Population growth, family planning and the Paris Agreement: an assessment of the nationally determined contributions (NDCs)

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Abstract

Under the Paris Agreement, nations made pledges known as nationally determined contributions (NDCs): national climate plans detailing countries’ ambitions to adapt to climate change and reduce greenhouse gas emissions. Population growth is a driver of both climate vulnerability and climate-altering emissions. We asked, to what extent do countries take population growth into account in their NDCs, beyond simple statements of population trends? Our research method was a comprehensive text review of 164 NDCs submitted by countries. About one-third (49) of countries’ NDCs either link population growth to a negative effect and/or identify population growth as a challenge or trend affecting societal needs. Common impacts of population growth noted were increased energy demand, natural resource degradation, vulnerability to climate impacts, and decreased food and water security. Seven NDCs included strategies to slow population growth, and none specified implementation measures. Overall, the adaptation potential and mitigation co-benefits associated with slowing population growth through meeting the unmet need for family planning are largely overlooked in national NDC documents, suggesting that they are also neglected in countries’ climate change planning. In upcoming rounds of NDC updates, we recommend that governments consider the potential impact of population growth on adaptation and mitigation efforts, prioritize meeting their unmet needs for family planning, and integrate population-health-environment projects in their national climate plans.

Keywords NDC · Population growth · Climate vulnerability · Family planning · Adaptation

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1 Introduction

Nationally determined contributions (NDCs) present countries’ efforts to reach the Paris Agreement’s goal of limiting warming well below 2 °C. More specifically, they describe countries’ ambitions to reduce emissions and adapt to climate impacts given their national circumstances (Bodansky, 2016). NDCs differ from previous United Nations Framework for the Convention on Climate Change (UNFCCC) submissions as they apply to all countries, include strategies to reduce emissions (the mitigation component), may include strategies to prepare for climate impacts (the adaptation component), and are submitted every five years. This flexible structure of the NDCs also enables them to serve wider political functions by furthering national interests in global negotiations, e.g., signaling countries’ differential responsibility for climate change and its unequal impacts (Dasandi et al., 2021). For example, Dasandi et al. (2021) observed that while most NDCs mention health, poorer and climate-vulnerable countries that contribute least to climate change are likely to engage more with health, while richer countries focus on non-health sectors such as energy and the economy. Hence, the NDCs can be read as political texts that “reveal deeper tensions, ideas, and values about international climate policy” (Mills-Novoa & Liverman, 2019), providing an opportunity to investigate climate priorities for nearly all countries in an international forum (Leinaweaver & Thomson, 2021).

To date, much of the policy analysis of the NDCs has focused on the insufficiency of their mitigation commitments to achieve the stated goal of the UNFCC: limiting global warming to no more than 1.5 or 2 °C (Robiou du Pont & Meinshausen, 2018; Höhne et al., 2018; United Nations Environment Program, 2018). NDCs have also been reviewed to determine how countries address issues related to oceans (Gallo et al., 2017), REDD+ (Gallo & Albrecht, 2019; Hein et al., 2018), land use, land use change and forestry (Fyson & Jeffery, 2019), waste management (Powell et al., 2018), and health (Dasandi et al., 2021; Dickin & Dzebo, 2018). No scholarly study to date has fully analyzed NDC’s treatment of population growth or family planning policies—an oversight, given the important roles they could play in helping to achieve nations’ adaptation and mitigation goals (Bongaarts & O’Neill, 2018; Hawken, 2018; Mogelgaard, 2018; O’Sullivan, 2018; Ripple et al., 2019).

Population growth is directly related to climate adaptation and mitigation as it is a driver of both climate risks (Asefi-Najafabady et al., 2018; Dodson et al., 2020; Jones et al., 2015; Liu et al., 2017) and climate-altering emissions (IPCC, 2014a; O’Neill et al., 2015; O’Sullivan, 2018). According to the IPCC (2014a), population growth is a major driver of increases in greenhouse gas emissions. Recent projections show the global population may increase 40% by 2100, from 7.7 billion to 10.9 billion (United Nations, 2019a). The entirety of this increase is forecasted for less developed regions, considered most vulnerable to climate risks (Jiang & Hardee, 2011). Particularly in high impact areas, population growth is likely to exacerbate vulnerability by outpacing investments in social services and increasing the demand for and depletion of limited resources (Stephenson et al., 2010). Slowing this growth could help countries increase their capacity to adapt to climate impacts (De Souza, 2014) and provide mitigation co-benefits (Engelman, 2014).

