Addressing Question number 1 :

# **Reducing greenhouse gas emissions through cultural change in cooking with wood fuel.**

Reduction of GHG emissions cab be brought about in two ways. First, is to reduce emissions by reducing the energy intensity of production, for example, a shift from extracting ground water to utilizing surface water, or a conjunctive use of ground water or surface water. This change would reduce the energy required in agricultural production and depending on the emission intensity of the energy used, whether diesel or electricity, there would be a reduction in GHG emissions.

The second way in which emission can be controlled is to reduce the emission intensity of energy used, by shifting from cooking with GHG-releasing wood fuel to cooking with LPG; or from inorganic to organic fertilizers, LPG, for instance, has very low emissions, or a lower carbon footprint, compared to wood and kerosene. Though it is a fossil fuel and thus will be depleted over time, it nevertheless has the advantage of almost negligible current emissions.

The use of firewood as cooking fuel results in two problems. One is that there is a release of carbon (black carbon) contributing to the build-up of greenhouse gases (GHGs) in the atmosphere. It is estimated that 30 percent of ambient air pollution in India is due to household air pollution from cooking with solid biomass (Global Alliance, 2017). Second, black carbon and other unburnt particulate matter are inhaled by the household, particularly by women and small children who spend more time around the cooking fire. The WHO estimates that there were 1.3  million deaths in India due to household air pollution from using solid fuels (WHO, 2016).

The UN Sustainable Development Goals’ indicator (7.1.2) is, “Percentage of population with primary reliance on clean fuels and technology.” In India almost 80 percent of rural households use solid biomass as the primary cooking fuel (67.3 percent rely on firewood, with another 9.6 percent dung cake), while only 15 percent use LPG (NSS, 68th Round, 2011–12).

**Experiences of Government Programmes:** The Government of India has recently launched the Ujjwala Programme, under which it has provided over 80 million LPG connections to women under the poverty line in their own name. A subsidy of Rs.1,600 (USD 24) is provided out of the cost of about Rs.2,000 of a new connection, not including the stove, which would be another Rs.1,200. The cost of refilling cylinders comes to roughly around Rs.370 per cylinder. Thus, initially the poor women who get the subsidy would have to bear an additional initial expense of Rs.1,600, equal to the amount of the subsidy, and a recurring cost of Rs.375 per cylinder.

**Where wood can be collected with women’s unvalued labour, capital subsidy at best leads to fuel stacking and not fuel switching.**

Recently, we noted that in Tamil Nadu a programme to subsidize LPG equipment seems to have been quite successful in bringing about fuel switching. In our 2016 study of three Self Help Groups (SHGs) in Dharmapathurpathi village in Dindigul, Tamil Nadu, all 30 women had LPG and used it as the primary cooking fuel. This was important in saving time, not just in collecting wood, but also in cleaning vessels. They said that they would never go back to cooking with wood because they worked on the farm or as wage employees in non-farm work from early morning onwards. There is a link here between women’s involvement in nonhousehold employment and women’s adoption of LPG as the principal and only cooking fuel.

**Women’s Income Earning Opportunities Make the Difference in Turning Access into Use of Clean Cooking Fuels:** Clean fuels are not only good for women’s health, they are also labor-saving systems of cooking. But monetary cost, both capital costs of equipment and running costs of fuel, are involved in switching to clean fuels. Wood, on the other hand, is collected largely by women with their unpaid labor, meaning there is no monetary cost involved.

Where there are few opportunities for women to use the wood-collecting labor time saved in income generating activities, it is unlikely that they will spend cash on LPG. Such economizing of women’s labor time is more likely to occur where women are substantially involved in income-generating activities and, therefore, some empowerment with a greater say in household decisions. Thus, it is increasing pressure on women’s time in production, with resource/asset ownership in the women’s name, is likely to lead to the adoption of clean cooking methods, which are also labor-saving methods.

Generally, men dominate household spending decisions, assigning last priority to LPG connections. Ignoring impacts on women’s health, they are likely to utilize available money on entertainment or other such uses, rather than in re-filling LPG cylinders. But this choice hierarchy could be changed if cooking with LPG becomes a prestige good.

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Question number 4 :

# **Indigenous women in India: adaptation strategies and mitigation measures.**

**Adaptation**

Despite limited support for adivasi and indigenous women to plan and implement adaptation One of the distinguishing features of the strategies, it is encouraging that in a number cases adivasi and indigenous women in poor rural areas have adopted adaptation strategies.

