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## Social Innovation as a Tool for Enhancing Women's Resilience to Climate Change: a look at the BRICS

Paula Cruz, Isabella Todaro and Elena Bizzi



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## Summary

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## Executive Summary

This paper explores the relationship between climate change and gender with a special focus on the BRICS countries. It argues that social innovations constitute positive tools for enhancing women's adaptive capacity. We first examine how women are severely affected by climate change and greenhouse gas emissions, particularly in rural areas. We then emphasize the need for more gender-sensitive social innovations to tackle such effects, and provide a few examples within the BRICS. The hope is that more gender-sensitive solutions can spread worldwide, contributing to safeguarding the livelihoods of women not only in the BRICS but everywhere.

# Social Innovation as a Tool for Enhancing Women's Resilience to Climate Change: a look at the BRICS

Paula Cruz(1), Isabella Todaro(2) and Elena Bizzi(3)\*

## Introduction<sup>1</sup>

As the world faces the reality of climate change and works to reverse it, it is important to think critically about the effects of climate change and how they will be distributed around the world—geographically, across national borders, amongst classes, races and genders. Who will face the greatest challenges? Will they be well-equipped to meet these challenges? Only by answering questions like these can we begin the hard work of fortifying our world and its people against an imminent shift in temperatures and weather patterns.

In this paper, we explore the relationship between climate change and gender with a special focus on the BRICS countries, and argue that social innovation is a promising tool for enhancing women's adaptive capacity, especially in rural areas. Rising sea levels, erratic weather, and natural disasters affect the world's poor and disadvantaged most. Deriving an agricultural livelihood and obtaining sufficient quantities of water becomes much harder as climates change. This has forced millions of people to be displaced. All of these complications are more likely to affect women. Above all, it is women who constitute the majority of the world's poor and who mostly suffer from cultural biases that elevate their risk.

The BRICS countries face both the challenges of developing nations in facing climate change and bear the responsibility of the developed ones. These countries have been leaders for the developing world in climate negotiations and have taken responsibility and action to reduce their contribution to the problem. Yet, in the BRICS millions of marginalized people, especially women, face the everyday challenges of changing climates. In this paper, we first examine how women are severely affected by climate change, particularly in rural areas. We then emphasize the importance of gender-sensitive social innovations to tackle the impacts of changing climates and greenhouse gas emissions, and provide a few examples of initiatives within the BRICS that might contribute to enhancing women's resilience. Moving forward, as the consequences of climate change multiply and become more prevalent, the hope is that more gender-sensitive, socially-innovative solutions can spread worldwide, contributing to safeguarding the livelihoods of those at greater risk.

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## BOX 1. Key Definitions

**Climate change:** a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UNFCCC, Article 1).

**Gender:** the social differences between females and males throughout the life cycle. These gender differences are learned, and though deeply rooted in every culture, are changeable over time, and have wide variations both within and between cultures. 'Gender', along with other aspects of social identity such as class and race, determines the roles, power, and access to resources for females and males in any culture (Oxfam 2010: 3).

**Social innovation:** new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society's capacity to act (Caulier-Grice, et al. 2012: 18).

**Vulnerability:** the characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of climate change and other hazards. (Oxfam 2010: 3).

**Mitigation:** a human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs), or human interventions to reduce the sources of other substances which may contribute directly or indirectly to limiting climate change (IPCC 2014: 1266-7).

**Adaptation:** the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC 2014: 1251).

**Resilience/Adaptive capacity:** the ability of a human or natural system to adapt – that is, to adjust to climate change, including to climate variability and extremes; to prevent or moderate potential damages; to take advantage of opportunities; or to cope with the consequences (WHO 2009).

# 1. Rural women's vulnerability to climate change

Climate change is one of the greatest challenges of our time: '250 million people face the pressures of sea-level rise; 30 million people are affected by more extreme weather, especially flooding; 25 million people are affected by permafrost thawing; and 5 million people are pressured by desertification' (DARA 2012: 18). Of course, the whole world is affected by these concerns. Yet, evidence shows that the detrimental effects of climate change are more likely to affect women than men, particularly rural women and girls.

According to the Food and Agriculture Organization of the United Nations (FAO), nearly 70% of the world's 1.3 billion poor<sup>2</sup> are women and women account for an estimated two-thirds of the world's 600 million poor livestock keepers.<sup>3</sup> Women living in extreme poverty are concentrated especially in rural areas in developing countries and depend heavily upon natural resources and agriculture for their livelihoods. The agricultural sector has nevertheless been seriously threatened by climate change. Based on a series

<sup>2</sup> According to the international standard of extreme poverty set by the UN, poor people are those living on less than US \$1 per day.

<sup>3</sup> Available at: <<http://www.fao.org/gender/infographic/en/>> [accessed on 7 January 2016].

of studies covering a wide range of regions and crops, in its 2014 report the Intergovernmental Panel on Climate Change (IPCC) concludes with high confidence that 'negative impacts of climate change on crop yields have been more common than positive impacts' (IPCC 2014: 6). The report also highlights that '[c]limate change will amplify existing risks and create new risks for natural and human systems', unevenly affecting disadvantaged people and communities the most (IPCC 2014: 14). As floods, droughts, extreme temperatures, and desertification begin to have greater negative impacts on crop yields, the consequences for the livelihoods of people around the world will be felt most acutely in the lives of rural communities, and particularly affect the livelihoods of young rural women of the developing world.

Women play an essential role in agricultural and rural economic activities, including crop production and procuring food, water and fuel supplies. They comprise, on average, 43% of the agricultural labor force in developing countries and 79% of them rely on agriculture as their primary source of livelihood.<sup>4</sup> However, despite the essential contributions women make to agricultural and economic activities, gender discrimination often compel women to work in informal, low-paying jobs with low or no social security and few chances of upward mobility (IFAD 2011). Gender discrimination in labor markets is particularly accentuated in rural areas of developing countries, where the 'feminization of bad jobs' is a case in point (IFAD 2011).

In addition, despite the increase in woman-headed rural households in developing countries, rural women still have significantly less access and control over critical assets (including land, education, health care and financial services) than men do (FAO 2011; IFAD 2011). They also have fewer opportunities to improve their knowledge and skills, and almost no say in decision-makings. Women's working hours are generally longer than men's. And yet, women tend to earn less than their male counterparts in terms of rural wages (IFAD 2011). In many areas, rural women also spend substantial time and energy collecting water and fuel for their households. These activities are likely to have serious consequences for women's health as climates change (we will get back to this in section 2). Box 2 shows some examples of gender inequalities in agriculture in different parts of the developing world. We then explore some of these inequalities within the BRICS.

## **BOX 2. Gender inequalities in agriculture – some examples**

- Men's landholdings average almost three times the size of women's landholdings (globally).
- Fertilizer is more intensively applied on men's plots and is often sold in quantities too large for poor women to buy.
- An analysis of credit schemes in five African countries found that women received less than one-tenth of the credit that was received by men smallholders.
- In most developing countries, rural women's triple responsibilities – farm work, household chores and earning cash – often add up to a 16-hour work day, much longer than their male counterparts. However, women continue to lack access to important infrastructure services and appropriate technologies to ease their work loads.
- Women-owned businesses face many more constraints and receive far fewer services and support than those owned by men. In Uganda, women's enterprises face substantially higher barriers to entry than men's, although those that exist are generally at least as productive and efficient as men's in terms of value added per worker.
- In Guatemala, women hold only 3 per cent of snow pea production contracts but contribute more than one-third of total field labor and virtually all processing labor.
- Although Latin American countries are leading the way in establishing women's land rights, gender inequalities in asset distribution are very prominent here too – for example, women comprise only between 11 and 27 per cent of all landowners across the region.

**Source:** Adapted from IFAD 2011

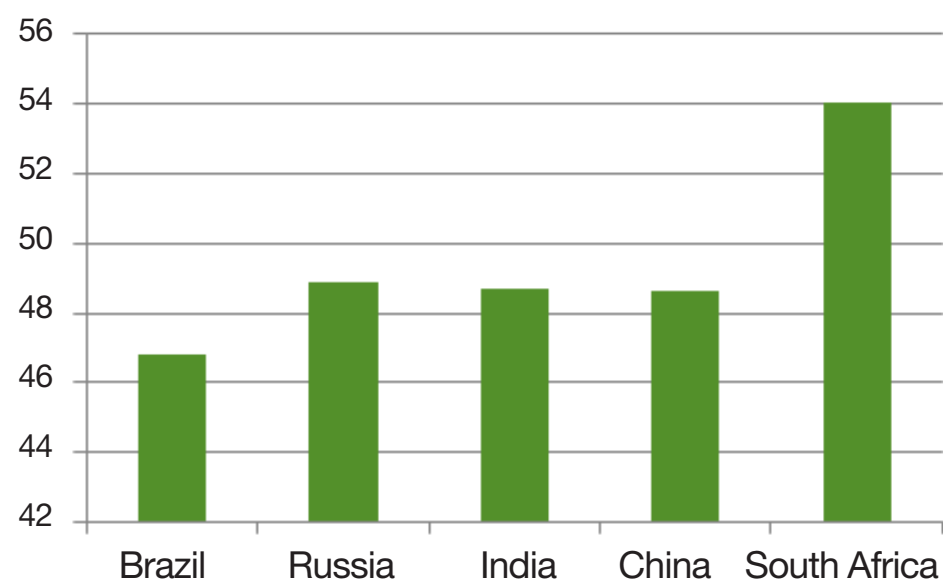
<sup>4</sup> Available at: <<http://www.fao.org/gender/infographic/en/>> [accessed on 7 January 2016].



