19).

Kwauk et al. (2019, p. 5) highlight other ways that quality girls' education can impact on climate change mitigation and adaptation: can enhance girls' "green skills" that increases their resilience and adaptive capacity and prepares them for a potential in traditionally male-dominated green sector jobs; can increase girls' opportunities for leadership and decision-making, both of which are highly correlated with pro-environmental and sustainable outcomes; an education that includes comprehensive sexuality, reproductive health, and puberty education with attention to issues of gender and power, can increase girls' sexual and reproductive health and rights (SRHR) outcomes. Furthermore, Kwauk et al. (2019, p. 5) argue that "the achievement of universal girls' education and girls' rights would represent a fundamental, and progressive shift in the social fabric and global political economy currently fueling the climate crisis."

Education as part of a suite of measures aimed at (indirectly and directly) reducing population growth in Africa, "could help change mindsets and overcome the cultural obstacles to contraceptive use" (Dodson et al., 2020, p. 6). Family planning actually improves girls' access to

[11] See https://gain.nd.edu/our-work/country-index/rankings/

[12] Information taken from https://gain.nd.edu/assets/254377/nd_gain_technical_document_2015.pdf

education “by improving household finances and increasing parents' ability to invest in each child, reducing the need for girls to care for siblings at home, as well as avoiding teenage pregnancies” (Dodson et al., 2020, p. 6). But despite the apparent benefits of investing in girls’ education, climate action and financing have paid little attention to girls’ education as a cost-effective strategy for tackling long-term climate action.

Women’s empowerment

Although the literature reviewed by Engelman et al. (2016, p. 17) “does not demonstrate directly that increased use of family planning contributes to environmental sustainability through women’s empowerment, some papers offer evidence that, cumulatively, can support that statement.” Of the 112 top-ranked papers, 11 document evidence for the value of gender equity and women’s empowerment in environmental outcomes.

A study by Oyawole et al. (2020) assessed the effect of women’s empowerment on the adoption of climate-smart agricultural practices at the plot level in Nigeria. The study calculated the empowerment score for each plot manager, as well as the women empowerment gap for each household using the Abbreviated Women’s Empowerment in Agriculture Index methodology and using data from the ECOWAS-RAAFPASANAO survey conducted in Nigeria in 2017. Oyawole et al. (2020) results show that men are significantly more empowered than women in four out of the five domains of empowerment, while preliminary descriptive statistics indicate that female plot managers adopted the climate smart agricultural practices considered more than their male counterparts. Econometric results confirm that female plot managers have a higher likelihood of adopting green manure and agroforestry, while male plot mangers are more likely to adopt crop rotation. However, no significant gender differences in the adoption of organic manure use and zero/minimum tillage were found. They conclude that closing the empowerment gap would positively influence the adoption of climate smart agricultural practices in Nigeria, their results also add to the literature base on how gender differences influence technology adoption.

FAO (2018) argues that all aspects of climate action should actively promote gender equality in climate responses. The paper highlights that gender equality was a principle objective of only 3% of Climate ODA in 2014, while 28% of it included gender equality as a secondary objective. There is strong focus on gender equality and women’s empowerment in the 2030 Agenda for Sustainable Development.

There is also the UNFCCC's Gender Action Plan, which was adopted at COP23 in November 2017 under the Lima work programme on gender. Gender equality is also mentioned in 75% of SSA's nationally determined contribution (NDC) submissions to the Paris Agreement (FAO, 2018, p. 9). The FAO (2018, p. 10) highlights that the "feminisation of agriculture" offers important untapped opportunities for closing the gender gap in agriculture for gender resilience. The empowerment of female farmers "can significantly contribute to building the household resilience to climate impacts," with "Women's ownership of productive assets [being] positively linked to their uptake of climate-smart practices and soil conservation techniques." Awareness-raising and access to information and knowledge about climate-smart agriculture options for women is important, and will lead "to greater uptake of these technologies and practices, and enhance the resilience of entire households and communities and food systems to climate-related shocks and changes" (FAO, 2018, p. 10 – see Box 1 for a country example).