 In Jaintia Hills, for example, women vegetable farmers have taken up a new variety of cabbage and cash crops such as turmeric and broom grass, which can withstand unseasonal and heavy rains. Likewise in Ribhoi district of Meghalaya, two women swidden farmers confirmed their traditional major cash crops of beans and karela (bitter gourd) were repeatedly destroyed irregular and heavy rains experienced over past 4-5 years. Hence, they have switched cultivation of new cash crops—ginger and strawberry—which they grow alongside sweet potato, yams, beetroots, carrots, and Chinese turnips in the swidden field, though in smaller amounts. When queried about any difficulties in new crops, Mirseda Umdor, the older of the two farmers said: “We have no problems in the marketing of vegetables. We are able to sell all kinds of agricultural produce, either in the local market or in Shillong”. To that end, they have also added traditional herbs and fruits grown in their field or backyards to what they sell at market, while providing for household consumption as well.

In addition to ingenuity, these efforts evidence that indigenous women's extensive experience in agriculture as well as knowledge of nutritional and medicinal properties of local plants, roots and trees—including edible plants not normally used—may be of central importance in communities coping with environmental stress and food shortages expected due to global warming.

Worth noting, these autonomous adaptation efforts mirror similar observations of adaptation by the International Union for Conservation of Nature (IUCN), who found that in Sikkim, India, for example women farmers have cultivated a new variety of cardamom, which is better suited to the increased frost and fog. And in the Terai area of Nepal, women have also modified seed choice and switched to cultivating crops that can be harvested before the region's floods or plant taller, water-resistant rice varieties have mobilized to better prepare for floods. They have also built community shelters, take their assets and livestock to higher places, and those who have enough resources, increase the plinth livelihood of their houses/homesteads to protect their belongings.

These last examples, of simply affording to build shelters or reinforce vulnerable homes evidence the practical link between wealth and capacity adaptation. While not directly an adaptation strategy, economic resiliency is a cornerstone of effective adaptation. Therefore, initiatives that directly support women's livelihoods are essential.

In Bastar, Chattisgarh Gond and other areas, Adivasi women have developed their skills in traditionally male vocations such as terracotta, bell metal and wood sculpture. These alternative skills could increase their economic residency as the climate shifts, since they decrease women’s dependency on agriculture or collection of NTFPs, which global warming is expected to impact negatively or stress in many areas.

In India, self-help groups (SHGs) have been a highly effectual strategy to support women's livelihood and social empowerment. SHGs give market access to women for their non-timber forest products (NTFPs), which include, inter alia, gum karaya (used as medicine and food), maredugaddulu (used in preparing sherbets), narmamidi bark (used in making incense sticks, soapnut (used in soaps and shampoos), pongamia seed (used in hair oils and as a bio-substitute for diesel) and adda leaves (used for making plates). The greatest impact, however, has been the SHGs elimination of middlepersons, minimization of overhead expenses, and focus on keeping profits within the community. Women's work moved up the value chain, where they are not only the collectors of forest produce and makers of different products, but also sellers and negotiators for collective purchase of these products in the market (Kelkar and Nathan, 2005; Revelli, 2006).

**Mitigation Measures**

Adivasi and indigenous women may easily have the smallest carbon footprint on earth. Their sustainable livelihood practices such as swidden farming, pastoralism, hunting and gathering, trapping and the production of basic goods and services, often use environmentally friendly, renewable and/or recyclable resources. Adivasis of Jharkhand, Chhattisgarh, Andhra Pradesh and the North-eastern states of India, for example, as well as the Karen and other indigenous peoples of Thailand, China and Myanmar, continue to practice jhum or podu (rotational agriculture), with very limited or no use of petroleum fertilizers. As a result, they not only produce few greenhouse gases, but the conserved forests in their domain and sustainable use of agricultural lands provide the additional benefit of a healthy ecosystem that helps preserve biodiversity and provides a sink for global greenhouse gas (GHG) emissions (UNFII, Tauli-Corpuz and Lynge, 2008).

Indigenous communities are increasingly interlinked, however, to mitigation initiatives by external actors including forestry projects for sequestering carbon, and the development of alternative energy such as biofuel and wind power. Only limited efforts, however, are often made them in consultations and implementation of these projects at any level—local, national, regional, or international. For example, adivasi communities in Harda district in Madhya Pradesh, were neither notified nor aware of a carbon forestry project intended to regenerate forests for carbon sequestration and storage. Women however—and in some cases children—were employed on a seasonal basis to plant the seeds in the forest, but were not informed of their role in a larger carbon storage project (Madhu Sarin, 2003 cited in Tebtebba 2008). More concerning to indigenous peoples, some mitigation projects such as securing forests or lands for carbon sinks and renewable energy projects have been established on indigenous peoples' lands through means of deception, and without securing the free, prior and informed consent, particularly of women, as in the case of initial years of wind farms by Suzlon in the state of Maharashtra, India.

An universal recommendation from the field is to benefit all member of indigenous communities equally for regulatory payments for the communities' provision of environmental services, including carbon sequestration via avoided deforestation and the frequently under-valued externalities of watershed and biodiversity protection. This would require an accountability mechanism to ensure that funds are distributed to women and men equitably.