## Gender gap in the BRICS

Drawing on data provided by FAO (2011), in 2010 nearly 1.68 billion people lived in rural areas in the BRICS. As Figure 1 shows, women constitute 46.8% of the rural population aged 15-49 in Brazil, followed by 48.6% in China, 48.7% in India, and 48.9% in Russia. In South Africa, women’s share even exceeds the share of their male counterparts in 4%. Taken together, women represent 49.4% of the BRICS’s overall rural populations aged 15-49. As suggested above, those women are among the most vulnerable people to climate change’s detrimental effects in the BRICS.

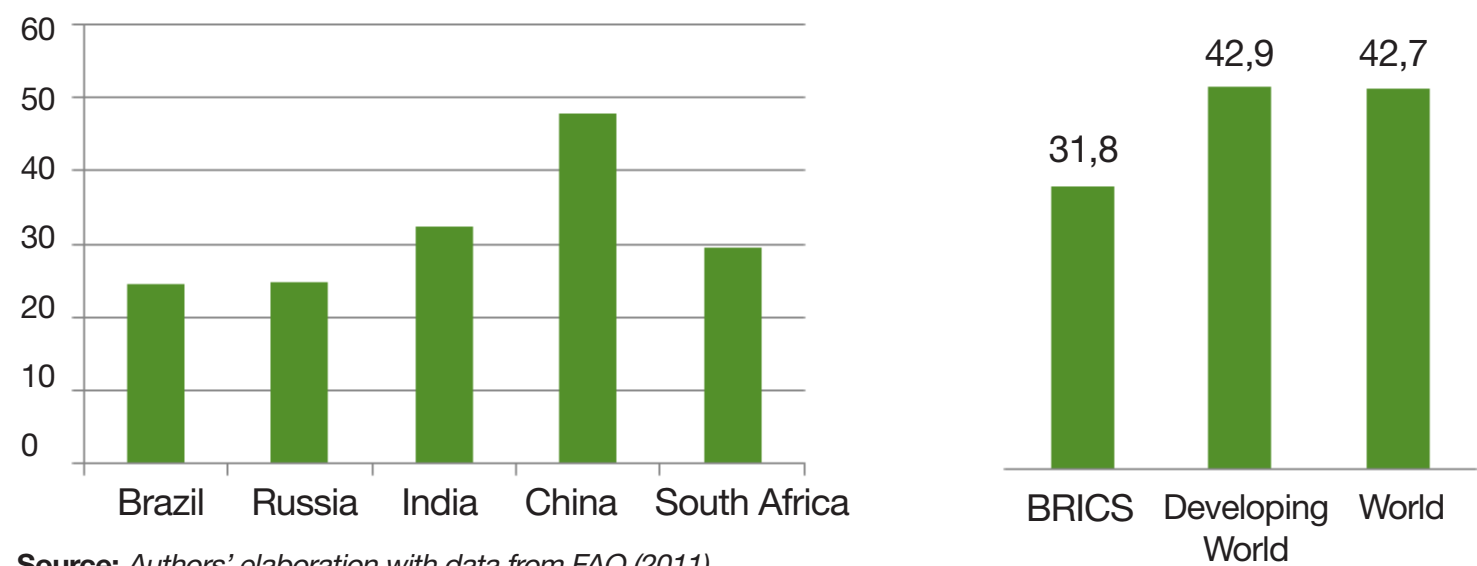
**Figure 1:** Female share of rural population aged 15-49, most recent observations (%)



**Source:** Authors’ elaboration with data from FAO (2011)

Women’s contributions to agricultural and rural economic activities within the BRICS range from 24.5% to 48.6% (Figure 2). On average, the female’s share of economically active population in agriculture in the BRICS is approximately 32% —more than 10 percentage points below the average for developing countries (virtually 43%). With the exception of China, wherein it almost equals the male’s share, in all of the other BRICS the female’s share is considerably low: 32.4% in India, 29.6% in South Africa, 24.7% in Russia, and 24.5% in Brazil.

**Figure 2:** Female share of economically active population in agriculture, 2010 (%)

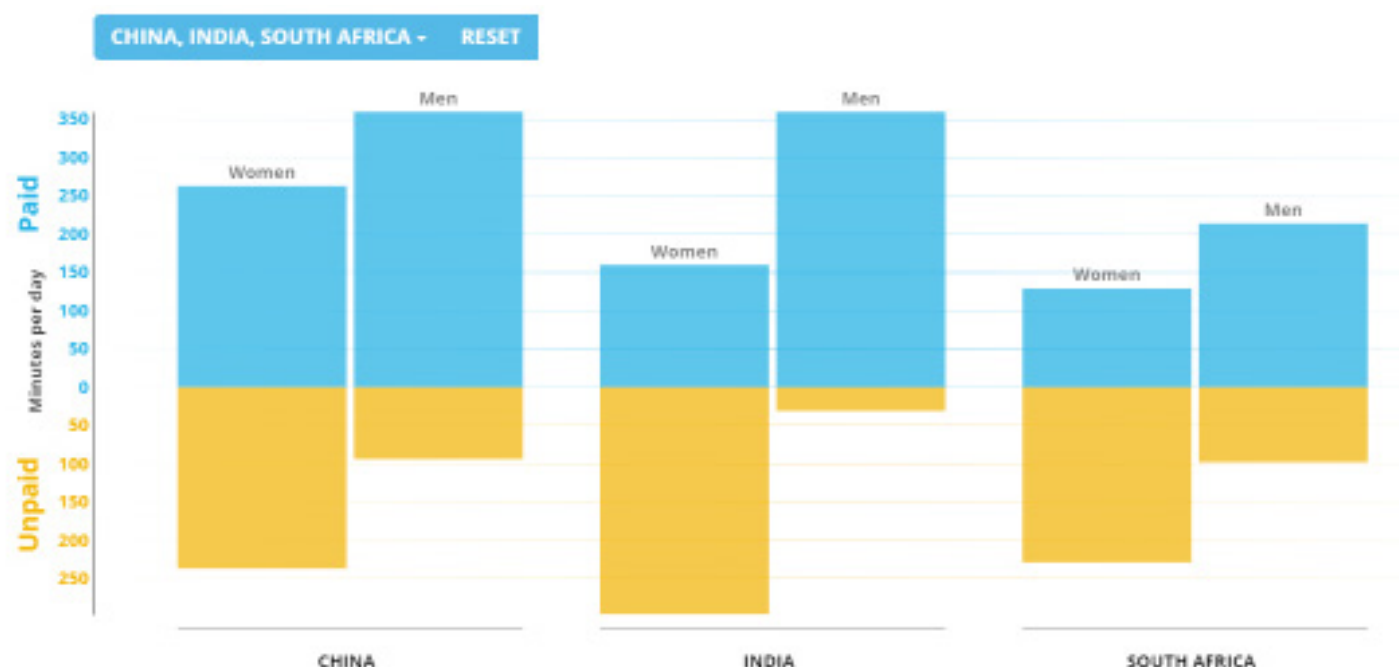


**Source:** Authors’ elaboration with data from FAO (2011)



By contrasting Figures 1 and 2, one can infer that even though women constitute nearly half of the BRICS’s rural populations in this age group, women still face great difficulties in participating in rural economic activities (as traditionally understood), and therefore in achieving economic autonomy. Moreover, this points to the fact that economic indicators still largely disregard the importance of unpaid work such as routine housework and care for household members for economic development (see, for example, Aslaksen and Koren 2014). The 2015 Human Development Report provides data from three of the BRICS, namely China, India and South Africa, in regard to imbalances in paid and unpaid work. Figure 3 shows that such imbalances are markedly gendered issues in all these countries. India stands out as the most unequal between the three, with Indian women performing the bulk of unpaid work, while men spend less than one hour per day performing tasks that do not directly generate income. In South Africa, differently from their male counterparts, women’s time is also predominantly invested in unpaid work.

**Figure 3:** Female share of economically active population in agriculture, 2010 (%)



**Source:** *The Human Development Report 2015*. Available at: <<http://report.hdr.undp.org/>> [accessed on 10 April 2016].

In the 2015 Global Gender Gap Report, the World Economic Forum measures inequality in achievement between women and men of 145 countries in four dimensions: economic participation and opportunity, educational attainment, health and survival, and political empowerment. According to the report, within the BRICS, only South Africa is ranked among the top 20 performing countries on the global index. As Table 1 shows, this is especially due to South African women’s improvements in health and survival and political empowerment. Brazil has also achieved gender equality in health and survival, and additionally in educational attainment. On the other hand, however, women in Brazil are far from having the gender gap closed when it comes to economic participation and opportunity, and political empowerment. Political empowerment is by far the most critical dimension of gender inequality in Russia as well. In China, the gender gap is marked by great disparities in health and survival. Nevertheless, the worst scenario is again presented by India. Despite the fact that India has currently one of the highest GDP rates in the world, and although Indian women have furthered their political empowerment, there are still enormous gender gaps in economic participation and opportunity, educational attainment and health and survival in the country. This illustrates how economic development does not at all imply social equity, including gender.