Many strategies can lead to lower fertility and slower population growth, while accelerating societal development: most notably, family planning programs, girls’ education, and programs to promote gender equity (Bongaarts, 2016; Dodson et al., 2020). Family planning is becoming increasingly recognized as a human-rights based and cost-effective measure to improve public health and reduce vulnerability to climate risks (Hardee et al., 2018;
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Mogelgaard, 2018), particularly as over 200 million women around the world of reproductive age want to stop or delay childbearing, but are not using modern contraception (Starrs et al., 2018). Meeting this need could improve maternal and child health (Chola et al., 2015), and ease future population pressure on food and water security (Gunasekara et al., 2013; Moreland & Smith, 2012), enhancing societal resilience to climate impacts.

The inclusion and treatment of population growth and family planning have been examined in previous UNFCCC submissions and in a subset of NDCs. Under the Kyoto Protocol, least developed countries were invited to submit National Adaptation Programs of Action (NAPAs) to identify immediate adaptation priorities. Bryant et al. (2009) and Hardee and Mutunga (2010) found that many of the NAPAs recognized population growth as a problem that exacerbates vulnerability or reduces resilience; however, few NAPAs identified slowing population growth or investments in family planning as priority adaptation actions. The authors recommended that population be included in longer-term adaptation strategies, through attention to family planning and socially beneficial actions such as improving girls’ education (Hardee & Mutunga, 2010, Bryant et al., 2009). A recent United Nations Population Fund publication reviewed a subset of NDCs from Africa, Arab States, Asia Pacific, Latin America, and the Caribbean for the inclusion of sexual and reproductive health related topics (United Nations Population Fund, 2021). In half of the NDCs (25/50), aspects of population dynamics were referenced as a challenge exacerbating climate change issues, and six NDCs included references to maternal health and/or family planning services. As NDCs are globally representative national climate policy documents, it is important that attention to population is examined in all NDCs submitted by countries at all development levels. Here we ask, to what extent do countries take population growth into account in their NDCs, beyond simple statements of population trends? We answer this research question through a text review of 164 NDCs submitted by countries. Their concerns related to population growth are identified, as are any proposed actions or strategies to slow population growth. Our more specific questions are:

1. Which countries explicitly included impacts of population growth in their NDCs?
2. What are the most common impacts they identified?
3. What actions or strategies, if any, were proposed to slow population growth?

Overall, we expected less developed countries to include impacts of population growth, and few NDCs that identify impacts of population growth to outline actions or strategies to slow population growth. Other demographic variables, such as population density, age structure, urbanization, and migration, affect community vulnerability to climate change and could affect a government’s perception of population growth as either an opportunity or challenge. However, analyzing each country’s context in relation to these variables was beyond the scope of this paper. Here we limit our review of NDCs to population increase; hence in what follows, ‘population’ refers to changes in population size.

2 Methods

We reviewed 164 of 166 NDCs submitted to the UNFCCC Secretariat by August 2018. This covers 191 countries and associated territories, since the NDC from the European Union spans all 28 EU members (see Online Resource 1 for full list of parties). France submitted a complementary NDC for its associated territories. This complement was an
addendum to the EU NDC and is included in the NDC count as part of the EU NDC. However, both the EU NDC and addendum are excluded from analysis due to differences in data scale (i.e., values for the EU are regional averages, while all other data points are country-level), and due to lack of data for the territories included in the addendum. If a party submitted a revision, we analyzed the most recent submission (submitted as of December, 2019).

We selected two core ‘population’ keywords and completed a standardized search for these keywords in each NDC (see Table 1). We identified paragraphs of text with core keywords, and identified secondary keywords indicating increases in population size, henceforth referred to as growth keywords (e.g., grow, increase, and expand; see list of growth keywords in Table 1). When core keywords were found in combination with growth keywords, the entire section was extracted and read in its entirety.

When we found no core keywords, or core keywords were not found in combination with growth keywords, we classified the NDC as population exclusive. Similarly, if population growth was mentioned but the impacts of growth were not included (e.g., “the current population growth rate is xx%”) or it was stated as a methodological assumption (e.g., “the baseline scenario is based on the following population projections”), the NDC was also classified as population exclusive. This is because NDC guidance documents encouraged countries to state population trends when describing their level of ambition (Holdaway & Dodwell, 2015), and include population assumptions in their emission projection methodologies (Levin et al., 2015) (see Online Resource 2). Only when countries clearly stated the impacts of population growth, identified population growth as a challenge, or identified population growth as a trend affecting societal needs, did we classify the NDC as population inclusive (see Table 2 for examples).

