

INCREASING THE GENDER GAP: THE IMPACTS OF THE BIOECONOMY AND MARKETS IN ENVIRONMENTAL SERVICES ON WOMEN

May 2013



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www.globalforestcoalition.org



Increasing the Gender Gap: The Impacts of the Bioeconomy and Markets in Environmental Services on Women was made thanks to the generous contribution of the Association of Women's Rights in Development (AWID) - www.awid.org

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Photo in cover courtesy of ICCA Consortium
www.iccaconsortium.org/wordpress

The author wishes to thank the members of the Women's Major Group (WMG) for their contributions - www.womenrio20.org

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Summary

Governments are responding to today's economic and environmental crises with a raft of policies designed to pull in private finance by being business-friendly. These include transitioning to industrial production based on biomass rather than fossil fuels, and creating new markets that allow the private sector to trade in the world's ecosystem functions.

However, these novel approaches are fraught with risk. They are largely untested and look set to have significant social and environmental impacts of their own, especially because of the way in which they will ramp up demand for natural resources and land. Women are likely to be impacted particularly severely, mainly because of their involvement in managing and using natural resources, their role in small-scale agriculture and the production of food, and their lack of formal land tenure and involvement in decision-making processes. Negative impacts are likely to include denial of access to resources, loss of land for farming, and exclusion from the increasingly commercialised world of 'bioeconomies' and 'ecosystem services' markets. This will in turn contribute to the feminisation of poverty.

Introduction

The social and environmental crises we are witnessing today are based on ingrained patterns of overproduction and overconsumption benefitting wealthy elites. This flawed approach, which is driven by corporate globalisation, ignores the fact that there are limits to the 'carrying capacity' of the planet and the non-renewable nature of many of the resources we are extracting so rapidly.

Indeed, our economic system continues to maximise production even as we stand and watch our climate changing as a direct result of this industrialisation, which has increased the concentration of greenhouse gas emissions in the atmosphere.

Yet governments are struggling to find ways of addressing the various crises without hindering the industrial production process, because they are preoccupied with short-term economic interests. This means they are not necessarily opting for the most effective policy options, but the most convenient ones.

One such policy is the 'Green Economy' approach, which is central to the Rio+20 agendaⁱ and makes it exceptionally clear that businesses are important actors steering the wheels of this new economy. But there is still a huge debate and a great deal of uncertainty about what the green economy is and who will really benefit.

In 2011, the United Nations Environment Program (UNEP)ⁱⁱ published its report on the green economy defining it as: *"one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities"*. However, NGOs, IPOs and other civil society organisations have shown discontent with this definition, as have developing countries: *"The G77, in particular, has questioned the appropriateness of the term, noting that the "green economy" should not replace or redefine sustainable development and highlighting the need for a better understanding of the green economy's scope, benefits, risks and costs."*ⁱⁱⁱ

At the moment, plans for this 'green economy' include commodifying and bringing ecosystem functions into the market, and other market-based approaches, including:

- Payments for Environmental Services (PES): one party pays an environmental services provider, which can be a government or community, for guaranteeing the provision of the so-called 'service' (e.g. protection of watersheds, forests or biodiversity).
- Carbon Markets, together with schemes focused on Reducing Emissions from Deforestation and Forest Degradation and enhanced carbon stocks (REDD+): polluting companies in the Global North pay governments and/or individuals in the Global South for not cutting down or degrading forests. In turn, companies receive carbon credits thus supposedly 'offsetting' their own CO₂ emissions.
- Biodiversity Offsets: similar in nature to carbon offsets, this mechanism seeks to compensate for biodiversity destruction, say for a mining project, protecting biodiversity elsewhere — despite concerns that the two different sites may have completely different species present.

Furthermore, in response to the increasingly limited availability of fossil fuels to power the industrial economy and provide the raw materials for a vast range of manufactured products including plastics and medicines, many industrialised and some developing country governments are also developing a new industrial strategy, under the guise of concern for the environment.

Disguised as 'green', the 'Bioeconomy' aims to replace current production processes based on fossil fuels with production based on biomass and the use of potentially risky biotechnologies (including those yet to be developed).^{iv}

The trouble is that although there is an intention to increase resource efficiency there is no apparent intention to reduce manufacturing and consumption levels, meaning that, in the EU for example, there will be significant increases in demand for biomass, both grown domestically and imported.^{v,vi} In spite of the fact that waste materials are to be used as well, this will increase demand for wood and other plant-based materials, and land to produce them on. For instance, imports of biomass are already required in order to meet UK^{vii} and EU biomass demands.^{viii}

The bioeconomy agenda is especially attractive to fossil fuel companies who want to be seen pursuing an exit-from-oil strategy, and biotechnology companies desperately in need of a Trojan horse to provide safe passage for risky and unpopular new technologies^{ix} and practices, including genetically-engineered trees, synthetic biology, nanotechnology and geoengineering.^x

Well-known transnational corporations (TNCs) are already major players, including energy companies (Exxon, BP, Chevron, Shell, Total), along with the US military; pharmaceuticals (Roche, Merck); food and agribusiness companies (Unilever, Cargill, DuPont, Monsanto, Bunge, Procter & Gamble); and chemical transnationals (Dow, BASF).^{xi}

In short, both markets in environmental services and 'bioeconomies' offer very good business opportunities for the financial and industrial sectors at a time when they are threatened by economic crisis — but both approaches fail to address the underlying causes of environmental degradation or address the objectives governments have already set for

the conservation and sustainable use of nature, the reduction of poverty and tackling climate change.

Quite the opposite, in fact. They are likely to boost biodiversity loss and all its associated impacts, both on ecosystems and societies, as increased demand for natural resources will trigger not only its unsustainable exploitation but also its commodification and privatisation leading to further land and resource grabbing,^{xii} increasing community displacements, and violence in highly productive areas, especially in the Global South.