Table 1: Gender gap in the BRICS

|              | Global Index |       | Economic Participation and Opportunity |       | Educational Attainment |       | Health and Survival |       | Political Empowerment |       |
|--------------|--------------|-------|--|-------|------------------------|-------|---------------------|-------|-----------------------|-------|
|              | Rank         | Score | Rank                                   | Score | Rank                   | Score | Rank                | Score | Rank                  | Score |
| South Africa | 17           | 0.759 | 72                                     | 0.670 | 85                     | 0.987 | 1                   | 0.980 | 14                    | 0.400 |
| Russia       | 75           | 0.694 | 42                                     | 0.731 | 27                     | 1.000 | 42                  | 0.979 | 128                   | 0.066 |
| Brazil       | 85           | 0.686 | 89                                     | 0.642 | 1                      | 1.000 | 1                   | 0.980 | 89                    | 0.123 |
| China        | 91           | 0.682 | 81                                     | 0.657 | 83                     | 0.988 | 145                 | 0.919 | 73                    | 0.162 |
| India        | 108          | 0.664 | 139                                    | 0.383 | 125                    | 0.896 | 143                 | 0.942 | 9                     | 0.433 |

Source: Authors’ elaboration with data from the Global Gender Gap Report (World Economic Forum 2015)

In the next section, we present some of the main impacts of climate change and greenhouse gas emissions on women’s lives, with a special focus on the BRICS. In the last section, we address some social innovative solutions that potentially contribute to enhance women’s adaptive capacity, particularly in rural areas.

## 2. Selected climate change detrimental effects: a gender perspective

### Health

Most detrimental effects of climate change involve health problems. According to the World Health Organization (WHO 2015), given the impacts of climate change on the social and environmental determinants of health (i.e. clean air, safe drinking water, sufficient food and secure shelter), ‘the overall health effects of a changing climate are likely to be overwhelmingly negative’. The WHO (2015) estimates that between 2030 and 2050, climate change will have caused approximately 250,000 additional deaths per year due to heat stress, diarrhoea, malaria, and malnutrition.

There is a strong correlation between climate change and infectious diseases. These include water-borne diseases and diseases transmitted through insects and other pests (WHO 2015, DARA 2012). Floods contaminate fresh water with bacteria and pollution, increasing the occurrence of water-borne diseases like cholera and diarrhoea. Floods and elevated temperatures also create breeding grounds for insects such as mosquitoes, increasing the likelihood of diseases like malaria and dengue. Some elucidative examples of the possible effects of environmental changes on infectious diseases are presented in Table 2.

**Table 2:** Examples of environmental changes and possible effects on infectious diseases

| Environmental changes                                    | Related diseases  | Outcomes   |
|--|---|--|
| Dams, canals, irrigation                                 | Schistosomiasis<br>Malaria<br>Helminthiasis (worm infection)<br>River Blindness                                       | ↑Snail host habitat, human contact<br>↑Breeding sites for mosquitoes<br>↓Larval contact due to moist soil<br>↓Blackly breeding, disease  |
| Agricultural intensification                             | Malaria<br>Venezuelan hemorrhagic fever   | Crop insecticides and<br>↑vector resistance<br>↑rodent abundance, contact  |
| Urbanization, urban crowding                             | Cholera<br>Dengue   | ↓in sanitation and hygiene;<br>↑water contamination<br>Water-collecting trash, ↑Aedes aegypti mosquito breeding sites  |
| Deforestation and new habitation                         | Cutaneous leishmaniasis<br>Malaria  | ↑proximity, sandfly vectors<br>↑Breeding sites and vectors, immigration of susceptible people  |
| Reforestation<br>Ocean warming<br>Elevated precipitation | Oropouche<br>Visceral leishmaniasis<br>Lyme disease<br>Red tide<br>Rift valley fever<br>Hantavirus pulmonary syndrome | ↑contact, breeding of vectors<br>↑contact with sandfly vectors<br>↑tick hosts, outdoor exposure<br>↑Toxic algal blooms<br>↑Pools for mosquito breeding<br>↑Rodent food, habitat, abundance |

↑ increase ↓ decrease

Source: Patz et al. (2003)

It is worth noting that some of these diseases constitute major public health concerns in the BRICS. For example, this is the case of the snail-borne disease schistosomiasis in China, and of the mosquito-borne disease dengue in both Brazil and India. In 2015, Brazil and India reported already significant increases in the number of dengue infections,<sup>5</sup> and this upward trend is likely to continue to grow as climates change since the *Aedes aegypti* mosquito (vector of dengue) is highly sensitive to climate conditions (WHO 2015). Still more worryingly is the fact that not only is the *Aedes aegypti* mosquito the vector of dengue as it is also the vector of Zika virus—a virus that has alarmed the Brazilian population and government over the past months. Above all, such an alarm relates to the fact that the recent outbreak of the Zika virus disease in Brazil has been accompanied by a significant increase in the number of newborns identified with microcephaly (heads smaller than usual), as well as infants with Guillain-Barré syndrome (a neurological disorder that could lead to paralysis and death).<sup>6</sup> Although many existing studies on the relations between Zika virus and pregnancy regard their findings still inconclusive, for the WHO ‘there is scientific consensus that Zika virus is a cause of microcephaly and Guillain-Barré syndrome’.<sup>7</sup>

Evidence shows that globally, some infectious diseases tend to threaten more women than men. Extreme heat and increasingly variable rainfall patterns affect freshwater supplies and water quality. Water scarcity and contamination compromise hygiene, increase the risks of cholera and diarrhea and, in extreme cases, lead to drought and famine (WHO 2015). As drought and erratic access to water becomes increasingly prevalent, women’s domestic chores will become both more time consuming and

5 According to the WHO, Brazil registered over 1.5 million cases of dengue (approximately 3 times higher than in 2014), and India recorded over 15 thousand cases (its worst outbreak since 2006). Available at: <<http://www.who.int/mediacentre/factsheets/fs117/en/>> [accessed on 10 January 2016].

6 Available at: <<http://www.who.int/features/qa/zika/en/>> [accessed on 20 April 2016].

7 Ibid.

more dangerous. In areas without proper irrigation, time spent collecting water could increase and as women travel farther distances to find water, they also face increased threats of violence. If water sources are degraded because of overflows from wastewater systems, women will be especially endangered because of the nature of their domestic chores which require dealing with unboiled water for cooking and cleaning. This effect has been recorded, for example, in Peru after the 1997-98 El Niño year in which malnutrition among women was a major cause of peripartum illness (World Bank 2009).

Like the Zika virus disease, Malaria is also a big threat to pregnant women. Malaria kills almost 600,000 people every year (WHO 2015), and pregnant women are the ones at greater risk in most endemic areas. According to the WHO (2007), although adult men and women are equally vulnerable, risks are higher in pregnant women (particularly in adolescent girls) because of their decreased immunity. Consequences of infection include abortion, stillbirth, premature delivery and low-birthweight infants.

The incidence rates of malaria and the Zika virus disease vary greatly across the BRICS countries. According to the Centers for Disease Control and Prevention (CDC), there are very low risks of malaria in rural areas in China, low risks in the North region of Brazil and in some parts of northeastern South Africa, but moderate risks in all areas of India, including cities of Mumbai and Delhi.<sup>8</sup> Zika virus cases, on the other hand, have not yet been reported by any of the BRICS countries other than Brazil, wherein the first infections were confirmed in May 2015. Nevertheless, according to the CDC, outbreaks of the Zika virus disease are currently occurring in many countries, and the virus will continue to spread.<sup>9</sup> This signals the importance of gendered-sensitive climate-change mitigation policies that go hand in hand with disease prevention and containment policies in both local and global scales.

Besides the deaths and health problems arising from extreme heat, natural disasters and other environmental changes, the human costs of the ongoing climate crisis also involve deaths and health complications linked to the burning of fossil fuels. In their 2012 report on the human and economic costs of the climate crisis, the DARA International Foundation estimates that in addition to the 400,000 deaths on average that are caused by climate change each year, about 4.5 million annual deaths are caused by carbon-intensive energy systems and related activities (DARA 2012: 17) (see Table 3).

**Table 3:** Number of deaths

|                |                                 |                  |                  |
|----------------|---------------------------------|------------------|------------------|
| <b>Climate</b> | Diarrheal Infections            | 85,000           | 150,000          |
|                | Heat & Cold Illnesses           | 35,000           | 35,000           |
|                | Hunger                          | 225,000          | 380,000          |
|                | Malaria & Vector Borne Diseases | 20,000           | 20,000           |
|                | Meningitis                      | 30,000           | 40,000           |
|                | Environmental Disasters         | 5,000            | 7,000            |
| <b>Carbon</b>  | Air Pollution                   | 1,400,000        | 2,100,000        |
|                | Indoor Smoke                    | 3,100,000        | 3,100,000        |
|                | Occupational Hazards            | 55,000           | 80,000           |
|                | Skin Cancer                     | 20,000           | 45,000           |
| <b>World</b>   |                                 | <b>4,975,000</b> | <b>5,957,000</b> |

Source: DARA (2012)

<sup>8</sup> Available at: <<http://www.cdc.gov/malaria/map/>> [accessed on 20 April 2016].

