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A smoke-free kitchen: initiating community based co-production for cleaner cooking and cuts in carbon emissions

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ABSTRACT

Cooking over open fire with solid fuels results in incomplete combustion and indoor air pollution (IAP) causing respiratory and other diseases leading to nearly two million premature deaths per year. In urban areas, IAP interacts with outdoor pollutants in toxic chemical mixtures affecting also other citizens and damaging regional air quality in terms of 'brown clouds'. Deaths result mainly in women, children and infants, who are directly exposed to smoke in unventilated kitchens, thus reflecting differentiated and unequal impacts across population groups. Despite the heavy health burden and discomfort, IAP has only recently been recognised as associated with neglected diseases. In search of synergies between adaptation and mitigation, we seek gender sensitive social innovations to halt smoke, soot and early death while reducing deforestation and carbon emissions. Using transition arenas as a participatory method for experiments and social learning we engaged with local entrepreneurs and peasant farmers in sub-Saharan Africa to initiate co-production of efficient flue-piped stoves that save energy, labour and lives. Findings indicate that successful design, production and adoption of improved cooking stoves is possible, but the structural challenges of poverty, inequality and distrust may inhibit further diffusion and more profound processes of social learning. Insights from local studies must therefore be contextualised into broader understandings, as attempted here, while local adoption must be combined with wider initiatives and government policies into complex micro-to-macro solutions that provide forceful effects against IAP and its drivers.

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1. Introduction: cooking and coughing in the context of climate change

Global inequality is a main cause of both overconsumption and underconsumption (Jönsson et al., 2012). It drives food insecurity, ill-health, hazardous living conditions and social conflicts within and between population groups. It interacts with social, technological, environmental and climate change in complex and ethically problematic ways (Rogers et al., 2012). As such it is at the root of the multi-scalar issue of indoor air pollution (IAP) causing discomfort, disease or even premature deaths for local users of inefficient cooking stoves while exacerbating regional and global climate change. In addition, dangerous reproductive work, like cooking over open fire, is conditioned by gender norms defining productive and reproductive rights and responsibilities while regulating access

to labour-saving devices, clean technology and health improving innovations. In response, and as seen in this journal, recent research on livelihoods in the context of climate change, water scarcity and ill-health explicitly underlines the importance of gender and women's agency (Figueiredo and Perkins, 2013; Gabrielsson and Ramasar, 2013). In this article, and like other gender informed research in the climate change debate (Terry, 2009), we stress gender as one of several intersectional inequalities operating at the nexus of poverty, ill-health, environmental degradation and climate change.

Cooking over open fire with solid fuels has long been recognised as a serious health problem (Bruce et al., 2000; Padmavati and Pathak, 1959). Since at least the mid-1970s the use of wood fuel has been known as a major driver of deforestation (Eckholm, 1975; Manibog, 1984). Further, the incomplete combustion from cooking over open fire is now understood as an important source of greenhouse gas emissions (Ludwig et al., 2003). However, despite the longstanding recognition of the multiple and accumulative consequences of this technology (Turner et al., 1990), the situation for stove users has not improved much (Kodgule and Salvi, 2012). In a previous article, we analysed how the many problems associated

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with cooking over open fire have been framed historically in terms of deforestation, energy-efficiency, ill-health and a heavy work burden (Jerneck and Olsson, 2011). Further, we have discussed in more detail how agroforestry can be a remedy against deforestation while serving as a profitable activity for ‘opportunity seeking’ peasant farmers in subsistence agriculture (Jerneck and Olsson, forthcoming-a, forthcoming-b). In this article we will show how solutions to IAP must be tackled in a gender sensitive mode, including women’s and men’s agency, in order that both uptake and the continued use of a cleaner cooking technology can take place.

2. Smoke, soot and sufferings

Every day throughout the global South people who are poor, and some who are not so poor, cook on simple stoves in rural, urban and peri-urban households. In window-less and poorly ventilated kitchens, women spend hours preparing meals for their family. Squatting on mud floors they stir their clay pots and metal pans over an open fire encased by three stones, often meanwhile tending small children and, from time to time, carrying a baby strapped on the back. Silently they endure the smoke. It irritates their eyes and creeps into their lungs, hour after hour, day after day.

In magnitude, half the global population depends in this way on solid fuels like wood, dung, coal and agricultural residues for everyday cooking, heating and lighting (Grieshop et al., 2011; Rehfuess et al., 2006; Torres-Duque et al., 2008). Further, it is predicted that another 200 million people will rely on biomass for cooking and heating by 2030 (Warwick and Doig, 2004). The use of low-grade fuels on energy-inefficient and poorly ventilated cooking stoves, as described here, results in incomplete combustion and indoor air pollution with dire health hazards for stove users (Rehfuess et al., 2006) thereby causing a high disease burden, disability and premature deaths (Fullerton et al., 2008).