Likewise, emerging technologies' impacts on the environment and on people's livelihoods are likely to threaten the most vulnerable groups in society the most, including Indigenous Peoples, and women and children, who already constitute the majority of the world's poor.^{xiii}

Rural and Indigenous women's reliance on natural resources

Women's issues and environmental issues are often considered as being separate issues, which may not be all that surprising to some, given that in today's world a significant part of the population lives in cities. But in many countries, and especially in rural areas, gender roles remain differentiated, and women continue to have traditional responsibility for supplying their families with food and water, and providing overall care for them, often without economic compensation. Thus most rural women's activities relate to small-scale, subsistence farming, whereas men tend to dominate those areas that relate to commercialisation, throughout marketing and distribution chains. In Africa for instance, 70% of the agriculture is in the hands of women and 90% of women manage household water and fuelwood.^{xiv}

Hence, women spend more time on tasks that deal directly with the use of natural resources. In fact, *"for many women, biodiversity is the cornerstone of their work, their belief systems and their basic survival; for indigenous and local communities in particular, direct links with the land are fundamental, and obligations to maintain these form the core of individual and group identity."*^{xv} Certainly, industries looking for further sources of biomass in order to meet demand, mainly from Northern countries, are bound to affect this relationship that women have with biodiversity, that has been maintained over centuries, with detrimental consequences for rural and Indigenous women's livelihoods and survival, especially if they are denied free access to and control over land and/or natural resources. Women and their families often have to rely on land that they have traditionally used but that they do not formally own, and this constitutes their main basis for survival. The impacts are felt even more sharply in the many households where women are the head of the household and depend on their home-based businesses for generating income.^{xvi}

But governments' targets for replacing fossil fuels with other renewable energy resources will further complicate the situation for rural and Indigenous women who depend on natural resources; the EU has energy use targets in place for 20% of renewable sources by 2020, but most of these renewables come from trees, which was seen by governments as the only possible way for meeting these targets.^{xvii} Thus, the scale of global demand for wood to feed the different industries moving into the 'renewables business' is likely to lead to the further uprooting of forest dependent women.

In addition, the privatisation and commodification of natural resources to supply the market for 'environmental services' continues to exacerbate the problem, as the different burdens imposed on women multiply. Women are less likely to be considered as providers of these

‘environmental services’ because they have fewer property rights and fewer capital assets (in other words, they are not seen as the providers of those services). The fact that they generally have less access to education and reduced participation in processes that affect them also makes it much harder to engage in important processes that affect their livelihoods. This means that their own needs are much less likely to be taken into account. They may also find it difficult to participate in programmes because of the burdens of caring for their families and having to deal with problems such as polluted water sources or deforested areas, which mean that they have to walk much further in order to collect fresh water, fuel, fruits and seeds, etc.

Even in 1997 Bryceson and Jamal had noted that market-oriented policies tend to benefit larger farmers, and to increase inequalities between them and smallholder producers.^{xviii} Thus the existing patriarchal systems are kept in place: *“issues with property rights are rooted in historic patriarchal systems where women lack any land tenure rights, including inheritance rights. Still today, some land reform programs in different global regions have had the tendency to ignore gender.”*^{xix}



Photo courtesy: Critical Information Collective (CIC).

Land and resource grabbing hits women hardest

An examination of the ongoing process of privatising natural resources reveals that this privatisation is tending to concentrate most of these land rights in the hands of a minority. Because of economic and cultural factors and the influence of those already in power, this minority tends to exclude women.^{xx}

The growing worldwide interest in bioeconomies and ecosystems services markets, means that a small number of people — mostly men, many of whom have experience working with agribusiness companies and banks — are taking over more and more of the world’s farmlands, and the water and other resources that go with it, leaving everyone else with access to fewer resources, or none at all.^{xxi} This thirst for land-based wealth is increasing rapidly, especially in the Global South, where lands are known to have a higher productivity.

Foreign investors are targeting countries with weak land tenure security but relatively high levels of investor protection.^{xxii} Reported cases all over the world are on the rise. Local and

foreign companies have found valuable allies in order to carry on with their profitable businesses, as numerous cash-strapped governments have welcomed dubious investments in spite of concerns over food security, water availability and human rights. Incoming investors are even welcomed in with tax exemptions and deductions. This new wave of 'colonialism' includes investors from the 'usual suspects' such as the US and the UK, but also other countries including Saudi Arabia, India, China, South Africa and South Korea, all of which are known to be buying up vast tracts of land in other developing countries.^{xxiii}

For example, Meles Zenawi, late prime minister of Ethiopia, transferred huge areas of land in the southern half of the country to foreign and domestic investors for large-scale agricultural projects. His government identified four million ha for this programme, one million more for biofuels, and another five million for sugar-cane plantations. By the end of 2011, 800,000 ha had already been leased to foreign investors. In readiness, Zenawi also built dams, forcibly displaced communities, and used the army to quell opposition violently.^{xxiv} One of the 'beneficiaries' in Ethiopia, company Saudi Star Agriculture Development plc acquired 10,000 hectares of land along the Alwero River in the Gambella region of Ethiopia.^{xxv}

Clearly, in a country like Ethiopia with a strong history of starvation and malnutrition, such land grabbing deals are likely to bring more harm than benefit to its already impoverished population. Furthermore, in a region where women-headed households constitute 30% of the population, and are among the most destitute as well, the impacts on women and their families are likely to be stark.^{xxvi}

A study in six African countries, including Ethiopia, details the impacts that land grabbing is having on small-scale farmers, the majority of whom are women. In all six countries, women have more limited access to resources than men, especially with respect to access to, control over and ownership of land. This means that although women constitute the majority of agriculturalists, the income from the land is mostly controlled by their husbands. Furthermore, in some cases, investors in the six countries have only consulted the local elite. Women are most likely to be sidelined in consultations due to the fragility of their land rights.^{xxvii}

In addition it is often Indigenous and rural women that are leading the protests, resisting evictions from their territories and confronting increased militarisation in the lands that have been grabbed for profit making, as there is a cultural belief that women will not be attacked with violence; but cases in Cambodia^{xxviii} and Honduras,^{xxix} to name but a few, have shown the opposite. In fact, violence against women intensifies and criminalisation towards women's rights leaders becomes increasingly normal as militarisation and conflict increases.^{xxx}