Box 1: FAO Nap-Ag programme – Uganda

FAO supports countries in integrating gender issues into their National Adaptation Plans (NAPs) through the Nap-Ag Programme. The programme provides technical trainings on gender analysis and mainstreaming in adaptation planning; incorporates of sex-disaggregated data and gender analysis into agriculture censuses and impact evaluations; as well as tools for countries to promote women's empowerment and climate resilience in agricultural value chain development.

Uganda was one of the Nap-Ag pilot countries. The programme has assisted Uganda to finalise their NAP framework for the agricultural sectors, which was launched in 2018. Some other highlights of NAP-Ag work in Uganda include: sensitization of technical staff and public service providers on NAPs; and training and stock-taking of decision tools for prioritizing investment options and assessing climate impact.

Source: FAO, 2018, p. 11; http://www.fao.org/in-action/naps/partner-countries/uganda/en/

Family planning and reproductive health

1. Possible physiological effects of climate change

Grace (2017, p. 479) argues that "Factors related to fertility such as population size, composition and rate of growth may influence a community's ability to adapt to a changing climate and must also be brought into the discussion of future scenarios." But how climate change may impact on human fertility and reproductive health over time and space in poor countries is not well understood. Grace (2017, p. 479) highlights that climate change (through precipitation changes, extreme heat, extreme weather events, seasonality changes etc.) can impact (indirectly or directly) on changes in sexual behaviour and coital frequency, sperm quality, birth and fertility goals and planning, psychological well-being, general maternal and child health, and access to health services. Although there is limited research that explores these links between climate and human fertility and reproductive health outcomes in poor, rural women in poor countries (or for the wider population), Grace (2017, p. 480) argues that an empirical understanding of these links is important for understanding "processes underlying fertility changes and differences within and

across communities and are instrumental in the development and application of public health strategies focused on supporting women and families in poor countries."

Grace (2017, p. 480) characterise key (indirect and direct) links between climate and human fertility and reproductive health outcomes in poor countries under the following headings: time use and physical labour, nutrition and food security, and resource stability and income. Meaningful micro-level (household-level, community-level) research including climate in human fertility and reproductive health studies is needed to better explore these areas. Grace (2017) recommends that human fertility and reproductive health research in SSA should also focus on incorporating questions that can help to capture variation in how individuals use their time and how they respond to weather changes. Analyses like these, Grace (2017, p. 484) concludes, can support and inform the development of relevant policies on contraceptive use (and unmet contraceptive need) and food insecurity etc. This is particularly important in SSA, to better understand apparent stalls in fertility transitions, low use of contraception and high childbearing goals.

Eissler et al (2019) use 40 rounds of Demographic and Health Survey data from 18 SSA countries, linked to historical climate records, to analyse the relationship between climatic variability and fertility goals among reproductive-aged women. Their findings suggest that "women exposed to adverse environmental conditions—namely abnormally hot or dry spells—will reduce their ideal family size and their preferences for having another child. In some cases, however, fertility goals may also decline during spells of favourable environmental conditions, possibly due to increased labour demands among women and their spouses." Although the magnitude of the association is not large it is according to the authors "non-trivial." Eissler et al. (2019, p. 10) argue that the policy relevance of their findings is potentially important for helping to understand the myriad of ways in which individuals and households adapt or fail to adapt to climate change, suggestion that "adaptation may also involve ideational changes that could affect behaviour throughout women's reproductive years." They also suggest that increasing resources for family planning could be a useful component of climate change adaptation.

2. Benefits of family planning and reproductive health

Regions of high population growth, high fertility, and high unmet need for family planning overlap with regions of high vulnerability to climate change. Ongoing unmet need for family planning in these regions can exacerbate vulnerability and make it more difficult for individuals, households, and communities to adapt. A policy brief by Mogelgaard and Patterson (2018, p. 1) for Population Reference Bureau, summarises some of the key short- and long-term benefits that meeting women's needs for family planning and reproductive health has for climate change adaptation efforts and promoting resilience:

- Women and their children are healthier—a fundamental building block of resilience to climate change impacts.
- Women become more empowered (fewer caregiving demands means women are more likely to continue education and/or engage in the labour force and other activities), opening up greater possibilities for them to effectively engage in adaptation efforts. These outcomes can also lead to improved earnings that a woman can use to improve the resilience of her household to shocks.