We counted and categorized the references to impacts of population growth. Ten categories were used, based on the categories used in a previous review of countries’ NAPAs (Hardee & Mutunga, 2010). The frequency of impacts was counted, i.e., the number of times each impact was identified within and among NDCs.

Most NDCs were submitted in English (118) or had English translations available (25). Those that did not have an English translation available (Spanish (8), French (13)) were reviewed using Google translate. We excluded two NDCs submitted in Arabic with no translation (Iraq and Kuwait). For non-English NDCs, we translated core keywords into the respective language and conducted a standardized search for the core keywords in the NDC. We translated any identified paragraphs to English to determine the presence or absence of growth keywords (see Table 1 for non-English keywords). When we found core keywords in combination with growth keywords, we translated the entire section to English, then read and evaluated it following the same protocol.

Table 1 Core search keywords and identified growth keywords

| Language | Core keywords | Growth keywords |
|----------|---------------|-----------------|
| English  | populat*, demograph* | grow*, increas*, project*, expansion, surge, stabiliz*, dynamics, control, forecast, trend*, will be, expected to/will reach, change* |
| Spanish  | poblac*, demográf* | crecimiento, proyecciones, aumento |
| French   | populat*, démograph* | croiss*, changements, evolution, augmenté, projections |

Bold growth keywords indicate keywords in NDCs that included at least one impact of population growth. Asterisks indicate the truncation operator used in the search.
Although NDCs varied considerably in length and content, they followed a similar format: an introductory section including national circumstances, a mitigation section, and an optional adaptation section. Mitigation refers to actions that result in reductions of national greenhouse gas (GHG) emissions. Adaptation refers to vulnerabilities from climate change and actions that reduce climate change impacts. Every time an impact of population growth was identified, the corresponding section was noted. If the section heading was unclear, we used section content to determine whether the impact was discussed in terms of national circumstances, mitigation, or adaptation.

Population growth data originate from the UN’s World Population Prospects: 2019 Revision (United Nations, 2019a). We obtained data for the unmet need for family planning from the United Nations Estimates and Projections of Family Planning Indicators (United Nations, 2019b). The unmet need for family planning is defined as the percentage of women of reproductive age (15–49 years) who want to stop or delay childbearing but are not using contraception.

We descriptively compare the difference in population growth rates between population inclusive countries NDCs \((n = 48)\) and countries that did not include impacts of population growth in their NDCs (population exclusive, \(n = 115\)). Such a comparison was also made for the unmet need for family planning (samples of \(n = 42\) and \(n = 103\), excluding 18 countries due to lack of data (Cook Islands, Iceland, Liechtenstein, Marshall Islands, Micronesia, Monaco, Nauru, Palau, South Sudan, St. Kitts and Nevis, Tuvalu, West Bank and Gaza (Palestine), Andorra, Brunei, Dominica, Niue, San Marino, and Seychelles)). We also compute total population and compare total fertility rates (TFR, the expected average number of children per woman, UN 2019a data) of population inclusive and exclusive countries. Because countries are not randomly drawn, and cannot be considered independent statistical units in comparisons like these.
(see Götmark & Andersson, 2020, p. 6 for detailed arguments), we avoid probability testing, instead presenting descriptive estimates (means ± SD) and graphics.

3 Results

3.1 Countries including impacts of population growth in NDCs

Of the 164 climate plans collectively submitted by 191 countries, 49 countries identified at least one impact of population growth in their NDC (Fig. 1). A large majority of these population inclusive NDCs were submitted by countries in less developed regions (94%); almost half were submitted by countries in Africa (49%), followed by Asia (16%) (Fig. 1). Only three countries from more developed regions included population effects in their NDCs, all in Europe: Andorra, San Marino, and Switzerland (Fig. 1).