False solutions to climate change, real problems for women

Women and the impacts of climate change

Measures taken for tackling climate change haven't really solved the problem they were meant to solve; on the contrary, climate change continues to happen and its effects continue to be felt worldwide. Rural communities and especially women are highly vulnerable to its impacts. Women's greater responsibilities for crop and food production and preparation in most of the developing world render them more susceptible to the impacts of climate change: they must adapt these activities to declining water supplies, climate variability, natural disasters, pest outbreaks, changing precipitation patterns and other impacts of climate change on crop production.^{xxxi}

During extreme weather events, more women die than men (or die at a younger age) because of a variety of factors, including:^{xxxii}

- Gender discrimination
- Lack of access to resources and information
- Cultural factors (in developing countries, women often don't know how to swim, for example, and their traditional clothes can impede mobility during floods)
- The added burden of a pre-existing traditional role as caregivers in the informal economy, which is exacerbated during natural disasters
- The increased susceptibility of pregnant women to malaria and other forms of disease (according to the World Health Organization), which are becoming more prevalent as a result of climate change.

As migrants and refugees leave areas of climatic stress, women also confront greater risks in terms of disease and violence.^{xxxiii} In Haiti, after the earthquake in 2010, the UN High Commissioner for Refugees reported an alarming increase in rape and violence against young girls and adult women in these camps.^{xxxiv}

However, in spite of all these factors, policies to tackle climate change have seldom taken gender aspects into account.

The impact of biofuels production

The twin crises of peak oil and climate change have propelled governments and industries into pursuing alternative energy sources and related policies in order to 'mitigate' and 'adapt' to climate change. Governments have generally opted for solutions that allow businesses to generate a profit, rather than regulation that might impede economic welfare, even if the outcomes are less effective.

As a result of this changing dynamic, many companies have jumped into the 'renewable energy' business, investing significant amounts of money in developing biofuels production with a view to generating substantial profits. National policies in numerous countries have been focused on establishing biofuel mandates,^{xxxv} especially in the transport sector; these mandates dictate that transport fuels must contain a certain percentage of biofuels. This is massively increasing the demand for wood, vegetable oil, cereals and, crucially, for land.

Biofuels only account for 3% of global transport fuel at the moment, but according to a report by the International Land Coalition, they were still responsible for 59% of all land-grabs between 2000 and 2010.^{xxxvi} As demand for land goes up, so do food prices: crops once aimed at feeding people are converted into crops for 'feeding' transport, a situation that has been occurring in Asia, Africa and Latin America, where biofuels can be grown more cheaply.

By pushing up the price of cereals and vegetable oils, biofuels have contributed to greater hunger and malnutrition, and the increasing destruction of forests and other ecosystems – including peatlands – for profit-generating palm oil, soy and other plantations.^{xxxvii} This has left women even worse off, as the resources their livelihoods depend upon are seriously diminished.

"Now that the United States is using 40 percent of its crop to make biofuel, it is not surprising that tortilla prices have doubled in Guatemala, which imports nearly half of its corn. Roughly 50 percent of the nation's children

are chronically malnourished, the fourth-highest rate in the world, according to the United Nations.” xxxviii

Research into land grabbing in Africa has found that *“land grabbing through massive agricultural investments is contributing to the further corrosion of women’s land rights.” xxxix* The same study also recognises that *“this is true because various generalized arguments that have been made to justify biofuels investments do not fit with the lived realities of women, particularly where women’s land rights are concerned. These arguments include that: a) growing biofuel feedstocks would increase incomes for rural dwellers; b) that growing biofuel feedstock on ‘marginal land’ is the solution to resolving tensions over land rights; c) that rural dwellers will receive compensation for lost land; and d) that biofuels will not compete with food crops. However, research shows that the likelihood of rural women gaining increased incomes from growing biofuel feedstock is reduced, as a result of the power dynamics relating to access and control of land in many societies.”*

Despite the fact that there is limited information regarding the specific impacts of agrofuel production (also euphemistically known as biofuels^{xi}) on women, cases worldwide prove that agrofuels often touch upon the same three dimensions — social, environmental and labour rights — which impact women either directly or indirectly. In one country considered — Colombia — there is a convergence of all these aspects, which makes women in this country even more vulnerable (see Annex I for case study).

Furthermore, increasing evidence proves that biofuels are not as ‘green’ as previously thought. If looked at in terms of their entire lifecycle, CO₂ emissions could be even greater than those from fossil fuels.^{xii}

The impact of large-scale wood-based bioenergy for heat and power

Central to the overall bioeconomy agenda, industrial wood-based bioenergy for heat and power is expanding rapidly, particularly in Europe and North America. This is being fuelled by public subsidies and targets, yet the time-lag in building the infrastructure (power stations, pellet plants, new shipping facilities, etc.) means that the full consequences for forests, land-use and communities have yet to be felt.^{xiii}

Promoted as clean and climate-friendly, and driven by lucrative renewable energy subsidies and tax credits, biomass energy — heat and power produced by burning wood and other biological materials — is on the rise. Again, however, recent scientific and policy developments recognise that biomass energy has significant greenhouse gas emissions which has blown a major hole in arguments for treating biomass as a favoured renewable energy source.^{xiiii} It has been calculated that if the whole trees are used to produce energy (as they sometimes are), the carbon emissions produced over 20 years would actually be 79% higher than those of coal (the dirtiest fuel) — there is no carbon reduction until 100 years have passed.^{xliv}

Rachel Smolker from Biofuelwatch, notes that this rapidly expanding field is already driving conflict between traditional uses of biomass, such as rural cookstoves, and new commercial and industrial uses. In the United States, for example, massive ‘bio-refineries’ already exist, supposedly using plant material from the surrounding area. At the moment they produce energy and electricity, but the intention is that they will eventually manufacture plastics, pharmaceuticals, and other products. But in reality most of the world’s biomass is located in the Global South, and that’s why we see the European Union now importing woodchips and wood pellets from Brazil and from other South American countries.