- Couples who are able to avoid unintended pregnancies tend to have smaller families, limiting household demand on climate-sensitive resources like food and water.
- Slower population growth reduces pressure on the local natural resource base and results in fewer people exposed to climate hazards.

The brief argues that the best opportunity for funding family planning and reproductive health within adaptation projects is to integrate women's empowerment—including family planning—within multisectoral proposals (Mogelgaard & Patterson, 2018). Gender equitable policies that eliminate barriers to contraceptive use should be complemented with expanded family planning programmes that provide universal access to all types of safe, effective contraception. The benefits of family planning must be emphasised and recognised as an investment. See Box 2 for an example of USAID integrating a family planning component into an existing resilience programme.

Box 2: Building Resilience through Strengthening and Integrating Reproductive Health and Family Planning in Niger (RISE-FP): USAID

In 2017, the Evidence to Action (E2A) Project (2011–present), with support from USAID, launched "Building Resilience through Strengthening and Integrating Reproductive Health and Family Planning in Niger" (RISE-FP) in the Sahel to integrate quality family planning (FP) programming into the 2014-RISE initiative. RISE is a multi-partner initiative focused on building the resilience of chronically vulnerable households in targeted agro-pastoral and marginal agriculture zones in Niger and Burkina Faso through economic empowerment, strengthening governance, and improving health and nutrition.

As part of the RISE-FP project, E2A proposed to pilot and document an innovative integrated FP and resilience intervention built on the concepts of integration and partnership between the health and non-health sectors. The intervention theorised that "by increasing information about and the availability of health services—including FP and nutrition—as well as agriculture services (conservation farming), to a wider range of people in the communities, the resiliency of more households will increase, making households better able to withstand changes to their social, economic, and environmental systems." Integrated FP/RH and conservation farming activities by community-based distributors and conservation farmer group leaders took place in 13 villages in the Zinder region between September 2018 through June 2019.

The policy brief argues that although the intervention was relatively small in scale, its significance is substantial. The findings show promise for expanding access to family planning and may increase uptake of conservation farming practices, which would ultimately increase community resilience. These findings reinforce the evidence from PHE literature indicating that such partnerships and integrated information are often successful at reaching men with FP information, and may encourage more supportive attitudes toward FP. Results could produce synergy for household food security, health, and nutrition—and thereby resilience—across the Sahel, particularly for vulnerable women and children.

Source: USAID & E2A. 2019

Population-Health-Environment (PHE) and multi-sector programmes[13]

There is a burgeoning literature on "Population, Health, and Environment" (PHE), which is a development approach or model characterised by the integration of voluntary family planning (FP), health care, and natural resource management into a single suite of project activities.[14] Whilst these may not always be explicitly aimed at climate change, there are links, especially around resilience-building.

A review by Lopez-Carr and Ervin (2017) using evidence from USAID-sponsored programmes in Africa and Asia, explore whether combined population-health-environment initiatives provide synergies above and beyond more traditional singular efforts (NB: environment is often associated with conservation efforts). They emphasise that there is scant scholarly evidence on the effectiveness of integrated PHE initiatives, and so they aim to add to this body by exploring the potential effectiveness of integrated PHE investments for conservation outcomes. The study conducted expert interviews and used data from the World Wildlife Fund (WWF) designated high priority marine and terrestrial conservation sites with USAID-sponsored PHE programmes in the Philippines, Nepal, India, Mozambique, Madagascar, Kenya, Cameroon and the Central African Republic. Lopez-Carr and Ervin (2017, p. 92) conclude that "Quantitative and qualitative results indicate diverse, and in some cases dramatic, improvements in maternal and child health and conservation measures that overall appeared to benefit from the integrative PHE approach."

They also emphasise the importance of promoting PHE interventions within the framework of livelihood improvement. Cultural sensitivity and local buy-in were also key to success, as was effective collaboration with health partners. See Box 3 on the next page for an evaluation of the USAID Health of the People and Environment in the Lake Victoria Basin (HoPE-LVB) programme in Uganda and Kenya.