<sup>9</sup> Available at: <<http://www.cdc.gov/zika/geo/>> [accessed on 20 April 2016].



As Table 3 above shows, more than 3 million of the deaths caused by carbon dioxide (CO<sub>2</sub>) are linked to indoor smoke. This directly implicates women, particularly rural women. A high percentage of households in rural areas still cook with wood, dung, coal or agricultural residues on traditional stoves or open fires (WHO 2009). Indoor smoke from solid fuel causes about 21% of lower respiratory infection deaths worldwide, 35% of chronic obstructive pulmonary deaths and about 3% of lung cancer deaths; 64% of these deaths occur in low-income countries (WHO 2009). Given the traditional distribution of labor and roles in rural households, women generally spend more time cooking than men do, and hence face more exposure to indoor smoke than their male counterparts. Within the BRICS, solid fuel is still largely used for cooking in rural areas. In both Brazil and China, more than half of rural households use solid fuel for cooking, while in India, this percentage reaches approximately 85% (Table 4).

**Table 4:** Solid fuel use for cooking in rural areas

|                     | Solid fuel on improved stove | Solid fuel on traditional stove | Total solid fuel use | Number of households in rural areas |
|---------------------|------------------------------|---------------------------------|----------------------|-------------------------------------|
| <b>Brazil</b>       | 19.4                         | 33.6                            | 53.0                 | 824                                 |
| <b>China</b>        | 10.1                         | 40.7                            | 50.8                 | 2,676                               |
| <b>India</b>        | 5.8                          | 78.8                            | 84.6                 | 9,154                               |
| <b>Russia</b>       | 18.6                         | 1.9                             | 20.6                 | 589                                 |
| <b>South Africa</b> | 4.2                          | 34.0                            | 38.2                 | 1,028                               |

**Source:** Authors' elaboration with data from WHO Multi-Country Studies Data. Available at: <<http://apps.who.int/healthinfo/systems/surveydata/>> [accessed on 3 December 2015].

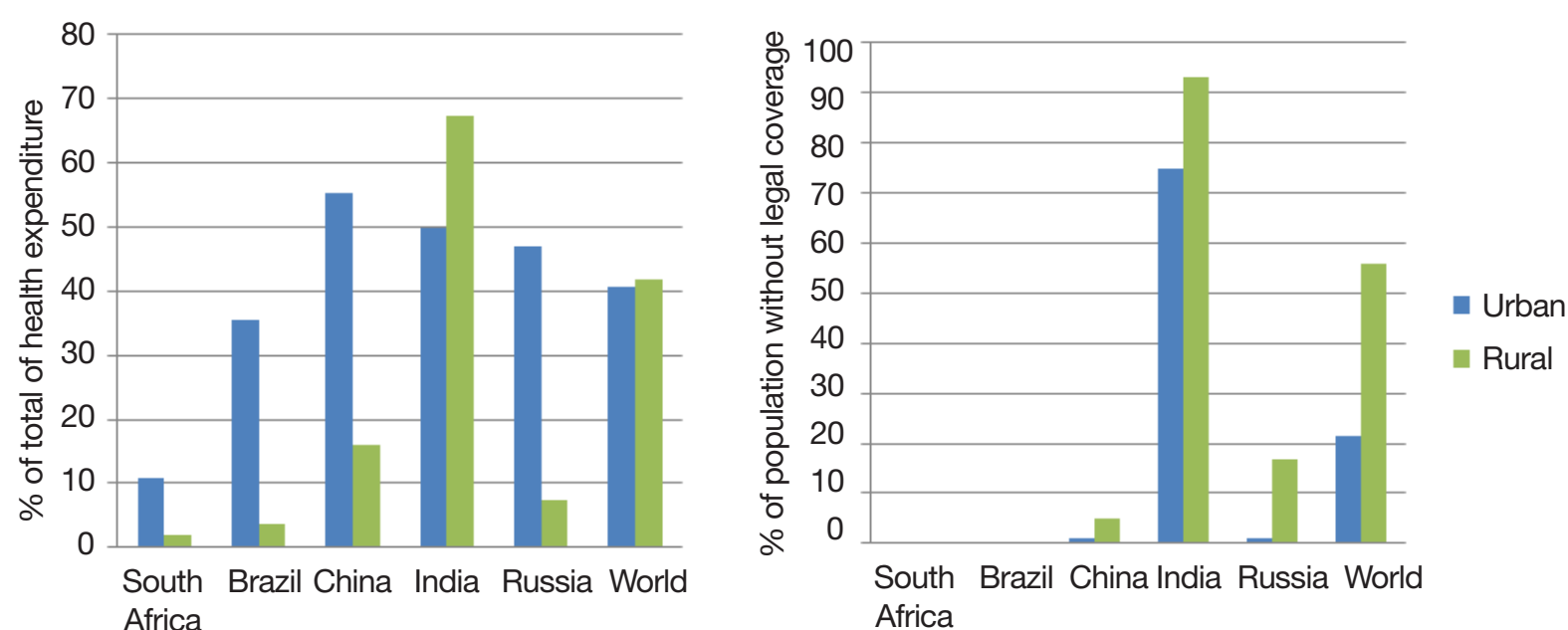
Despite their increased vulnerability, women face major difficulties in accessing health care. According to the United Nations Development Programme (UNDP), global trends in gender equality are 'less positive in the area of health [than in education], with life expectancy ratios making uneven progress and demonstrating greater global divergence' (UNDP 2013: 168). Following the noteworthy rural/urban divide that characterizes the access to health care worldwide, rural women are even more disadvantaged in combating the ill effects of climate change.

A recent study from the International Labor Organization (Scheil-Adlung 2015) shows significant if not extreme differences between rural and urban populations in health coverage and access at global, regional and national levels. It is reported that only 22% of the world's urban population lacks health coverage, while 56% of its rural population is not covered. China, for example, has historically favored urban residents, whereas more than 50% of China's mainland population continue to live in rural areas and are largely excluded from many of the public benefits urban populations enjoy, such as medical insurance coverage (OECD 2009) and greater access to education (Ivins 2013). It is estimated that this rural/urban divide is consistent around the world, existing within most regions and countries and depriving the majority of rural populations from exercising their fundamental right to health and social protection.

Indeed, with the exception of India, on average, much less people living in the BRICS' rural areas bear with the costs of health expenditures themselves. Elaborated with the latest data provided by the International Labor Organization, Figure 4 visually demonstrates the large discrepancy between the BRICS's rural and urban residents in this regard. Although South Africans and Brazilians are legally covered by public national health systems, more than 10% (in South Africa) and 35% (in Brazil) of the

overall health expenditures of their urban residents come from their own pockets. This is mainly due to the low quality of the services offered by these public systems, which ends up affecting mainly rural inhabitants—who cannot generally afford to pay for private services. In China and Russia, public health has become increasingly privatized over the last decades, also to the disadvantage of rural residents (Ivins 2013). In these countries, urban inhabitants' out-of-pocket expenditures reaches 40-50% of their total health expenditures, while the percentage of rural inhabitants' out-of-pocket health expenditures remains on average below 20% in China and even below 10% in Russia. India, on the other hand, shows a different trend, with rural residents' out-of-pocket health expenditures exceeding that of urban residents' in nearly 20 percentage points (pp). This trend in India is nevertheless consistent with the rural/urban gap concerning legal health coverage in the country, which also presents a deficit of nearly 20 pp (93.1% of the rural population contra 74.9% of the urban population without legal coverage). In other words, although rural inhabitants in India pay themselves for the major part of their health care, this seems an attempt to compensate the lack of legal coverage the majority of them face. However, India's numbers are indeed high in both cases, even when compared with the world's averages.

**Figure 4:** Out-of-pocket health expenditure vs. legal health coverage deficit



**Source:** Authors' elaboration with data from Scheil-Adlung (2015)

Within rural populations, social exclusion and the lack of access to services are more severe for those who are the most at risk of poverty—for whom private health care is thence not an affordable option. This directly affects women, since women working in agriculture and employed for labor-intensive tasks are often exploited, generally earn lower wages and are more likely to be paid at piece rate than their male counterparts. In Africa, for example, in the casual agricultural labor market, women are usually paid half the amount of men's wages (FAO 2015). Moreover, since rural women are traditionally confined to domestic roles, they do not have equal access to off-farm employment opportunities, which are often crucial to sustain rural households (FAO 2015). A study (Stephens, Ross-Degnanc and Wagner 2013) on whether access to medicines differs by gender, conducted on 15 low and middle income countries, including Brazil, India and South Africa, showed that, although no country favored one gender exclusively, gender differences were indeed significant in some areas.

In short, poverty is deeply rooted in the flagrant imbalance between what women do and what they have—in terms of both assets and rights, including their right to access adequate health care. Differences in income and culturally-biased gender differences are therefore major obstacles for women in accessing adequate health care once they are affected by climate change and increased exposure to CO<sub>2</sub>.