“Women are the most vulnerable to the land-grabs that result from this increased demand for wood. Women are the main food producers, they’re responsible for children, they’re the first to go hungry when food shortages occur, they have less secure tenure over their lands, they have less decision-making over their lands, they have less of a role in the cash economy and are often viewed as cheap labor,” concludes Smolker.^{xlv}

In addition, for communities living near biomass power stations there are serious concerns over air quality and human health; biomass incinerators require constant fuel inputs and the resulting pollutants cause disease, pain and suffering and increase health care costs. According to figures from the US Environmental Protection Agency, even burning ‘clean’—i.e. not chemically treated—wood emits 79 different pollutants. These include nitrogen oxides, sulphur dioxide and small particulates, dioxins and furans, formaldehyde, benzene, cadmium, arsenic, chromium and lead. Some of these are linked to respiratory and heart disease, others to cancer, birth defects and other health problems.^{xlvi} In fact, the U.S. Lung Association has opposed biomass incinerators as they have severe impacts on the health of children, older adults, and people with lung diseases.^{xlvii} This in turn will increase women’s burden since they are primarily responsible for the care of sick family members. Lead poisoning is also known to have greater effects on women during pregnancy, where it can result in miscarriage or reduced growth of the foetus and premature birth.^{xlviii}



Mc Neill biomass powerstation in Vermont. Photo courtesy: Biofuelwatch

Biomass predictions under 'Bioeconomies'

Published in April, The Economist article "*Wood the Fuel of the Future: Environmental Lunacy in Europe*" provides interesting facts and figures on this topic. It states that since power stations can be adapted to burn a mixture of 90% coal and 10% wood (called co-firing) with little new investment, British company Drax, one of Europe's largest coal-fired power stations, could convert three of its six boilers to burn wood. When up and running in 2016 they will generate 12.5 terawatt hours of electricity a year. This energy will get a subsidy, called a renewable obligation certificate, worth £45 (US\$68) a megawatt hour (MWh), paid on top of the market price for electricity. According to Roland Vetter, at current prices, Europe's largest carbon-trading firm, Drax could be getting £550m a year in subsidies for biomass after 2016—more than its 2012 pretax profit of £190m... Europe consumed 13m tonnes of wood pellets in 2012, according to International Wood Markets Group, a Canadian company. On current trends, European demand will rise to 25-30m a year by 2020. Imports of wood pellets into the EU rose by 50% in 2010 alone and global trade in them (influenced by Chinese as well as EU demand) could rise five- or six-fold from 10-12m tonnes a year to 60m tonnes by 2020, reckons the European Pellet Council; already prices for hardwoods from western Canada have risen by about 60% since the end of 2011.

Moreover, according to the the US Energy Information Administration's *Annual Energy Outlook 2013* biomass use will total 4.2 quadrillion Btu in 2035 and 4.9 quadrillion Btu in 2040, up from 2.7 quadrillion Btu in 2011. Excluding hydroelectricity, renewable energy consumption in the electric power sector will grow from 1.6 quadrillion Btu in 2011 to 4.5 quadrillion Btu in 2040, with biomass accounting for 24 percent of the growth (*further information via <http://www.eia.gov/forecasts/aeo/er/pdf/0383er%282013%29.pdf>*)

Already in 2009, Marshall Wise *et al.* - published in *Science* 324 - studied the implications of limiting CO2 concentrations for land use and energy. Results showed that putting a price on fossil carbon while promoting bioenergy as carbon-neutral will increase pressure on forest ecosystems as well as other ecosystems — especially pastures often incorrectly catalogued as '*marginal land*'. This is because demand for land to grow bioenergy crops pushes land requirements beyond traditional croplands and into lands that are increasingly less productive, requiring increasing quantities of land to grow each successive unit of agricultural product.

**Often these wrongly classified 'marginal lands' are important ecosystems used by different species and with different purposes, eg. seasonal use for pastoralists. In some countries, especially women rely on those lands for subsistence as they have restricted access to fertile lands.*

Women do not count as 'environmental service' providers

Women and Payment for Environmental Services (PES) systems

Many of the benefits that we as humankind receive from nature have suddenly been catalogued as 'environmental services' by a group of ambitious economists who believe that introducing ecosystems into markets could benefit their conservation while compensating those who make the conservation effort. However, a reality check is needed: turning vital ecosystem functions into marketable goods has not only proved difficult but mainly benefits those who already have the advantages in market economies, including big transnational corporations, and 'conservation' NGOs who have appropriated land for 'conservation' purposes, barring many people from access to their traditional livelihoods.^{xlix}

Wunder's definition of a Payment for Environmental Services (PES) scheme includes a voluntary transaction where a well-defined ecosystem service (or a land use likely to secure that service) is being bought by one or more buyers from one or more providers, so long as the provision of the service is secure.¹ To parcel up the service, creating the necessary

paperwork that can be traded between companies involves a process of commodification, privatisation and commercialisation,^{li} an idea that seems absurd to those groups in society whose cultural values and livelihoods have depended on free access to these common resources for centuries.

Furthermore, incorporating biodiversity into a market economy in this way puts women at a severe disadvantage. It makes them and their families more dependent upon the income of their husbands, and, in the worst cases, deprives them of essential resources that provide them with a nutritionally diverse diet, primary health care resources and energy resources. It is women who suffer most when areas are declared 'protected', or when they suddenly have to pay for resources like clean freshwater and fuelwood, which used to be available for free, as they are clearly more dependent on biodiversity's non-monetary benefits.^{lii}

Furthermore, if a prerequisite for setting up an 'environmental services' market is that the so-called service has to be owned by an entity that can sell it, then several questions need to be asked: Who owns biodiversity? The government? The owner of the land where it is found? The community that manages the land? The men within that community who make decisions or the women who actually manage the land in practice? Or the Indigenous community that managed the land sustainably until Western landowners took over their land in colonial or post-colonial times?^{liii}

Women and forest carbon projects

Confusingly, forests are being considered for their potential to provide biofuel and wood-based bioenergy on the one hand (which entails them being cut down) and their capacity to absorb carbon on the other (which means they need to be left standing/growing). This latter purpose — should it prevail — is encapsulated in a 'carbon offsets' approach, which is the largest environmental services market, designed to tackle climate change.

