The political economy of Modern Energy Cooking Services (MECS)

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1 Abstract

The purpose of this paper is to use a political economy analysis to generate discussion on who the winners and losers might be in the strategy of the Modern Energy Cooking Services (MECS) programme and anticipate research, action and dialogue that might avoid or mitigate resistance to change.

The 'Modern Energy Cooking Services' programme is a new approach that will intentionally seek to assist economies to transition to modern energy cooking services. In so doing it may touch the lives of many stakeholders, across several government agencies and private sector, and may change the shape of the how energy for cooking is delivered and accessed. In this paper we try to lay a foundation for addressing that gap in our understanding through a limited political economy analysis.

The paper starts by considering some **meta influences on the political economy**. It considers climate change and the rise of urgency that will influence decisions over the coming decade. In that consideration the paper touches lightly on whether fossil fuels or renewable energy will dominate the coming landscape, and how the global economy might influence the transition to modern energy cooking services. Setting this in an African context, the paper considers **the structure of the power sector in Africa**, and considers what the literature says about the rent seeking winners of the current system. The paper notes that globally the power sector will undergo significant change in the coming ten years and considers who the winners and the losers might be in the future.

Section 4 of the paper lists **key stakeholders**, and then explores 6 stakeholder groups in particular – utilities, the need for inter-ministerial discussion at a government level, the role of men in decision making, youth employment and youth activism, the local charcoal industry and the concerns of the Ministry of Agriculture.

Section 5 briefly considers **4 myths that have influence on all involved in the political economy**. By definition a myth has an element of truth, but the whole myth is not backed by evidence, and is subject to change. The myths discussed will affect all the above stakeholders and will need to be addressed if change is to occur. They are that:- Pay as you Go makes Solar PV home systems cost effective; We have to focus on the rural off-grid market; The myth of that electric cooking is expensive and that burning trees is carbon neutral.

Finally, the paper draws together some **conclusions and recommendations** that might be considered as the programme MECS moves forward.

Please note that this version mainly does not have references per se and uses endnote hyperlinks to the source papers and webpages. This paper is presented for feedback.

Throughout the paper MECS (in capitals) is used as meaning the UK Aid funded MECS programme; mecs (lowercase) is used as shorthand for the concept of modern energy cooking services.

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Contents

2 Introduction

1.1 What is Political economy

A political economy analysis seeks to understand why plans and policies that seem so good on paper are often not implemented. In contrast to a technocratic approach that considers what infrastructural systems need to be in place for a change to occur, a PEA considers the people, the stakeholders, and how they may support of may hinder the transition. It considers the incentives and interests of each stakeholder, determining the impact on their lives. It seeks to identify why some stakeholders may be against the change, and to find a solution that may be technocratically feasible, economically beneficial, and politically sustainable.

Barnett et al[i] identify three key questions within a PEA framework. :-

- What features of the political economy generate and contribute to the persistence of the problem? (Diagnosis)
- What is the potential for change, and what are the mostly likely pathways of change? (Prognosis)
- How can particular actors help to shift the pattern of incentives in a manner that promotes desirable change? (Interventions)

In addition to the PEA framework, other authors such as Schmitz (2015) [ii], suggest that the key question can be summarised as "Who will drive or obstruct this change?".

In summary, political economy is about who the winners and the losers are. Do the winners have the political strength to see the change through, or will the losers realise what they might lose and prevent such change? In this paper we examine the political economy of economic transitions in Africa and Asia away from a dependence on biomass for cooking to a broader range of choices including the use of modern energy for cooking services.

2.1 What is the Modern energy Cooking Services programme

Batchelor et al 2019[iii] describe a change of strategy regarding cooking in Africa and Asia. They describe the enduring problems of biomass cooking, and how they believe that a disconnect between the development community's response to energy access and biomass cooking can be overcome and be the springboard for a new approach. They note that many agencies are saying that the 'business as usual' approach is not working. Recent studies provide evidence that improved biomass cookstoves do not (or barely) improve health, that their uptake is not keeping up with population growth, and that by 2030 there will still be about 2.3 Billion people cooking with biomass.

"While there has been some progress on access to clean cooking, our analysis shows that by 2030 2.3 billion people will still lack access to clean cooking facilities, with 2.5 million[iv] premature deaths each year still attributable to the resulting household air pollution." (ibid)

They discuss a UK Aid programme that seeks a new approach. The focus is on modern energy cooking services. The concept is that a greater emphasis and focus on modern energy in the form of electricity and gas could transform the situation and bring the world closer to SDG 7, i.e. affordable, reliable, sustainable access to modern energy for all (inclusive of cooking) (our addition). They pick up on the IEA recommendation that "If we are to witness the kind of progress expected on electricity, **clean cooking must be placed on a par with electricity access on the policy agenda**." [v](our emphasis).

Batchelor et al 2019 describe how the main driver for the research is the idea that (renewably generated) electricity is going to reach a price point of affordability within a few years, with associated reliability and sustainability, that will open up completely new possibilities and markets. It will seek to integrate more effectively the agendas on climate change, increased access to modern energy, and the alleviation of the

burdens of cooking with biomass, so that cooking becomes seen as a key to unlocking modern energy access, enhancing grid extension and off-grid solutions.