[13] Many of the case studies given in this section are taken from the Population Reference Bureau's *Population, Health, Environment, and Development Activity Map* [last updated 22/10/2019] – see https://www.prb.org/population-health-environment-activity-map/

[14] See https://toolkits.knowledgesuccess.org/toolkits/population-health-environment-toolkit/why-phe

Box 3: Health of the People and Environment in the Lake Victoria Basin (HoPE-LVB): USAID

An evaluation from 2018 examines the evidence on the effectiveness and scalability of the HoPE-LVB model of integrated population, health, and environment (PHE) community development in Kenya and Uganda. A USAID funded project that ran from 2011-2017, the project aimed to increase access to sexual and reproductive health services and improve maternal and child health care practices while reducing threats to biodiversity conservation in project communities.

Stakeholders consistently perceived that HoPE-LVB's PHE model added value. Positive outcomes were also found from institutionalisation, sustainability, and expansion of the model. In particular, the evaluation notes that the degree to which PHE practices spread organically to neighbouring communities and across regions through site visits and meetings was striking (although acknowledges there is considerable potential for further adoption). The evaluation found that "the key value the HoPE-LVB project added was its capacity to make people appreciate the relationship between population, health, and environment. Informants highlighted that HoPE-LVB significantly changed the quality of life among people in the project's areas of jurisdiction in both Uganda and Kenya, including populations traditionally more set in their ways." Family planning was highlighted as being a key aspect that influenced most people in the intervention communities; with family planning training helping to influence the number of children in the target communities. More women were also involved in income-generating activities and their bargaining power in the household had also improved.

The evaluation notes some key factors in the project:

- The importance of women's central role in PHE solutions.
- While the context (ecological, cultural, political, economic) will change across diverse geographies, the core message remains universal of the relationship between population, health, and environment.
- Successful PHE expansion will identify champions and key stakeholders at different scales and across thematic areas.
- Strategic messaging will retain the core PHE message, which has proven effective when tailored to the local context.
- Model households and exchange visits were paramount in demonstrating the PHE concept and providing living laboratories.

Source: López-Carr et al., 2018

A study by Hardee et al. (2018) uses 2016 household survey data from western Tanzania from the Tuungane integrated PHE project to quantify the link between resilience and family planning (see Box 4 for more information on the Tanzania project). The analysis finds that the association between family planning and maternal and child health, and resilience is robust across a range of factors and broadly related to the construct of resilience. Their analysis supports the importance of including family planning and maternal and child health in the design and implementation of

integrated, multisectoral projects to enhance resilience. The study notes that it was a first of its kind, and therefore it had some limitations, such as the components used to define resilience may not be complete. The authors urge the need for further research into replication of these measures with other data sources and further refinement.

Cooper Hall (2018) in a policy brief for the Population Reference Bureau explores the potential to expand the use of Family Planning High Impact Practices (HIPs) in PHE projects. HIPs are a set of evidence-based practices that improve family planning and reproductive health programme outcomes. PHEs are typically located in remote communities where unmet need for family planning is often high. When PHE projects use HIPs in their work, they can direct their family planning resources more effectively to achieve greater impact. Most PHE projects already carry out activities that align with elements of select HIPs, especially HIPs in the Enabling Environment category through policy work with decisionmakers. To strengthen the impact of their activities, PHE projects should strategically consider how to leverage the HIPs they currently implement and explore opportunities to strengthen their projects by using additional HIPs. A case study used by Cooper Hall (2018) to demonstrate the value added of HIPs to a PHE project can be seen in Box 4.

Box 4: Tuungane integrated population, health, and environment (PHE) project in Tanzania

The Tuungane PHE project is led by Pathfinder International and The Nature Conservancy in 24 remote villages beside Lake Tanganyika in an ecologically rich area of western Tanzania. The project aims to improve access to reproductive health services while also assisting community members to better manage natural resources to ensure their livelihoods are sustainable and their community is healthy using a cross-sector approach. Analyses of the 2011 baseline and 2016 midline quantitative data, and additional qualitative data from 2016, measured the project's progress and shed light on the contribution of the project interventions to building resilience, and on the links between family planning and other components of resilience. After four years, the Tuungane Project made progress toward increasing resilience on key indicators relating to population, family planning, and reproductive health. Progress was made in social cohesion-participation; natural resources protection attitudes; food security and assets; water, sanitation, and hygiene; climate change awareness; and family planning and access to health care. It was noted that regarding respondents' attitudes to population and family planning, while most people still desire large families, they understand and value family planning for its ability to improve maternal and child health.