In theory, a Northern country or industry must reduce its emissions by a certain amount, but it can pay someone else to make this reduction instead, more cheaply. In other words, the commitment can be 'offset'. Although the reduction *should* still happen, it may well not, for a variety of reasons. For example, too many emissions permits were given out in the first place 'thanks' to corporate lobbying, so there is no need in practice to make much or any improvement in energy efficiency. Furthermore, the projects in the South might have been going to happen anyway. Carbon offset schemes are also highly prone to fraud and crime, as carbon counting, monitoring and verification represents a significant challenge.^{liv} Overall, it is a flawed mechanism that doesn't really aim at reducing greenhouse gas emissions from those who are polluting, mainly in the North, but 'greenwashes' the image of polluting industries.

During the 13th Conference of the Parties to the United Nations Framework on Climate Change (UNFCCC-COP13) in Bali, 2007, a policy called REDD+ (Reducing Emissions from Deforestation and Forest Degradation) was introduced. During UNFCCC-COP 16 in Cancun in December, 2010, the Women's Caucus noted that REDD+ as currently designed will contribute to a global land grab of communities' and Indigenous Peoples' lands and territories, which will particularly affect women. The following points have been taken from their statement:

"1) Industrialized-country governments and corporations will only pay for the preservation of forests if they get rights over the carbon in those forests in return.

This will have a particular impact on women as their property rights are less secure.

"2) REDD+ initiatives create perverse incentives and inequities. Women play a differentiated and key role in forest conservation and restoration. The current REDD+ design is that actors will receive carbon credits for reducing their deforestation. Women are, overall, less responsible for deforestation and forest degradation and therefore, according to this set-up, they would be less eligible for forest carbon credits.

"3) REDD+ as an offset mechanism will not address climate change as it takes away the responsibility for mitigation from the North and shifts it to the South. Contracts to provide pollution licenses for fossil fuel-dependent corporations will potentially harm communities elsewhere who are suffering from the fossil fuel extraction or pollution for which those corporations are responsible. Women and girls in these communities carry a disproportionately higher amount of this burden".

"4) The commercialization of life and carbon markets are incompatible with traditional and indigenous cosmologies and a violation of the sacred. Women, as holders of at least half of all traditional knowledge, are integral to the preservation and living practice of this knowledge. Many indigenous tribal traditions in their historic responsibility protect the sacredness of Mother Earth and are defenders of the Circle of Life which includes biodiversity, forests, flora, fauna and all living species."

In fact, the current discussion on social impacts of REDD+ is still weak with respect to the gender dimension. Most forest policies and organisations continue to overlook women's specific needs and contributions regarding forests, in part because of the identification of forestry as men's work. Thus there is, in general, an institutional gender blindness that renders women's participation and contributions invisible and allows forest management to be incorrectly treated as 'gender neutral'.^{lv} (See Annex II for a case study in the Congo Basin where women were not involved in REDD discussions.^{lvi})

Other problems recognised from REDD+ schemes are:

- **Finance.** There are issues regarding sources of financing for the expensive strategy, design and implementation processes involved in REDD+. On the other hand, the large potential profits that have been mentioned (but may well not materialise) are already attracting 'carbon criminals', which raises further questions about the extent to which communities will actually benefit from REDD+ at all,^{lvii} and yet more about land grabbing and conflict.

- **Monitoring, Verification, Reporting (MRV).** One persistent concern is the difficulty in countering 'leakage' as deforestation moves to non-REDD+ areas to meet continuing demand for timber and agricultural products. Besides, REDD+ skates over the fact that it is really hard to measure carbon.^{lviii}

- **Safeguards.** Proposed safeguards need to be designed as part of a bottom-up process. Too often safeguards developed by international NGO processes have been inappropriate for local circumstances. Safeguards need to guarantee the Free, Prior and Informed Consent of communities with respect to whether or not they are willing to participate in these

projects.^{lix} Moreover, the UNFCCC safeguards emerging from the Cancun negotiations do not include any gender aspects; in March 2012, the UN-REDD Programme proposed the Social and Environmental Principles and Criteria (SEPC) as a guiding framework to UNFCCC's safeguards, and despite mentioning gender through Principle 2/Criterion 8 - *Respect and protect stakeholder rights in accordance with international obligations/Promote and enhance gender equality, gender equity and women's empowerment, respectively* – its operational guidance on mainstreaming gender in REDD+ is still pending. Likewise, the World Bank's social and environmental policies have not covered gender issues adequately.

- **Toxic trees.** REDD+ will drive the expansion of monoculture tree plantations, thus plantation companies could be accessing REDD+ finance. This approach to REDD+ could also trigger the deployment of harmful technologies such as genetically engineered (GE) trees, as could biofuel production (see below).^{lx}

Women and emerging technologies

The past few decades have seen unprecedented technological advances, which are massively transforming the planet and impacting people's daily lives — and not necessarily in the direction of sustainable development.^{lxi} New and emerging technologies are characterised by being brought to market with very little by way of regulatory framework or technological assessment, in flagrant disregard for the precautionary principle. It is therefore impossible to know whether any given technology will actually help to reduce pressure on the environment and society, as promised, or whether they will introduce yet more problems. The promise of profit-making for a few corporations with strong lobbying power, seems to have been more important than the potential long-term hazards derived from risky, unproven technologies.