## Human displacement and female trafficking

Besides increasing the number of deaths and the likelihood of health problems, natural disasters cause additional suffering as a result of human displacement. In its 2007 report, the IPCC anticipated that the negative impacts of climate change could create an entirely new set of migrants constituted by climate refugees (i.e. those displaced because of the natural disasters, crop failures, and infrastructure failures due to climate change) (IPCC 2007). According to the Internal Displacement Monitoring Centre (IDMC 2015), more than 184.5 million people in the world—almost 89.5 only in the BRICS—were displaced by natural disasters during just a six-year time period (2008-2014) (see Table 5). These already significant numbers can be expected to increase even more as the effects of climate change intensify. China and India are among the top three countries with the highest numbers of internationally displaced peoples in the world, the large majority of whom were displaced by natural disaster—more than 58 million people in China and almost 30 million in India.

**Table 5:** People displaced by disaster

|                     | 2008       | 2009       | 2010       | 2011       | 2012       | 2013       | 2014       | Total       |
|---------------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Brazil</b>       | 309.435    | 522.950    | 230.497    | 169.500    | 35.000     | 83.556     | 150.313    | 1.501.251   |
| <b>Russia</b>       |            |            | 22.950     | 3.500      | 31.875     | 29.198     | 22.860     | 110.383     |
| <b>India</b>        | 6.662.165  | 5.304.000  | 1.411.285  | 1.503.320  | 9.110.000  | 2.145.871  | 3.427.620  | 29.564.261  |
| <b>China</b>        | 18.659.649 | 4.030.507  | 15.920.060 | 4.489.545  | 5.730.800  | 5.924.143  | 3.611.376  | 58.366.080  |
| <b>South Africa</b> | 3.500      | 20.000     | 6.000      | 52.172     | 2.000      | 17.819     | 3.525      | 105.016     |
| <b>BRICS</b>        | 25.634.749 | 9.877.457  | 17.590.792 | 6.218.037  | 14.909.675 | 8.200.587  | 7.215.694  | 89.646.991  |
| <b>World</b>        | 36.524.828 | 16.732.507 | 42.350.166 | 15.015.954 | 32.363.477 | 22.260.359 | 19.253.728 | 184.501.019 |

Source: IDMC (2015)

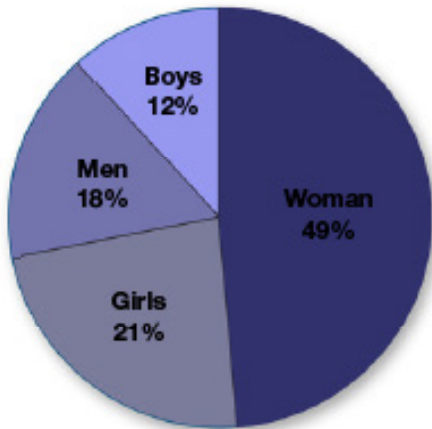
According to the World Bank's sourcebook on gender in agriculture, 'women, children, and the elderly are most negatively affected by loss of land or access to land because of displacement or resettlement for transport and other infrastructure' (World Bank 2009: 375). This is mainly due to the fact that land and property are usually registered in men's names. This prevents women from receiving payment of resettlement compensation, and contributes to increasing their economic dependence on men after losing their common property resources in environmental shocks (Word Bank 2009). As Oxfam and Panafrican Climate Justice Alliance (2015) conclude about women farmers in Africa, women are on the "front lines", facing the effects of climate change, but cultural and legal structures prevent them from accessing adequate funding to mitigate or adapt to these changes successfully. Women who are left behind as a result of men's out-migration due to slow-onset disasters usually take on men's traditional roles and responsibilities, what increases women's work burdens. And yet, women lack equal access to financial, technological, and social resources. In Brazil, for example, women left behind because of land degradation and drought in the Brazilian Semi-Arid region are called "widows of the drought" (Word Bank 2009: 450).

Negative impacts of resettlement and displacement can also include the increasing vulnerability on widows and deserted women. In the case of climate refugees, for instance, women's and girls' vulnerability



to physical violence is potentially increased. Incidents of rape, attempted rape, and other physical abuse were reported, for example, in refugee camps in Ethiopia (Gebreyosus 2014). Women refugees also face a heightened risk of becoming victims of human trafficking. According to the latest data from the United Nations Office on Drugs and Crime (UNODC 2014), 70% of all detected trafficking victims were women and girls (see Figure 5). By increasing the vulnerability of women and girls to human trafficking, a refugee crisis induced by a changing climate has therefore a strong gender dimension.

**Figure 5:** Detected victims of trafficking in persons, 2011



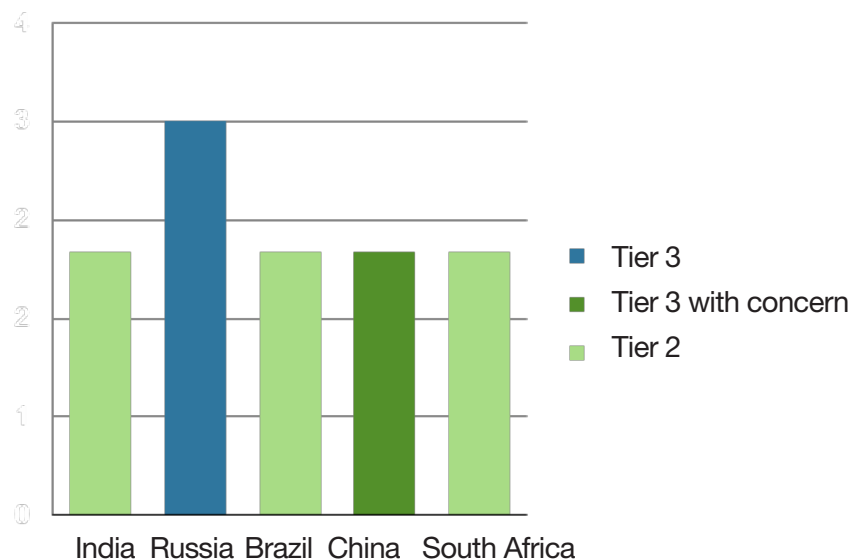
**Source:** Authors’ elaboration with data from UNODC (2014)

The BRICS are also susceptible to the environmental effects of climate change that could create climate refugees. The IPCC (2014) anticipates a series of climate change effects that might contribute to this. Especially in rural populations, reliance on natural waterways and forests could result in a forced migration when these systems are disrupted. In the Amazon, changes in extreme flows in the Amazon River and increased tree mortality and forest fire might force people to flee from their original homes. Also in Brazil, desertification and drought could have the same effect in the country’s Semi-Arid region, where water supply is already a critical issue. Similarly, drastic changes in rainfall in South Africa are already affecting people’s ability to live off the land. Flooding in India and parts of China, decreased maize and wheat yields in China, and a warming climate in Arctic Russia are also already impacting people’s livelihoods in those areas, forcing them to migrate either to seek refuge or to find more stable and fertile climates.

Existing networks for human trafficking in the BRICS pose addition threat to potential displaced women and girls. As Figure 6 illustrates, the United States Department of State’s 2015 report on trafficked peoples around the world classifies Brazil, India and South Africa as “Tier 2” level of concern. This means that these countries have failed to meet the Trafficking Victims Protection Act of 2000 standards,<sup>10</sup> but have nevertheless shown an effort to work towards these standards. China is ranked as a “Tier 2 nation on watch”, meaning they are also non-compliant working towards compliance, but the number of victims elevates the level of concern. Russia, on the other hand, is a “Tier 3” nation on the 3-tiered scale, meaning that the trafficking problem in Russia is particularly concerning as is the lack of effort to solve it.

<sup>10</sup> The Trafficking Victims Protection Act of 2000 outlines actions that governments should take to minimize human trafficking in their countries

**Figure 6:** Levels of concern regarding human trafficking



**Source:** Authors’ elaboration with data from USDOS (2015)

### Culturally-constructed gender roles and practices

As suggested along the previous sections, culturally-constructed gender hierarchies and entitlements put women at higher risk before climate change effects. Women’s and girls’ increased vulnerability relates to gender-based inequalities in a multidimensional way, including access to livelihood assets, division of labor, and participation in decision making processes (World Bank 2009: 449). Indeed, a study conducted by Kamarunga Banda and Agnes Babugura in two rural provinces of South Africa (Limpopo and Kwazulu-Natal) found that ‘[g]ender differentiated impacts of climate variability were manifested in the unequal distribution of roles and responsibilities of men and women in both study areas’.<sup>11</sup>

Cultural biases and gender hierarchies have a direct effect on survival rates, for example, in times of natural disasters. As the WHO (2014: 9) points out, ‘although disasters create hardships for everyone, on average natural disasters such as droughts, floods and storms kill more women than men, especially women at a younger age’. Neumayer and Plümper (2007) attribute this gender gap in mortality to more than physical capacity to withstand disaster. They argue that women’s socially-constructed roles place them at great risk at the moment when a natural disaster occurs and their lower socioeconomic status disadvantages them in their ability to cultivate resilience post-disaster. In Bangladesh, for instance, when floods occur, women are often the last ones to receive assistance and those who have lost their clothes and are unable to cover themselves, are denied entrance to public areas and to access aid. This happens even when women have lost their culturally appropriate clothes, precluding them from leaving temporary shelters to seek medical care and resources (Neumayer and Plümper 2007).