Until recently (1984), respiratory disease was the main cause of death in many countries (WHO, 2010b). As of 2010 the main killer in low-income countries is a communicable disease like HIV, malaria or diarrhoea (WHO, 2010a) but every year at least 1.6–1.8 million people die of respiratory diseases caused by IAP from cooking over open fire, corresponding to four percent of the global burden of disease (Torres-Duque et al., 2008). Pollutants from inefficient solid fuel combustion cause or exacerbate a whole series of illnesses (Naeher et al., 2007) including both respiratory and non-respiratory diseases (Fullerton et al., 2008). The majority of the victims are women and children (WHO, 2002) who are disproportionately exposed and afflicted, through daily spending hours near the fire (Po et al., 2011). IAP therefore poses a severe public health problem, especially for children and infants, who both absorb more pollutants and retain them longer, thereby putting their lives at risk (Budds et al., 2001). Because a young child has small lungs it breathes faster than an adult, thus risking more extensive inflammation from inhaling the smoky air. This may cause serious damage to its immune system (Warwick and Doig, 2004) or even fatal acute lower respiratory infection such as pneumonia (WHO, 2002).

In urban areas, IAP interacts with outdoor pollutants in complex ways producing a toxic mixture of chemicals affecting both the users and other city dwellers (Kadir et al., 2010). In addition to the immediate impact on stove users and the local air quality in the form of IAP and urban smog (Worobiec et al., 2011) the regional air quality is influenced at very large distances from the main source contributing to ‘brown clouds’ (Brunekreef, 2010). In addition, smoke in the form of black carbon (=soot) from incomplete combustion of solid fuels ranks as the second or third most important contributor to climate change with a global warming potential several magnitudes greater than CO₂ (Tami and Sun,

2005). As an aerosol, smoke has global climate impacts as well as decisive regional climate effects on precipitation (Rotstayn and Lohmann, 2002) and on temperature in the form of heat waves (Stott et al., 2004; Tressol et al., 2008). But, while it takes many decades for the effects of reductions in CO₂ emissions to become apparent (Grieshop et al., 2009), reductions in the emissions of smoke would have immediate effects and beneficial synergies all the way from an individual and local scale to regional and global levels. In sum, the smoke from household cooking, heating and lighting over open fire implies huge individual discomfort and suffering. Notably, the exposure and sensitivity to IAP is extremely differentiated across population groups hitting women and children the hardest. This makes it a clear example of intersectional inequality that deserves due attention. We argue that in the context of the climate change debate IAP amounts to a collective social problem of global health and environmental justice.

3. Sustainability science as a critical problem solving approach

In sustainability science we recognise the multi-scalar complexity and dynamics of climate change, energy use, global health and environmental justice (Jerneck et al., 2011). Using a political ecology frame compatible with sustainability science, we identify indoor air pollution from household cooking not only as a local issue with local effects but as a major neglected issue to be discussed in relation to climate change responses, global health policy, gendered technologies and intersectional inequality. To that end we see poverty and ill-health as multiple stressors in the context of environmental and climate change. In line with that, we agree with John Urry in his plea for a ‘resources-sociology’ that examines the wider social-ecological relations of resource use including energy use (Urry, 2011). First, we identify four decisive shifts in global health funding and the implications of that for the prevention and treatment of the neglected diseases following from IAP. Secondly, we offer a brief account of the historical responses to IAP. Thirdly, we identify three intersectional inequalities associated with IAP and discuss the gendered conditions of production, reproduction and technology in relation to cooking and energy. From a gender sensitive and critical problem-solving perspective, we look for combined social–ecological benefits from improved cooking stoves while aiming at adaptation-to-mitigation synergies at local to global scales. Drawing on repeated field research 2007–2010 on subsistence agriculture in twelve villages in western Kenya (Jerneck and Olsson, 2012; Olsson and Jerneck, 2010), we focus on co-produced and concrete ways to reduce the suffering from IAP in the context of small-scale farming in sub-Saharan Africa. Finally, we place our findings in a wider debate on synergies between, and policies for, climate mitigation and adaptation (Lemos et al., 2007).

4. Poverty, inequality and ill-health in times of climate change

Despite the vast and increasing scientific knowledge about climate change, how to define *dangerous* climate change is still an open, much debated and pivotal question in global climate change policy (Oppenheimer and Petsonk, 2005). Since climate change will be especially detrimental to people who are poor in the global south (IPCC, 2007) the answer must refer to actual adaptation capacity in the world’s most vulnerable areas and communities such as rural sub-Saharan Africa where small-scale farmers depend on rainfed agriculture. Their food, health and water will be at risk while their wellbeing is predicted to worsen due both to climate change and environmental conditions like land use change and land degradation (Andersson et al., 2011; IPCC, 2007). In addition,

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