3.2 Common impacts of population growth

The most common impacts of population growth identified in the NDCs were related to energy use and security, natural resource degradation and demand, vulnerability and resilience, agricultural expansion and food security, and water security (Fig. 2, see Table 3 for a list of countries by the ten categories). Impacts were most frequently included in the national circumstance components and least frequently in the mitigation components of NDCs (Fig. 2). For five of the ten categories, impacts were most frequently included in countries’ national circumstances. Population impacts related to climate vulnerability and resilience and water security were most frequently included in the adaptation components of NDCs, while population impacts related to agriculture and food security, GHG emissions and land use change were most frequently included in the mitigation components.

![Fig. 1 Map of countries and microstates that refer to impacts of population growth in their NDCs. Orange indicates countries that did not include impacts of population growth in their NDC (population exclusive), while red indicates countries that included at least one impact of population growth in their NDC (population inclusive). Gray indicates countries that either did not submit NDCs by the time of review or were excluded from our study (Iraq and Kuwait). Saint-Barthelemy, a French territory that submitted a population inclusive NDC as an addendum to the EU NDC, is not shown on this map.](image-url)
Population impacts related to agriculture and food security were included in national circumstances, mitigation, and adaptation components of NDCs (Fig. 2).

The most commonly identified impacts of population growth were energy use and security (18 NDCs), identified most often as a national circumstance (Fig. 2). In general,
countries were concerned about increases in energy production and consumption due to population increase. Specific energy concerns related to population growth were increases in road traffic volume and/or building heating, as noted in NDCs from Switzerland, Lebanon, Brunei and Andorra. Eight of the eighteen parties that linked population growth to energy concerns (Belize, Benin, Indonesia, Jordan, Niger, Pakistan, Tajikistan, and Timor-Leste) have very low per capita energy use, below 1000 kg oil equivalent per year (IEA, 2014), and population growth rates above the global average (United Nations, 2019a).

Increases in population were also associated with food insecurities and emission increases due to rising food demand (11 NDCs). Some countries, like Kiribati, expressed adaptation concerns that food production systems may not meet the needs of an increasing population. However, concerns about rising food demand were more frequently related to mitigation (Fig. 2). Many countries were concerned about the likely increase in agricultural emissions to meet future food needs. The NDC submitted by United Arab Emirates, an import-dependent country, stated that food imports are expected to double with continuing population growth.

Eleven countries recognized population growth as a factor increasing climate vulnerability and affecting resilience, primarily in the adaptation component (Fig. 2). Seychelles’ and Mauritius’ NDCs noted that population increase will have an “additional climate-health related burden.” The NDC submitted by Mongolia identified its growing population as one factor rendering Mongolia’s socioeconomic development vulnerable to climate change. Haiti, a country with an annual population growth rate of 1.3%, has taken measures to reduce vulnerability, but states that the measures have not had the scale or intensity to meet the needs arising from demographic growth.

In ten NDCs, population growth was linked to water security concerns (Table 3). Many countries acknowledge that population growth has increased the demand for freshwater, and express adaptation concerns for future water security. In Malaysia’s NDC, high population growth was identified as a factor leading to water stress; in Sudan’s NDC population growth was identified as one of four factors that make a “looming water crisis appear likely.”

### 3.3 Demography and unmet need for family planning

The total population of countries that included impacts of population growth in their NDCs is 2.8 billion ($n=48$), whereas the total population of countries that did not include impacts of population growth in their NDCs is 3.6 billion ($n=115$). There is a trend for countries that included impacts of population growth to have higher annual population growth rates ($n=48$, mean = 1.78% ± 1.00) than countries that did not include such impacts ($n=115$, mean = 1.30% ± 1.03) (Fig. 3). Fertility rates markedly influence population growth rates and countries with population inclusive NDCs tended to have higher fertility rates ($n=44$, mean = 3.60 children per woman ± 1.45) than countries with population exclusive NDCs ($n=106$, mean = 2.71 ± 1.15; note fewer countries than in the growth comparison, since the fertility rate comparison omits some small island states and small “city states”). Similarly, there was a trend for countries with population inclusive NDCs ($n=42$, mean = 15.3% ± 6.09) to have a higher unmet need for family planning than countries that submitted population exclusive NDCs ($n=103$, mean = 11.7% ± 5.40) (Fig. 3). It is important to note that these are descriptive comparisons and no statistical tests were conducted (see Methods).
Many countries with high population growth rates neglected to include the impacts of population growth in their NDCs. Of the 30 countries that had the highest annual population growth rates and also submitted NDCs, 16 out of 30 were population exclusive. These 16 countries, mostly in sub-Saharan African, had an average annual population growth rate of 2.9%. In a comparison of 48 countries with a growth rate above 2% (implying at least doubling of their population in 35 years), as many as 27 were population exclusive, e.g., Afghanistan, Bahrain, Oman, Ethiopia, Angola, and Burkina Faso. In contrast, it is also possible to find population inclusive countries with <0.5% annual population growth, e.g., Dominica, Mauritius, and Uruguay.