Furthermore, as Úrsula Oswald Spring contends, the culturally constructed proclivity of women to be caretakers also put them at greater risk vis-à-vis natural disasters. She calls women’s likelihood to put others before themselves the “mother of all” phenomenon, which compounds their increased vulnerability.<sup>12</sup> Indeed, besides their actual performance as economic actors, women traditionally perform the roles of “food producers and providers”, “guardians of health”, and “caregivers” (Oxfam and Panafrican Climate Justice Alliance 2015). Such traditional socially-constructed roles impel women to work even harder in times of droughts, deforestation, and erratic rainfall in order to supply their households with food, water,

11 Available at: <<http://192.64.74.193/~genera/es/documentos/2010/cop16/cambio-climatico-sudafrica.pdf>> [accessed on April 10 2016].  
12 Available at: <<http://www.pbmc.coppe.ufrj.br/pt/noticias/293-mulheres-sao-mais-vulneraveis-aos-impactos-das-mudancas-climaticas-globais>>. [accessed on 23 November 2015].

and fuel, and to keep their families healthy and safe. This directly impacts women's livelihoods as it leaves women with less time to improve their economic activities and invest in their future (WHO 2014).

Women's increased vulnerability to infectious diseases also has a strong cultural dimension insofar as patterns of exposure and of access to health care deeply relate to gender norms and behavior (WHO 2014). For example, after conducting a study on gender roles and responses to malaria in Ghana, Tolhurst and Nyongato (2005) found that 'women who lacked either short- or long-term economic support from male relatives, or disagreed with their husbands or family elders about appropriate treatment-seeking, faced difficulties in accessing health care for children with malaria'. Moreover, the authors highlight that despite often limited access to resources, the burden of the cost of seeking treatment also used to fall on women.

In the view of their limited access to resources, in the next section we present some examples of how social innovation can be a means for enhancing women's resilience to climate change. Prior to that, however, Table 6 summarizes a few examples of how gendered social and cultural constructs relate to differential experiences of climate change.

**Table 6:** Examples of how gender can change differential experiences of climate change

|                  | Women   | Men  | Link to climate change vulnerability  |
|------------------|---|--|---|
| <b>Roles</b>     | Stay home to care for children, as well as sick or elderly family members | Can migrate to access economic opportunities                         | Their ability to migrate in search of economic opportunities makes it easier for men to deal with crisis, and may result in benefits for the family as a whole. However, male migration often increases women's workload, as they are left behind to manage the household in addition to usual tasks. It can also increase women's exposure to other risks, such as gender-based violence and HIV infection.  |
|                  | Have lower incomes and are more likely to be economically dependent       | Have higher incomes and are more likely to own land and other assets | Men typically have more money and other assets than women. Men's savings provide a "buffer" during tough times and, along with other assets, make it easier for them to invest in alternative livelihoods.  |
|                  |   | Have more access to education and information                        | Managing climate-related risks to agricultural production requires new information, skills and technologies, such as seasonal forecasts, risk analysis and water-saving agricultural practices. Men are more likely to have access to these resources and the power to use them and are therefore, better equipped to adapt. At the same time, women often have traditional knowledge that can inform adaptation efforts. Both new and old information is important in the context of adaptation. |
| <b>Resources</b> | Have lower incomes and are more likely to be economically dependent       | Have higher incomes and are more likely to own land and other assets | Men typically have more money and other assets than women. Men's savings provide a "buffer" during tough times and, along with other assets, make it easier for them to invest in alternative livelihoods.  |
|                  | Have less access to education and information                             | Have more access to education and information                        | Managing climate-related risks to agricultural production requires new information, skills and technologies, such as seasonal forecasts, risk analysis and water-saving agricultural practices. Men are more likely to have access to these resources and the power to use them and are therefore, better equipped to adapt. At the same time, women often have traditional knowledge that can inform adaptation efforts. Both new and old information is important in the context of adaptation. |

|       |  |   |   |
|-------|--|---|---|
| Power | Have less power over family finances and other assets    | Have more power over family finances and other assets                 | Without the power to decide on family resources and finances, women’s ability to manage risks by, for example, diversifying crops, storing food or seeds or putting money into savings, is limited.               |
|       | Have limited engagement in community politics            | Have greater involvement/ decision-making power in community politics | Men are likely to have more influence over local governance-promoting policies and programmes that may not support women’s rights and priorities.   |
|       | Face many cultural restrictions/prohibitions on mobility | Face few cultural restrictions/prohibitions on mobility               | Mobility is a key factor in accessing information and services. It is also critical for escaping the danger posed by extreme weather such as floods. Therefore, women are often at higher risk from these events. |

Source: CARE (2010)

### 3. Tackling climate change through social innovation: the urge for gender-sensitive initiatives

Differently from mitigation policies and strategies, which have traditionally been implemented by governmental actors following the establishment of international agreements, adaptation initiatives have been mostly driven by individual and collective actors at more regional and local levels, particularly as responses to the direct impacts of climate change in people’s everyday lives. All the same, both mitigation and adaptation measures should strategically contribute to increasing people’s resilience, especially of those at greater risk. As we have demonstrated throughout this paper, globally the detrimental effects of climate change threaten more women than men. And yet, there is a widespread lack of gender-sensitive mitigation/adaptation policies and strategies around the world, including in the BRICS.

It is possible to infer from the BRICS’s mitigation goals prior to the 2015 Paris COP21 that these countries’ mitigation efforts basically consist of top-down attempts to curtail carbon emissions as a part of an international strategy to avoid two-degree warming (see Table 7). Nonetheless, as the world faces the challenge of mitigation and sets out to write policy which will serve this general goal, it is important that gendered issues are given due consideration. Part of ensuring constructive gendered outcomes is ensuring male and female representation in adaption and mitigation policy-making processes (UNFCCC 2015). In short, gendered representation is essential to yield best policy results.



**Table 7:** Mitigation goals prior to the 2015 Paris COP21

|                     | Reduction Target   | Planned to be achieved by |
|---------------------|--|---------------------------|
| <b>Brazil</b>       | Reduce greenhouse gas emissions by 37% below 2005 levels                         | 2025                      |
| <b>Russia</b>       | Reduce greenhouse gas emissions by 25-30% below 1990 levels                      | 2030                      |
| <b>India</b>        | Reduce greenhouse gas intensive sector as a % of GDP by 33-35% below 2005 levels | 2030                      |
| <b>China</b>        | Reduce greenhouse gas intensive sector as a % of GDP by 60-65% below 2005 level  | 2030                      |
| <b>South Africa</b> | Reach peak greenhouse gas emissions and begin plateau                            | 2030                      |

**Source:** Authors' elaboration with data from Amorin et al. (2015)

More than that, however, it is essential that more bottom-up solutions are encouraged, developed, and disseminated across the globe. In line with Bergman et al. (2010), we argue that technological innovation—i.e. novel technologies, products and processes—alone is insufficient to tackle the environmental challenges posed by climate change. On the other hand, social innovation—which focuses on new institutions, practices, and models of using technology—could yield far more benefits compared to more structured top-down processes. Benefits would include 'higher levels of public trust, improved decision making on local issues, shifts towards new social norms, values and practices, and a context to conduct innovative experiments' (Science Communication Unit 2014: 6).

In the climate change context, social innovation would include, for example, 'wood recycling social enterprises, organic gardening cooperatives, low-impact housing developments, farmers' markets, car-sharing schemes, renewable energy co-operatives and community composting schemes' (Science Communication Unit 2014: 5). These changes in behavior and lifestyle, new forms of energy saving, and new technical and non-technical solutions would nevertheless yield more benefits if combined with research and policy development. As Bergman et al. (2010) stress, '[w]ithout policy intervention there could be many missed opportunities for energy and emission reducing innovations'. Indeed, state policies can—and should—play a role in encouraging the development of social innovations and helping them to spread. As the EU Science Communication Unit (2014: 6) recognizes, '[s]ocial innovation cannot be meticulously planned, but it can be stimulated by creating the enabling conditions for it to emerge... As with all forms of innovation, there are various stations along its journey where policy can provide support to ensure it reaches its full potential.'

Intrinsic to the concept of social innovation is also the importance of people's involvement and empowerment. Thus, through a social innovation perspective, mitigation and adaptation initiatives in, for example, rural areas should benefit from traditional knowledges and practices from indigenous people. This would include locally adapted crops, fish and livestock, farming systems, soil, water and nutrient management, agroforestry systems and wild fire management (FAO 2012). As Seddon and Ramanathan (2013) show, already existing bottom-up, socially-innovative practices include methods to grow rice without continuous flooding in order to save water, methods to build cleaner cookstoves, pellet-based home heating systems for people who use biomass, and filters for diesel engines and lower-emission modern coke ovens for steel production. In short, as social innovations aim to resolve social needs and problems—and in so doing enhance society's capacity to act, a social innovation approach seems a more comprehensive and promising way of addressing the imperatives of climate change mitigation and adaptation.