The Tuungane project found that although access to and use of contraception has increased in the project area, desired family size has not changed. Increasing knowledge about comprehensive reproductive health services and facilitating dialogues about optimal birth spacing for family health and prosperity could help community norms evolve. Strengthening Tuungane's social and behaviour change activities may enhance these efforts (i.e. through using lessons from the Social and Behaviour Change HIPs).

Sources: Patterson, 2018; Cooper Hall, 2018; Hardee et al., 2018.

7. Climate policies

Family planning and education reflected in climate policies

The link between population and GHG emissions has been the topic of a large literature. However, it appears that policymakers seem to almost ignore the effects of policy on population size, and there is little attention by the international community to the potential of population-related policies to reduce risks from climate change (Arrhenius et al., 2020; Dodson et al., 2020). On the other hand, population policy "can only be applicable to climate policy if it can influence population growth rates, at acceptable costs and without other undesirable consequences" (Scovronick et al., 2017, SI Appendix, p.9). There is also general awareness of key population, climate change and gender challenges among policymakers in Africa, as well as the need to link and integrate the two issues at policy and programme levels. However, there is limited prioritisation of population issues in broader development policies and strategies (Aura et al., 2017).

O'Sullivan (2018, p. 119) notes the literature that emphasises that the effects of population change in SSA "dwarf the likely impacts of climate change on food and water security and on environmental damage." A population-focused voluntary family planning approach would be alongside a suite of other emissions reducing avenues. However, it is generally excluded from the UNFCCC discourse. O'Sullivan (2018) highlights that discussions of the risk population growth poses to heightened climate change impacts is considered taboo by the UN and development community since the adoption of the Cairo Agenda (i.e. the UN Programme of Action) at the 1994 International Conference on Population and Development, which called for the emphasis of reproductive health and rights over demographic aims. As a result, funding for reproductive health issues (e.g., maternal care, safe delivery, sexually transmitted diseases, and female genital cutting) rose and funding for family planning programmes declined in the 1990s and 2000s (Bongaarts & O'Neill, 2018).

Hardee and Mutunga (2010) review the National Adaptation Plans for Action (NAPAs) prepared by least-developed countries during the UNFCCC's 2009 climate adaptation agenda. They found that 37 out of 41 NAPAs highlighted population growth and density as factors increasing vulnerability to climate change. Moreover, six NAPAs (the Comoros, Ethiopia, Gambia, Kiribati, Uganda and Zambia) clearly state that slowing population growth or investments in reproductive health/family planning should be considered among the country's priority adaptation actions. Only one of these six (Uganda) actually proposes a project with components of reproductive health/family planning among their priority adaptation interventions, and none were funded. The UNFCCC guidelines lacked appropriate categories in which population action could be presented as valid climate action.

A more recent analysis from 2018 looked at the mention of SRHR in the Nationally Determined Contributions (NDCs) to the Paris agreement. Brok (2018, p. 1) from the DFPA screened the NDCs "for references to analyses and action related to population, fertility rates, family planning, and SRHR." Out of 190 NDCs available at the time, 164 were screened as the study was limited to the NDCs available in English and some countries have shared NDCs e.g. the EU. The study found that only seven NDCs mention SRHR (such as voluntary family planning), even though around a third link climate change and population growth. Predominantly low and lower middle

income countries express concern about the links between changes in climate and a growing population.