### 3.4 Actions and strategies to slow population growth

Of 49 population inclusive NDCs, seven included an action or strategy to slow population growth (Fig. 4). These actions or strategies were primarily adaptation measures, national development priorities, or means of NDC implementation. Tunisia was the only country to include a population related measure as a mitigation action (Table 4).

Two of the seven NDCs (Mauritius and Uganda) included strategies to slow population growth. The other five parties described ambiguous population efforts or included a population goal but provided no implementation measures (Table 4). Mali and Togo integrated national development goals and climate strategies to develop very broad population actions. For example, Mali integrated its Strategic Framework for Growth and Reduction of Poverty and national adaptation policies to create a list of adaptation actions, one of which was, “Master and manage the evolution of the population of Mali.” Niger was the only...
country to include a specific population growth rate target (Table 4), referencing the Niger Sustainable Development and Inclusive Growth Strategy 2012–2035.

4 Discussion

The majority of parties to the Paris Agreement did not include explicit impacts of population growth in their NDCs outside of population trends and emission projection assumptions. The minority of parties that did recognize impacts of population growth did so in regard to their ability to cope with climate impacts, limit emissions, and/or meet societal needs. In-line with our expectation, less developed countries were by far the majority of countries that included impacts of population growth in their NDCs. However, many less developed countries and other countries with high population growth rates did not include population concerns in their NDCs. Similar to other studies, few parties that recognized the impacts of population growth outlined strategies to slow population growth and none described clear measures of how population-related measures would be integrated with climate action. This contrasts with the countries’ regular reports on population policy to the UN’s Population Division, where a majority of developing nations report national policies for fertility reduction and lower population growth (United Nations, 2017).

The majority of population inclusive countries were less developed countries, countries which have contributed least to climate change and are negatively affected by climate impacts (Jiang & Hardee, 2011). Most often, impacts of population growth were regarded as countries’ special circumstances, as demonstrated by the most frequent inclusion of population effects in countries’ national circumstances (Fig. 2). Population effects were second most frequent in the adaptation components of NDCs, followed by the mitigation components. This finding reflects the broader political nature of the Paris Agreement and NDCs. For example, in the Paris Agreement, least developed countries were encouraged to

![Fig. 4 Proportion of NDCs that included actions or strategies to slow population growth. Of 164 NDCs (left), just under one-third included at least one impact of population growth. However, recognizing the climate-related impacts of population growth was largely not reflected in actions or strategies to slow population growth: Seven NDCs included an action or strategy to slow population growth (right)]
focus on capacity building and adaptation as ‘a key component of and contribution to the global response to climate change,’ and other authors examining NDCs observed that least developed countries elaborate more on adaptation actions and strategies than emerging or developed countries (Pauw et al., 2019). Our findings reflect similar patterns in regard to population-related effects.

Population growth seems to be of particular adaptation concern for countries in regard to future water security, natural resource degradation, and vulnerability and resilience to climate impacts (Fig. 2). The link between population growth and future water security is not surprising; depending on the study scale, future water scarcity is driven primarily by population increase, and only secondarily by climate change (Schewe et al., 2014; Smirnov et al., 2016). In addition, countries projected to be most negatively affected by climate change have a large proportion of their populations dependent on climate-sensitive sectors for their livelihoods (Bathiany et al., 2018). This seems to be reflected in countries’ concerns about the impact of population growth on natural resources. It is well established that population growth increases vulnerability to climate impacts (Rovin et al., 2013; IPCC, 2014b; Hardee et al., 2018) and can also hinder adaptation measures, as noted in Haiti’s NDC. Despite frequent population-related adaptation concerns across many NDCs, only two strategies to address population growth were included as adaptation measures (Table 4).