Already, 'male-made' Green Revolution technologies, including pesticides, fertilizers, and mechanised farming, have marginalised women, actually making women almost invisible in the agricultural sector, and perpetuating patriarchy.^{lxii} For instance, women's role as seed keepers has been side-lined as farmers started depending on a narrow range of commercially developed seeds. Large multinational corporations are controlling specific seeds for industrial production, which restricts other peoples' use, thus threatening the role of women in food production. This kind of industrialised agriculture requires intense water use and depletes soils, which in turn disrupts climatic patterns. With the introduction of mechanised farming, male-designed technologies certainly left women out of the process thus men largely control the market and income. Women are generally regarded as technology recipients rather than creators, and women's power with regards to technology is thus relegated to exercising 'consumer choice' over whatever products are made commercially available to them.^{lxiii}

In the case of genetically modified (GM) crops, there is considerable concern about the risks of contaminating organic and wild source crops, as well as worries about the health impacts of consuming products derived from GM crops. In 2000, for example, native corn in Mexico was found to have been contaminated in spite of a moratorium on the cultivation of GM corn that had been in place in Mexico since 1998.^{lxiv, lxv} In addition, promised yields have seldom been met thus leaving farmers indebted, after they have purchased expensive GM seeds and associated chemical inputs. All of these concerns clearly impact on women both in terms of their role as food producers, and in terms of their concern for the health of their families. Yet despite farmers' and other social movements' opposition to GMOs, these companies continue to thrive and their profits continue to grow.

Women and genetically engineered (GE) trees

The genetic modification of trees consist of trees being engineered to contain foreign DNA which gives them unnatural characteristics, such as the ability to kill insects, tolerate toxic herbicides or freezing temperatures, grow abnormally fast, or have altered wood composition.^{lxvi} Research on GE trees seems to have started in the late 1990's, and in countries like China, GM poplar, engineered to make a natural insecticide (Bt toxin) in its leaves, is already grown on a commercial scale with no independent assessment.^{lxvii} Despite being highly detrimental, causing irreversible effects and being poorly understood, the spread of GE trees for use in commercial plantations for timber, pulp and bioenergy is advancing quickly in the US, Latin America and elsewhere, with little or no consideration of the serious environmental risks that these developments could have.^{lxviii}

GE trees are known for dehydrating soils and depleting water tables, and their invasive nature together with the wide distances that their drifting GE pollen can travel threatens native forests as well as entire ecosystems. Even with the proposed 'terminator' technology – which in theory would create sterile seeds although it is not 100% guaranteed – cross-pollination of wild trees is impossible to control. If contamination occurs, all associated biodiversity could then disappear and it would mean the demise of all benefits derived from forests for forest dependent peoples. Frequently aided by neoliberal policies opening up investment markets, economic interests may trigger further land grabs for the conversion of native forests into monocultures of GE tree plantations, especially in the Global South.

The impacts derived will be particularly felt by women forest dwellers who will no longer be able to collect seeds, nuts, medicinal plants, fodder and all other resources their livelihoods depend on. For subsistence farmer women it will also represent the loss of their livelihoods as they will not be able to grow their food as they have done in the past due to precarious soil conditions, loss of natural pollinators, and freshwater scarcity, to name but a few. The distance travelled for water collection will probably increase significantly as well, meaning that women will have less time to dedicate to other tasks, such as education, care work, and possibly making their daily working hours longer. Under the circumstances, many women will be forced to leave their lands in search of better land or other opportunities. This might include migration to cities where they could be exposed to prostitution and other low paid jobs, both in the formal and informal sectors. This can in turn contribute to the further feminisation of poverty and loss of invaluable traditional knowledge.



Eucalyptus plantations in Mapuche territory, Chile. Photo courtesy: Orin Langelle.

Women and synthetic biology, nanotechnology, geo-engineering

With billions of dollars of public and private investment over the past few years (including by the world's largest energy and chemical companies), synthetic biology sees nature's biodiversity as a feedstock for its proprietary bugs – man-made designer organisms that will be used to transform plant cellulose into fuels, chemicals, plastics, fibres, pharmaceuticals or even food^{lxix} (see explanation of 'bioeconomy' in Introduction section above). Some products derived from synthetic biology have already reached the commercial market while others are in pre-commercial stages. With such investments, lack of a regulatory framework and growing demand for biomass, pressure on tropical forests and lands, biodiversity and the people who depend on it for their livelihoods significantly increases.

So far, it is not known how biological systems will respond to synthetic (synth-bio) organisms; there is no assessment of the potential ecological impacts derived from this technology, and the safe manipulation of organisms under confinement is not guaranteed. Escaping organisms could exchange genes with other species causing genetic contamination that could threaten biodiversity, communities' livelihoods, and food security.^{lxx} According to FAO, *"women produce between 60 and 80 percent of the food in most developing countries and are responsible for half of the world's food production."* This means that such technology tends to impact women harder. The replacement of biologically based commodities by 'man-made' commodities through synthbio will hit developing countries in particular, especially if their economy depends on the exports of certain commodity (e.g. Vanilla). To date, pronouncements from expert groups, — including from the President's bioethics commission, diplomats of the UN biodiversity convention, an EU expert group, and the insurance industry — have all agreed that no synthetic organisms should yet be released into the environment without 'precaution,' 'prudent vigilance,' regulation, monitoring and other sober and sensible safeguards.^{lxxi}

The case for nanotechnology is not that different; nanotech products are already known to be on the market in the US, although there is a total lack of regulation or consumer information. If a new nano-engineered material or a new bio-product created using synthetic biology equals or outperforms a conventional commodity and can be produced at a comparable cost, it is simply likely to replace the conventional commodity. This means that the new technologies have the potential to have a profound and very swift impact on communities and peoples' livelihoods, including women in rural areas who are involved in commodity production, and those in urban areas engaged in processing and manufacturing commodities. The global South and marginalised sectors, especially women, are already bearing the brunt of environmental deterioration and climate change. Due to the atomic and molecular level entailed in this technology, concerns over health and environment have emerged as there have not been enough toxicological studies on engineered nanoparticles, and no government has developed a regulatory regime that explicitly addresses risk at the nanoscale. Both synthbio and nanotech could also be used as powerful biological weapons increasing conflict and exacerbating their effects upon women and children.