A recent analysis of 160 NDCs and 13 National Adaptation Plans (NAPs) by Kwuak et al. (2019) looking at whether climate strategies include adequate attention to social protection and inclusion/ empowerment of vulnerable groups and girls' education, conclude that they do not. Within the analysis, "only one country's NDC makes a reference to girls' education and two additional countries refer to girls explicitly, a reflection of a larger omission of children/youth and education in climate strategies. Only 67 of 160 NDCs include a direct reference to children or youth and only eight to intergenerational injustice or future generations. [The] top 20 carbon emitting countries were least focused on education and children" (Kwauk et al., 2019, p. (3)). Furthermore the countries that "do attend to issues of intergenerational equity tend to be "young" countries—countries with a large under-15 population—and climate-vulnerable countries" (Kwauk et al., 2019, p. (3)). NDCs and other climate strategies tend to be focused on technical solutions and ignore sociological concerns, and where sociological concerns are considered this tends to focus on the politics of the economic state (i.e. politics between high income countries and low and middle income countries) and omit space for challenging social power structures (including gender). Kwuak et al. (2019, p. 26) emphasise that "the inclusion of girls' rights in national climate strategies can have mutual benefits for both climate action and gender equality."

Organisations promoting the role of SRHR in climate change approaches

Some key organisations and alliances are working to promote the role of SRHR in climate change approaches and sustainable development in international fora. For example the Population & Sustainable Development Alliance (PSDA)[15] works to strengthen and promote intersectoral approaches to sustainable development that encompass SRHR, maternal and child health, water and sanitation, livelihood diversification, food security, gender equality, community-based natural resource management, environmental protection and climate change resilience. PSDA was established and is chaired by the Danish Family Planning Association (DFPA) and made up of a community of member organisations (mostly CSOs). Engage with decision makers at international conferences across the globe, sharing evidence from peer-reviewed literature and the community-based work of PSDA members.

Mogelgaard and Patterson (2018) argue that with increasing focus on adaptation there is a growing opportunity for family planning to be included as part of multisectoral climate adaptation projects. However, family planning has not yet broadly been incorporated into projects funded by multilateral finance institutions. International climate finance institutions such as the Green Climate Fund (GCF) and the Adaptation Fund, are increasingly supporting climate change adaptation. Questions have risen about what counts as adaptation activities as this financial support has grown. However, according to Mogelgaard and Patterson (2018), none of the main multilateral adaptation funds have supported family planning efforts within their portfolios. On the other hand, none of their investment frameworks contain explicit prohibitions against doing so. Bilateral donors are also funding programmes that combine family planning with other climate actions. For example, see Box 5 for an example of REDD+ funding family planning interventions.

[15] https://psda.international/

Box 5: Norway & CAFI/FONAREDD DRC programme on Scaling up family planning

The Central African Forest Initiative (CAFI) launched in 2015, supports strategic, holistic and country-level REDD+ and Low Emission Development investments while focusing on Central African high-forest cover countries (Cameroon, the Central African Republic, the DRC, Equatorial Guinea, Gabon, and the Republic of Congo).

Since 2012 the DRC has established a REDD+ National Fund (French acronym, FONAREDD), CAFI funds have capitalised FONAREDD and are channelled through it. To date sixteen programmes have been approved, together totalling over US$ 140 million of CAFI capital. Five of the CAFI /FONAREDD-funded provincial integrated programmes, covering 8 provinces, have integrated demography activities and targets over the next 5 years aimed at reducing demographic pressure on forests. This includes a specific programme on **Scaling up family planning (PROMIS-PF its French acronym). Running from 2019 to 2022 (potential to extend to 2025), it is implemented by Tulane University, Marie Stopes International and DKT International with supplies from UNFPA and UNOPS, and is funded by CAFI (US$ 8 million) and Norway (US$ 25 million). It aims to reduce the effects of unplanned demographic growth on forests, supporting 193 health centres and 8 Million Couple Years of Protection, and also increase by 1.5% each year the services and inputs (such as contraceptives) in the eight provinces covered by REDD+ Integrated programmes**. More specific programme information is only available in French.