Overall, recognizing the impacts of population growth on climate adaptation and mitigation has yet to spur specific strategies to slow population growth. These results are similar to a previous review of least developed countries’ NAPAs. In their review, Hardee and Mutunga (2010) found that 37 of the 41 NAPAs recognized population pressure as an issue related to the ability to cope with climate change. Of those, only six clearly stated that

| Country | Section   | Subsection                                      | Action or strategy                                                       |
|--------|-----------|-------------------------------------------------|------------------------------------------------------------------------|
| Mali   | Adaptation| National Policies and Strategies                 | “Master and manage the evolution of the population of Mali”             |
| Mauritius | Adaptation| Adaptation Measures, Health Sector               | “Mainstream climate change adaptation in the health sector to respond to population increase and its additional climate-related health burdens” |
| Egypt  | National Circumstances | National Objectives and Priorities | “Focus efforts on controlling population growth”                        |
| Togo   | National Circumstances | Commitment to Sustainable Development | “Efforts focused on lack of population control”                        |
| Niger  | Means of Implementation | Obstacles and Gaps | “Reduce the population growth rate from 3.9% to 2.35% in the 2035 horizon” |
| Uganda | Means of implementation | | “Provide adequate support for policies and programs that take into account the interactions between population dynamics, climate change and development” |
| Tunisia | Mitigation | Sustainable Development Impacts, Forestry and Other Land Usages Sector | “Population stabilization and prevention of rural depopulation” |

Table 4 List of actions and strategies identified by parties to address concerns related to population growth
slowing population growth should be among the country’s priority adaptation actions and only two detailed implementation measures. In our review, only seven of 164 NDCs clearly stated that slowing population growth is relevant for their national climate plan, but none detailed implementation measures. This is despite potential adaptation actions, such as meeting countries’ unmet need for family planning, that could improve public health and reduce vulnerability to climate risks (Hardee et al., 2018; Mogelgaard, 2018). These results appear to be reflective of the general treatment of the health sector in NDCs. According to Dickin and Dzebo (2018), concrete steps to integrate the health sector into countries’ NDCs are missing.

Governments concerned with impacts of population growth should identify human rights-based actions to slow population growth, one of which could be to meet the unmet need for family planning, including reliable access to culturally sensitive contraception services. For example, the NDCs from Kiribati and Solomon Islands identified poor family planning services and lack of contraceptive use as two factors contributing to high population growth. Despite this recognition and Kiribati’s concerns about continued population growth, no strategies were identified to improve family planning services. Integrated, community-based programs that promote gender equity, ensure access to comprehensive family planning and allow women to have control over their reproductive decisions would increase contraceptive use (Ross & Stover, 2013, United Nations, 2019a), and in turn increase resilience by reducing future population pressure on climate-sensitive resources (Guillebaud, 2016; Zlotnik, 2009).

Moreover, family planning has been recognized by local communities (Rovin et al., 2013), non-governmental organizations (Mogelgaard, 2018), and the Intergovernmental Panel on Climate Change (IPCC, 2014b) as an action that would improve child and maternal health and simultaneously reduce greenhouse gas emissions. In recognition of the multisectoral benefits of family planning, there is a cross-sectoral effort to integrate sexual and reproductive health, population and environment (Newman et al., 2014), reflected in the recent development of Population-Health-Environment (PHE) projects. These can be extended to climate change to foster climate resilient communities, as in the recent Population, Health, and Environment and Climate Change project implemented by PATH Foundation Philippines (Women And Gender Constituency, 2017). This project applied a PHE approach, utilized multisectoral collaborations and partnerships, and employed multiple interventions to address needs for family planning services, the loss of biodiversity, and poor health and food insecurity, with a goal to increase community resilience. More concrete population-health-environment actions should be included in NDCs as countries strengthen or add to their next iteration in 2025.

5 Conclusions and recommendations

Overall, a minority of NDCs identified population growth as a factor influencing a country’s ability to limit emissions and prepare for climate impacts. Furthermore, no NDCs discussed family planning in a detailed or robust way, despite its importance to future climate adaptation. The few NDCs that included strategies to address population growth did so in a vague manner. As family planning is increasingly recognized as a cost-effective strategy which should be eligible for adaptation funding, governments concerned with population growth should be encouraged to include family planning programs in their multisectoral
climate strategies and projects. Integrated approaches that include population, health, and environment are well suited to prepare for climate impacts and reduce climate risks (Dodson et al., 2020). Finally, scientists and policy experts working on climate change should acknowledge the efficacy of family planning investments in lowering community vulnerabilities to future climate change, in order to encourage politicians to implement these programs.

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