Adding to Bergman and his colleagues' framework, however, we argue that such an approach should be attentive to gender. A gender account is fundamental here in order to reduce—and finally trump—the

pervasive inequalities between men and women that so markedly characterize the current climate crisis.<sup>13</sup> In other words, social innovation can be a powerful tool towards the reduction of women's vulnerability to climate change- and carbon-induced hardships. As Sterrett (2011) shows, there are enlightening examples of socially-innovative adaptation technologies in South Asia. The creation of portable and more fuel-efficient cooking stoves, made from clay and mud, is but one case in point. Besides facilitating cooking and providing sources of protein and income during times of flooding, these types of stoves reduce the amount of fuel required (lowering the impact on the environment), as well as the incidence of smoke, which has severe health implications for women (Sterrett 2011: 85-6).

Returning to the issue of traditional knowledge, it is important to note that some local knowledges and practices—for example, about less obvious resources such as small crops, forest food and medicinal plants—are often held only by women (FAO 2012). Úrsula Spring mentions an example in this regard concerning the initiative of the University of Campesina del Sur in Mexico, which is working with local groups—mainly composed of women—in order to find solutions to global problems such as climate change by combining scientific and traditional knowledge.<sup>14</sup> This illustrates the need for gender-sensitive adaptation and mitigation initiatives that take women's knowledges and “ways of doing” into account. In the context of rural livelihoods, this means benefiting from rural women's indigenous knowledge to enhance their own adaptive capacity.

Another interesting example here regards the project implemented in the Pacific Island of Vanuatu, called “Vanuatu Women Lead on Climate Adaptation Innovation in Solar Fruit Drying”. The project aims at training Vanuatu women to use solar food dryers in order to enhance the practice of drying fruits and vegetables to preserve and store them for future infertile periods.<sup>15</sup> Through social innovation, the project therefore contributes to reducing dependency on fossil fuels, and to fostering sustainability and resilience for food security in Vanuatu, while empowering women.

In the following boxes, we provide a few examples of social innovation initiatives within the BRICS that potentially contribute to enhancing women's adaptive capacity. Our rather random case selection reflects our exploratory efforts before a striking lack of studies on the matter. While case studies in Western and Central Africa are indeed more abundant and enlightening, empirical studies with focus on bottom-up practices within the BRICS are still very much needed. This paper should hence be seen as a preliminary effort in that direction. The ultimate goal is that, by stressing the urge for a more gender-sensitive, social innovation perspective, new ideas and solutions can spread worldwide, contributing to safeguarding the livelihoods of those mostly endangered by the current climate crisis—not only in the BRICS, but everywhere.

### **Brazil - *Brazilian Women Leaders Network for Sustainability***

Changes in river flows, biodiversity loss, rising sea levels and ocean acidification, floods, landslides, fishing potential loss, reduction in agricultural production, migration of rural population to the cities, increased cold and heat waves: these are the main impacts of climate change in Brazil.<sup>16</sup> As a result of changes in rainfall patterns, and the subsequent changes in river flows, an unprecedented increase in the demand for electric power is expected to occur in the country (which largely relies on hydropower today). Finding an innovative adaptive solution to this gloomy picture has nevertheless been one of goals of the Brazilian Women Leaders Network for Sustainability—a platform for Brazilian women's mobilization and action towards sustainability (UNEP 2015).

13 For general examples of gender-sensitive climate change adaptation, see table Oxfam (2010: 9).

14 Available at: <<http://www.pbmc.coppe.ufrj.br/pt/noticias/293-mulheres-sao-mais-vulneraveis-aos-impactos-das-mudancas-climaticas-globais>>. [accessed on 23 November 2015].

15 Available at: <[https://unfccc.int/secretariat/momentum\\_for\\_change/items/8352.php](https://unfccc.int/secretariat/momentum_for_change/items/8352.php)> [accessed on 3 December 2015].

16 Available at: <<http://viajeaqui.abril.com.br/materias/os-reais-impactos-das-mudancas-climaticas-no-brasil-segundo-o-painel-brasileiro>> [accessed on April 10 2016].

Considering Brazil's natural vocation for the use of solar power, and the fact that such use is still very restricted and largely unknown in the country, the Brazilian Women Leaders Network for Sustainability, together with companies in the energy sector, universities and NGOs, is developing a proposal whose goal is to expand the use of solar power in Brazil. The goal is to reach one million systems in operation by 2030. Working at the level of policy implementation, through this proposal—which includes the elaboration of a training and qualification program—the Network aims at 'encouraging schools, public building and companies to adopt this type of energy in cogeneration micro-systems (solar power + electricity from hydroelectric power plants)', and also include 'more women on the job market and creating better qualified technical jobs for them' (UNEP 2015: 17).

The "One million solar panels by 2030" proposal is part of the Network's priority agenda on Green Entrepreneurship & Sustainable Businesses, which comprises a truly gender-sensitive initiative aimed at tackling climate change through social innovation, while empowering women.

### **Russia – *Local smallholders' adaptive measures in the Altay Republic, West Siberia***

Female farmers have been particularly affected by extreme weather events in the Russian Federation. Climate change impacts crop production and threatens the food security of rural populations in Russia's major grain-producing regions. According to the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), 'the frequency of droughts in major grain-producing regions of Russia may increase by 1.5-2 times' (Oxfam 2012: 17).

Notwithstanding, local smallholders in the Altay Republic—one of the poorest and least developed regions of the country—are already inventing and making use of innovative adaptation measures. These include: (i) selecting new crops and cultures which are more frost resistant and have shorter growing periods; ceasing to sow cultures with long growing periods, e.g. barley; (ii) using greenhouses to protect vegetables from radical diurnal temperature changes; install heating systems in greenhouses to protect plants from extremely low temperatures at night; (iii) cultivating seedlings in the greenhouses; (iii) tying up plants such as tomatoes and cucumbers to protect them from rot caused by heavy rains; (iv) 'shadowing' plants, e.g. cabbage, eggplants, peppers, from excessive sunlight, with materials available at hand; and (v) intensifying watering during summer droughts (Oxfam 2012: 25).

In spite of such adaptive measures, Russian farmers argue that state support is nevertheless necessary to engender widespread preparedness, reduce price volatility, and create a system of crop insurance. As female farmer Ludmila K points out, '[t]he most important thing is state support. If the state would turn its face towards us, it would be easier to work and live' (Oxfam 2013: 17). Indeed, as we suggested above, state policies can—and should—play an important role in furthering the conditions where social innovations can flourish and spread.



## **India – *The CP-MUS/ Jalswarajya project in Maharashtra***

Nearly 85% of rural India's Maharashtra state clean water supply come from groundwater. Yet, groundwater availability is at the mercy of India's rapidly changing climate, which swings between extreme monsoon rains and drought, creating acute drought conditions in certain years (Mikhail and Yoder 2008). As a result, there has been critical shortages in drinking water, decreased food security, and failed agricultural activities in the region. For example, in only a three-month period in 2004, the decrease in food security resulted in over 1,000 rural child deaths caused by malnutrition. Furthermore, in the same period, failed harvests prompted more than 50 debt-ridden farmers to commit suicide (Mikhail and Yoder 2008). Ten years later, this number reached an even more striking scale: almost 1,000 farmers' suicides were registered in Maharashtra after failed cotton harvests.<sup>17</sup>

Before such critical impacts, a number of international organization-funded projects have been developed in rural Maharashtra over the last decades. The CP-MUS project is a case in point. Formerly implemented by the International Development Enterprises (IDE) in Nepal, this community-driven, demand-led project aimed to advance equitable access to clean water and to sanitation systems as 'an effective way to use water for poverty alleviation and gender equity' (Mikhail and Yoder 2008: 4). The project focused mainly on socially-innovative changes at the household level, particularly encouraging and helping households to create kitchen gardens. In Maharashtra, the project's scope comprised three particular districts: Nasik, Aurangabad, and Ahmednagar. In Nasik, the project was implemented through a previously existing drinking water project called Jalswarajya, which was funded by the World Bank and had three main pillars: (i) Community Capacity Building, (ii) Community Infrastructure, and (iii) Women Empowerment.

Key to the Jalswarajya project was therefore its gendered approach. Composed by at least 75% of women, the Women Empowerment Committee (WEC) provided separate funds and training activities for women, and incentivized them to 'play an active role in water and sanitation issues as well as other forms of village development' (Mikhail and Yoder 2008: 212). In addition, the project's partners should provide technical support for the WEC to start income-generating enterprises. The village of Samundi stands out as an enlightening case regarding rural women's empowerment in Maharashtra. As Mikhail and Yoder (2008) show, women in this lower-caste community have had a decisive role in improving access to water resources and in shaping their village development—truly bringing into play a social innovation approach.