The impacts of geo-engineering are still beyond our understanding. These emerging technologies aim to modify planetary-scale activities, such as the weather, and may pose grave threats to the planet's equilibrium. Geotechnologies are intended to modify vast portions of the Earth's systems by removing CO₂ from the air, limiting the amount of sunlight reaching the planet's surface, or fertilizing the ocean, for example. This large-scale manipulation raises concerns about the control over planetary systems such as water, land and air – what sort of control will be exerted, and who by? In addition, some may see this as

a 'solution' to climate change, shifting attention and valuable funding away from other more effective solutions and from affected peoples in the global South.

Overall, for women around the world, such 'technological quick fixes' have the potential to further increase inequalities, in an 'industry' that has largely been controlled by men.

Conclusions

Shifting from fossil fuel dependence to biomass will not solve any of the current social, financial, energy and environmental crises. On the contrary, it has great potential for exacerbating these problems, including those that are already affecting women around the world. Thus bioeconomies are yet another false solution perpetuating the systemic model that brought us the crises we face, which could in turn contribute greatly to the further feminisation of poverty.

A key concern is that the scale on which biomass would need to be produced has been underestimated, and imports of raw material coming from the Global South are needed. Land in these areas will become an ever 'hotter' commodity as a result, as both foreign and local companies strive to acquire cheap (or free) land, potentially disregarding the rights of those rural and Indigenous peoples who have used the land traditionally but who fail to demonstrate 'legal' tenure.

Foreign investors are likely to 'appropriate' lands for growing monoculture plantations that will increase their profits. They are already frequently aided in this by governments and/or flawed and misinformed policies. In the coming rush, food crops or land devoted to growing food are likely to be replaced by often exotic — and even invasive — species that have greater market value. Native forests also run the risk of being converted into monocultures. Consequently, forests and biodiversity will be affected and at the same time, water sources will be depleted since their functions are all closely interlinked.

For indigenous and rural women who have substantially less formal land titles than men, this will greatly impact their livelihoods. Their lack of land tenure rights, perpetuated by patriarchal systems in many societies, makes women more vulnerable to discrimination, evictions, displacements and associated violence. Thus, their participation in proposals for Payment for Environmental Services and REDD+ schemes is more difficult, and their historic lack of participation in decision-making processes adds to this problem. Women's unpaid work and their related inability to access the financial benefits that might be derived from markets, also puts them at a greater disadvantage whenever market-based approaches are put in place for the purposes of nature conservation. Consequences entail not only loss livelihoods and traditional knowledge but also migrations to areas where women and their families are exposed to illnesses, abuse, poverty, etc. Losing autonomy could also mean greater dependence on food aid.

Most small-scale farmers around the world are women but their role in agriculture has been largely neglected by policy-makers. Women play an important role in food security/sovereignty especially in developing countries, where they are in charge of feeding their families and providing freshwater. The gender-differentiated role of women with respect to managing and using natural resources makes them more reliant on the products and benefits they obtain from nature. As environmental degradation continues to grow, the burden imposed on women increases as well: distances to collect water become larger, time spent on care work intensifies and food supplies become scarcer. All of these prevent

women from participating in education and/or other capacity building processes that could ensure women's empowerment and engagement.

The production of large-scale wood-based bioenergy will also have detrimental effects on air quality, with direct effects on people who live near power plants and other biomass processing facilities; women being the most affected. These biomass incinerators also contribute greatly to climate change, which is known to impact women more, both during and after the occurrence of an extreme weather event.

Similarly, the biofuels experience offers a pointed example of how rushed policies intended to encourage profit-making approaches to 'solving' the climate change and energy crises have 'backfired'. The substitution of food crops for fuel crops has had an effect on food prices leading to the world food crisis in 2007. There is increased evidence showing that across the entire biofuel production chain, levels of greenhouse gases are higher than those from burning fossil fuels. And there is further impoverishment of communities due to rising evictions and displacements in Africa, Asia and Latin America, as land grabs intensify, while nothing is done to prevent the further corrosion of women's land rights. Often, companies turn to 'cheap' productive land in countries with weak governance, sometimes with the help of the governments themselves. Despite all this evidence, biofuels still attract subsidies in different countries around the world.

Thus, the growing push for bioeconomies will exacerbate the above problems, and act as a Trojan Horse for the introduction of both harmful and potentially untested biotechnologies and geotechnologies that may well be implemented without a proper regulatory framework being put in place. Valuable funding that could help people in the global South cope with climate change may now be funneled into these 'technofixes,' which have not been assessed properly and could wreak havoc on the environment, and consequently, on people. In addition, the appropriation of these technologies by large corporations, already big players in the fossil fuel industry which employ a powerful lobbying force, promotes further monopolisation of the food and energy sectors, dispossessing vulnerable groups in society, including women, even more.

Both the Bio-economy and Green Economy approaches represent potentially harmful practices and policies that are being branded as 'green' and 'bio' and are in turn perceived by the general public as cleaner ways for industries and governments to move forward. However, these do not serve sustainable development objectives and will only increase inequalities, including the already huge gender gap in societies. Neither of these proposals will realistically solve the problems they were designed to solve. The continuation of 'business as usual' is only disguised as 'green' and 'clean' but the capitalist system's dynamics — that drove us into these crises in the first place — remain firmly entrenched.

Fundamental transformations are required. There is increased recognition about the importance of taking into consideration women's needs when projects for nature conservation are designed, as well as the importance of empowering women so that they can participate fully in decision-making processes. Although women's contributions to climate change and sustainable natural resource management are often overlooked women have significant contributions to make in many different areas, such as agriculture, households and political decision-making, business and industry, through science and traditional knowledge, and ultimately, in the eradication of poverty. Such considerations could certainly drive positive changes.

Annex I. Impacts from Agrofuel Production on Women, based on Testimonies from Affected Peoples at the II Agrofuels Forum (Bogota, September, 2011)

In Colombia palm oil for biodiesel and sugar cane for ethanol are the main interest crops for agrofuel production. In 2011, the president eagerly announced plans for 6 million ha. of palm oil for biodiesel production but for people living (or who used to live) near monoculture plantations these plans represent a further threat to their livelihoods.