Sources: https://www.cafi.org/content/cafi/en/home/our-work/our-results/demography.html; https://www.cafi.org/content/cafi/en/home/partner-countries/democratic-republic-of-the-congo/drc-fonaredd-programmes.html; http://mptf.undp.org/factsheet/project/00116875 [in French]

Sensitivities and debates

A key sensitivity in the issues around population growth and climate change is that voluntary family planning programmes are largely aimed at high-fertility low and middle income countries, with relatively low per capita emissions, “while people in the developed world, which is primarily responsible for causing the climate to change, continue their excessive emission of greenhouse gases” (Bongaarts & O'Neill, 2018, p. 652). This highlights a key concern of many in the climate change community, a conversation that “blames the poor countries for problems created by the rich countries” (Bongaarts & O'Neill, 2018, p. 652). The call for a human rights–based approach (i.e. for women everywhere to have the right to freely choose when and how often to get pregnant) helps somewhat to move past these concerns. However, **although there is widespread agreement among governments and international organisations that family planning programmes are a valuable investment” they are often given low priority as they are considered a “health investmen**t rather than an investment with wide-ranging socioeconomic and environmental benefits” (Bongaarts & O'Neill, 2018, p. 652).

A growing group of scholars question and challenge what they see as "population control's current manifestations" and the "the continued prevalence of population control ideology, with attendant population alarmism, in sustainable development and climate change approaches" (Hendrixson et al., 2020, p. 308). Hendrixson et al. (2020, p. 312) argue that these manifestations of population control "restrict bodies, reinforce boundaries, and create spaces of exclusion and violence" and "These practices dismiss social justice and human rights goals and agendas or instrumentalize them." This demonstrates the ongoing, complex debates, discourses, sensitivities and ethical concerns that remain.

Future research

There is a recognised need for further research into population and climate change connections, and donors are starting to react to this (see for example Box 6). Dodson et al. (2020) highlight the need for more basic and applied research into population-related fields in order to create the most effective policies, especially around the efficacy of national population-related policies in the context of climate impacts. Given the general move away from support to population-focused voluntary family planning programmes since the early 1990s in international development, the research into the efficacy of national policies and the contraceptive needs for different scenarios has declined. A better understanding of the impact of different population trajectories within countries on expected climate impacts, such as food security, water security etc is needed. Cross-sectoral collaborative research with family planning and reproductive health professionals is also

Box 6: Population Council's Contributing to the Sustainable Development Goals by Investing in Adolescent Girls and Young Women: Danida

Denmark has placed sexual and reproductive health and rights of women and girls at the centre of their international work and priorities. The World 2030 – Denmark's strategy for development cooperation and humanitarian action recognises the need "to reverse the global population trend and turn the development around from being a challenge and a potential threat to being an opportunity and a resource." In 2020, Denmark allocated DKK 755 million to global efforts for sexual and reproductive health and rights, including efforts focusing on women and girls in humanitarian crises and conflicts. As part of this contribution, Danida initiated a cooperation with the organisation Population Council in 2020 with a focus on population growth, youth, and climate change.

The Population Council's programme, Contributing to the Sustainable Development Goals by Investing in Adolescent Girls and Young Women (AGYW), will run from July 2020 to December 2022, with a focus on girls in SSA. The Population Council will undertake a body of inter-disciplinary research to deliver three complementary outputs that together will: increase understanding of the population, health, development, economic and environmental impacts of more widespread and intentional investments in AGYW; equip national and global decision makers with the right kind evidence to guide investments; and, address the evidence gaps in climate and population research. Key outputs include the development of an evidence-based framework outlining opportunities on how to optimize adolescents' transitions to adulthood in order to accelerate progress for adolescents, their families, and communities, including the influence of education and family planning on fertility rates. An Adolescent Atlas for Action – an online analytical tool – expanded to 15 ODA countries for better data and evidence use for investment in adolescents.

Sources: Ministry of Foreign Affairs of Denmark, 2019; Population Council, 2020; https://um.dk/en/danida-en/strategies%20and%20priorities/

needed to determine the appropriate methods and response. Documenting the vulnerability reduction benefits that come with greater access to family planning is also needed. Finally, “More studies are needed that not only include actions to lower fertility, but also couple human and natural systems. To facilitate this, there should be more collaboration between social scientists experienced in reproductive health and population policy and climate scientists” (Dodson et al., 2020, p. 7).

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About this report

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