## **China – *The Biogas project in Guangxi***

While China's vulnerability to the direct impacts of climate change are expected to be moderate in terms of human and economic costs, its vulnerability is considered to be severe when it comes to carbon-related problems (DARA 2012: 19). Particularly affected by the current carbon crisis is the Chinese rural province of Guangxi, wherein the majority of farmers cannot afford to pay for fuel or electricity, or not even is connected to the power grid. Above all, women are the most ones implicated in this issue, as they generally carry the burden of spending long hours collecting fuelwood and wood, and cooking in smoke-filled homes.<sup>18</sup>

In order to tackle this issue, since the 1990s, China's strategy to promote the use of biogas as an alternative fuel for domestic cooking and household lightening was extended to remote communities in Guangxi. In 2002, the strategy was integrated to an IFAD-funded project aimed to 'improve and sustain

17 Available at: <<http://edition.cnn.com/2015/04/19/asia/india-cotton-farmers-suicide/>> [accessed on 6 December 2015].

18 Available at: <<http://www.ruralpovertyportal.org/country/voice/tags/china/biogas>> [accessed on April 10 2016].

the livelihoods of poor rural people while rebuilding and conserving natural resources'. The project basically consisted of helping households to build their own biogas plants to channel waste from the domestic toilet and nearby shelters for animals into a sealed container (a 'biodigester'), wherein the waste is naturally converted into gas and compost—which can be used to produce energy. In addition to producing fuel, according to IFAD, the biodigesters have encouraged better sanitation and generated natural fertilizers, which are currently used by many Guangxi's farmers.<sup>19</sup>

The biogas project has particularly transformed the lives of Guangxi's women. IFAD reports that 2.73 million biodigesters were built in Guangxi's villages, benefiting about 34.2% of their households. As a result, besides reducing Guangxi's women's exposure to smoke, these women can now direct more time to agricultural and other paid activities than they used to.<sup>20</sup>

### ***South Africa – Social entrepreneurship among female refugees in Johannesburg***

The city of Johannesburg is home to 450,000 forced migrants. Most refugees have fled from conflict in central and Western Africa, areas in which conflict has been contributed to resources shortages brought on climate change (Institute for Security Studies 2012). Although South Africa is a signatory to the 1951 Refugee Convention, and despite the fact that its Constitution guarantees basic human rights and socioeconomic rights to all South Africa's residents (regardless of citizenship), forced migrants still face discrimination, exploitation and abuse resultant from xenophobia (Women's Refugee Commission 2011).

This particularly affects women. More than half of the female refugees in Johannesburg are unemployed and especially susceptible to poverty. In addition, gender-based violence and sexual harassment are very high, commonly refraining those women from engaging in income generation activities. Yet, according to the Women's Refugee Commission (2011), many female refugees have demonstrated an entrepreneurial spirit to tackle these problems, innovate and adapt.

Considering that many female refugees cannot work because they cannot afford childcare while they are working, the Refugee Social Service Centre in Durban has devised a bottom-up, socially-innovative solution to help female refugees procure an income. The initiative consists of providing refugee women with starter kits, community organizing opportunities and education in order to help them launch home daycare programs. According to the Women's Refugee Commission (2011), despite some challenges, this initiative has allowed many women to work while ensuring their children's safety, and also provided a livelihood for the caretakers.

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<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

## References

- Amorim, A et al. 2015. The BRICS on the road to COP 21. BRICS Policy Center, BPC Policy Brief, 5(11), October-November.
- Aslaksen, J, Koren, C. 2014. 'Reflections on Unpaid Household Work, Economic Growth, and Consumption Possibilities'. In Bjørnholt, M, McKay, A. Counting on Marilyn Waring: New Advances in Feminist Economics. Bradford: Demeter Press. pp. 57–71.
- Bergman, N et al. 2010. 'Bottom-up, social innovation for addressing climate change', Environmental Change Institute, Oxford.
- CARE. 2010. 'Adaptation, gender and women's empowerment', CARE International Climate Change Brief, October.
- Caulier-Grice, J et al. 2012. 'Defining Social Innovation. A deliverable of the project'. The theoretical, empirical and policy foundations for building social innovation in Europe (TEPSIE), European Commission – 7th Framework Programme, Brussels: European Commission, DG Research.
- DARA International. 2012. Climate Vulnerability Monitor: A Guide to the Cold Calculus of a Hot Planet, 2nd Edition. Madrid: Estudios Gráficos Europeos, S.A.
- Food and Agricultural Organization (FAO). 2011. The State of Food and Agriculture 2010-11: Women in Agriculture: Closing the Gender Gap for Development. Rome: FAO.
- Gebreiyosus, Y. 2014. Women in African Refugee Camps: Gender Based Violence Against Female Refugees: the Case of Mai Ayni Refugee Camp, Northern Ethiopia. Hamburg: Anchor.
- Internal Displacement Monitoring Center (IDMC). 2015. Global Estimates: People displaced by disasters. Châtelaine: IDMC.
- International Fund for Agricultural Development (IFAD). 2011. Rural Poverty Report 2011. New realities, new challenges: new opportunities for tomorrow's generation. Rome: IFAD.
- Intergovernmental Panel on Climate Change (IPCC). 2007. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the IPCC [Core Writing Team, Pachauri, R K, Reisinger, A (eds)]. Geneva: IPCC.
- \_\_\_\_\_. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC [Core Writing Team, Pachauri, R K, Meyer, LA (eds)]. Geneva: IPCC.
- Ivins, C. 2013. 'Inequality matters–BRICS inequalities fact sheet', BRICS Policy Center/OXFAM, 1(12).
- Mikhail, M, Yoder, R. 2008. Multiple-Use Water Service Implementation in Nepal and India: Experience and Lessons for Scale-Up. Lakewood: IDE, CPWF and IWMI.
- Neumayer, E, Plümper, T. 2007. 'The Gendered Nature of Natural Disasters: The Impact of Catastrophic Events on the Gender Gap in Life Expectancy, 1981–2002,' Social Science Research Network, January, [www.ssrn.com](http://www.ssrn.com).

Organisation for Economic Co-operation and Development (OECD). 2009. OECD Rural Policy Reviews: China. Available at: <<http://www.oecd.org/gov/oecd rural policy review china.htm>>.

Oxfam. 2010 'Gender, Disaster Risk Reduction, and Climate Change Adaptation: A Learning Companion Oxfam Disaster Risk Reduction and Climate Change Adaptation Resources.' Available at: <<https://www.gdnonline.org/resources/OxfamGender&ARR.pdf>>

\_\_\_\_\_. 2012. 'The Adaptation Challenge: Key issues for crop production and agricultural livelihoods under climate change in the Russian Federation', Oxfam Research Reports, October.

\_\_\_\_\_. 2013. 'After the Drought: The 2012 drought, Russian farmers, and the challenges of adapting to extreme weather events', Oxfam Case Study, September.

Oxfam and Panafrican Climate Justice Alliance. 2015. 'Africa's Smallholders Adapting to Climate Change', Joint Agency Briefing Note, 14 October.

Patz, J A et al. (2003) "Climate change and infectious diseases". In McMichael et al (eds). Climate change and human health: risks and responses. Geneva: World Health Organization. pp. 103-132.

Scheil-Adlung, X (ed). 2015. 'Global evidence on inequities in rural health protection: new data on rural deficits in health coverage for 174 countries'. Geneva: ILO.

Science Communication Unit. 2014. 'Science for Environment Policy In-depth Report: Social Innovation and the Environment.' Report produced for the European Commission DG Environment, February 2014. Available at: <<http://ec.europa.eu/science-environment-policy>>

Seddon J, Ramanathan, V. 2013. 'Bottom-Up Solutions to Mitigating Climate Change', Stanford Social Innovation Review, Summer.

Stephens, P, Ross-Degnan, D, Wagner, A K. 2013. 'Does access to medicines differ by gender? Evidence from 15 low and middle income countries', Health Policy 110(1): 60-6.

Sterrett, C. 2011. 'Review of Climate Change Adaptation Practices in South Asia', Oxfam Research Reports, 16 November.

Tolhurst R, Nyongato FK. 2005. 'Looking within the household: gender roles and responses to malaria in Ghana'. Transactions of the Royal Society of Tropical Medicine and Hygiene, 5 October.

United Nations Development Programme (UNDP). 2013. Humanity Divided: Confronting Inequality in Developing Countries. New York: UNDP.

United Nations Environment Programme (UNEP). 2015. Brazilian Women Leaders Network for Sustainability: a Call for Action. Available at: <<http://redemulheres.mma.gov.br/wp-content/uploads/livro-pnuma-mulheres-lideres-ingles.pdf>>.

United Nations Framework Convention on Climate Change (UNFCCC). 2015. 'Report on gender composition', FCCC/CP/2015/6. Available at: <<http://unfccc.int/resource/docs/2015/cop21/eng/06.pdf>>.

United Nations Office on Drugs and Crime (UNODC). 2014. Global Report on Trafficking in Persons. New York: United Nations.

United States Department of Defense (USDOS). 2015. Trafficking in Persons Report 2015. Available at: <<http://www.state.gov/documents/organization/245365.pdf>>.

World Health Organization (WHO). 2007. 'Gender, Health and Malaria', Gender and Health, June.

\_\_\_\_\_. 2009. Global Health Risks: Mortality and burden of disease attributable to selected major risks. Geneva: WHO.

\_\_\_\_\_. 2014. Gender, Climate Change and Health. Geneva: WHO.

\_\_\_\_\_. 2015. 'Climate change and health', Fact sheet N°266, September. Available at: <<http://www.who.int/mediacentre/factsheets/fs266/en/>>.

Women's Refugee Commission. 2011. No Place to Go But Up: Urban Refugees in Johannesburg, South Africa. New York: Women's Refugee Commission.

World Bank. 2009. Gender in agriculture sourcebook. Washington: World Bank, FAO and IFAD.

World Economic Forum. 2015. Global Gender Report. Geneva: World Economic Forum.



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