I. Palm oil for Biodiesel in Curbaradó-Jiguamiandó (Chocó Biogeográfico)

In fact, massive palm oil plantations territories have historically been territories of violence now green-washed as 'green agroindustry' areas (see also Rosas, O. 2007. *Paramilitarismo Sustentable? In Biodiversidad Sustento y Culturas. No54, Uruguay*). In this region, rich in natural resources and with a strategic geographical location a great deal of conflicts converge: political, economic and social, armed actors and several economic interests (see Bermudez, R. 2008. *Megaproyectos de Infraestructura y Agrocombustibles en el Pacífico Colombiano, In Agrocombustibles: llenando Tanques vaciando Territorios, CENSAT Agua Viva & Proceso de Comunidades Negras (PCN), Bogota*). Therefore, the fight for controlling these territories has led to thousands of people being displaced while others were murdered; many men were killed which left many widows as heads of family thus, they were forced to migrate to cities ending up in low paid jobs, and other activities like prostitution putting women at higher risk of getting HIV infected. It is also important to highlight that sexual violence has also been used as a deterrent to get people to abandon their lands.

A relatively new policy from the government calls for land restitution to those who had to flee their homes due to violence, but several issues arise from this. First, most people who have gone back have found that their territories are now occupied by palm oil plantations, and whenever they have been able to resettle, soils have been vastly degraded and can't be used for food production anymore; second, many women can't provide proof of their dead husband's landownership and third, there are no safety guarantees for those coming back. Armed actors are still controlling the territories as they also own palm oil plantations and since a lot of men were killed, it is now women who lead the struggle to get their land back. However, some leaders have been murdered and some still receive threats frequently. Others, who managed to get their land back, have sold it for a few pennies to the agroindustry, known for having received subsidies from government agencies. Thus what we are witnessing is a form of land legalisation that makes it easier for the agroindustry to access lands "officially".

Humanitarian and Biodiversity zones have emerged for those going back as alternatives for auto-protection, accompanied by international human rights organisations, while women call for real land restitution (see <http://www.elespectador.com/noticias/nacional/articulo-409930-mujeres-reclaman-restitucion-real-de-tierras>).

II. Sugar Cane Fields in Valle del Cauca

The situation in the extensive sugar cane plantations area is also worrying. In the area, 92% of permanent crops are sugar cane monocultures; there are 5 major sugar mills, 3 of them belong to the same owner producing 65% of all ethanol in the country. In this region, there has been an increase in reported cases of sick children, deformities and abortion, which people believe are caused by agrotoxics used to fumigate the sugar cane plantations, which have filtered through to the water streams that communities use for their livelihoods, and/or due to the constant burning of sugar cane. In addition, the intensive water use in the process of agrofuel production has deviated rivers and even dried them out, as is the case of the Rio Sabaleta. Frequently, regional environmental agencies have granted sugar mills concessions over water bodies.

These plantations offer jobs only to men as it is a labour-intensive occupation hence, there are also important concerns over the sugar cane cutter's working conditions as they are not offered any social benefits and wages are very low. Many sugar cane cutters suffer from back pain and respiratory illnesses increasing pressure in the household and even having to retire earlier, some even perish, thus creating dependence on women's income as the main source for subsistence.

Annex II. Gender, climate change and REDD+ in the Congo Basin Forests of Central Africa (Brown, 2011).

In the Congo Basin forests over 30 million inhabitants, representing over 150 ethnic groups, depend on the forest for food, shelter, and other livelihood activities (Congo Basin Forest Partnership, 2006). However, there are gender differences in how men and women relate to forests and forest resources. While women are very dependent on forest resources as a source of livelihood, they continue to be disadvantaged by insecure access and property rights to land, forest and tree resources and to discrimination and male bias in the provision of services (Bandiaky and Tiani, 2010; Gurung and Quesada, 2009; Mwangi *et al.*, 2011). The study was conducted in three countries in the Congo Basin forest region, Cameroon, Central African Republic and the Democratic Republic of Congo, to ascertain the involvement of women in discussions or decision-making on climate change and REDD+ in these countries.

The research focused on formal national, regional and international institutions because of their decision-making role in climate change or forest issues or because of the impact climate change might have on them in the future. The selected institutions represented various government ministries, regional and international institutions, the private sector and civil society. Interview data were supplemented by a review of relevant documents, strategies, press releases and government statements related to climate change and REDD+.

Results revealed that women have had limited participation in discussions on issues of climate change in general, and for the most part have not been involved in discussions on REDD+. In fact, women's participation in government institutions, in general, was limited. However, there were some notable exceptions, particularly, in CAR where women occupied important positions related to forests and climate change. While the importance of stakeholder involvement in the process is mentioned as part of the Readiness Planning Idea Note (R-PINs), for the most part, gender concerns as a specific category was not evident.

Bandiaky and Tiani (2010) state that women's exclusion from decision-making circles regarding forest management in Africa is only one of many examples of their exclusion from political life in general. Explanations for this marginalisation include women's lack of access to training and information, socio-cultural rules on control of forest resources, poverty, as well as feelings of inferiority and vulnerability. The lack of involvement of women in developing national adaptation and mitigation strategies toward climate change could undermine the effectiveness of projects at the local level (Demetriades and Esplen, 2010).

Therefore, it is of concern that gender considerations have not been an integral part of National Adaptation Program of Action (NAPA) and REDD+ planning processes in the Congo Basin. Therefore, increased consideration of gender interests in the REDD+ process should necessitate land tenure reform that takes gender aspects into consideration; care will need to be taken in ensuring that the women most affected by climate change and REDD+ are part of decision-making at all levels. Their effective participation may increase the likelihood that discussions will not just be dominated by technical issues unrelated to their concerns.

ⁱ The UN Conference on Sustainable Development (UNCSD) was held in Rio de Janeiro 20-22 June 2012, and is known as Rio+20. It is a continuation of the 20-year partnership to Sustainable Development that began in 1992. www.unep/greeneconomy

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- ^{lxxi} <http://www.etcgroup.org/kickstopper?sid=221>