The paper summarises the old and new approach in a graphical overview of sources and flow of argument (Figure 1).

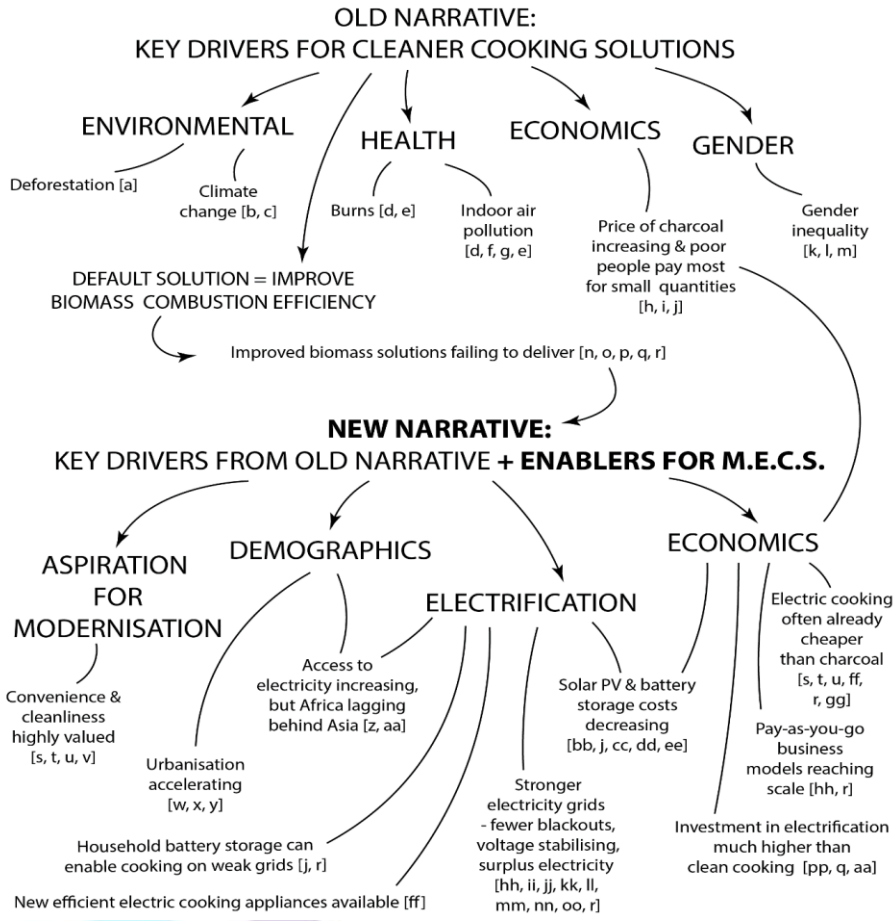


Figure 1: Graphical overview of sources and flow of argument.

In this change of narrative who will be the winners and the losers?

2.2 What is this paper

As discussed, 'Modern Energy Cooking Services' programme is a relatively alternative and new approach that will intentionally seek to assist economies to transition to modern energy cooking services. However, the justification to date could be characterised as predominantly technocratic and economic, based on a strong sense of social awareness and motivated by quality of wellbeing among the disadvantaged.

In this paper we try to lay a foundation for filling a gap in current understandings, by undertaking a limited political economy analysis, to consider who might be the winners and losers of such an approach. Applying a broad 'light touch' political economy analysis, we consider:-

- What features of the global and national political economy generate and contribute to the persistence of the use of biomass for cooking?

- What is the potential for change to modern energy cooking services, and what are the mostly likely pathways of change?
- How can particular actors help to shift the pattern of incentives in a manner that promotes an uptake of modern energy cooking services?

The purpose of this paper is to use political economy analysis to generate discussion on who the winners and losers might be in the strategy of the programme Modern Energy Cooking Services (MECS) and anticipate research, action and dialogue that might avoid or mitigate resistance to change.

Political economy is driven by people's beliefs and their resulting attitude to the status quo and change. Economists tend to say that the overriding drivers are the rents received from the existing system and the new (monetary) opportunities emerging. This paper would argue that people's decision making sometimes goes beyond their own monetary gain (or loss) and that there might be opportunity for foresight of a more social good. The paper starts by outlining a few meta narratives – ones which are affecting and influencing the global narrative and may likely have an impact on the political economy surrounding modern energy cooking services. These include; Climate change, the related narrative of oil production and renewable energy, and the value of employment opportunities especially in Africa (i.e. the narrative surrounding local or global production chains).

In section 3 we consider the changes in energy access. This overarching concern of the world enshrined in SDG7 provides the ground work for a transition to modern energy access. Stakeholders involved in both the energy access and cooking sectors are covered in Section 4. Each stakeholder may be a winner or a loser in the transitions, and the paper uses secondary data to identify who might gain and who might lose.

Finally, the paper concludes with some beliefs which we have characterised as 'myths'. Myths often contain an element of truth but have been exaggerated to the point where the story they tell can be challenged. These are the beliefs that any of the preceding stakeholder groups may or may not hold. They are common when discussing modern energy cooking services, and their inclusion is based on focus group data across several settings – they are the frequently made statements.

3 Political economy meta influences

3.1 Climate Change – mechanisms of mitigation

As stated above and in detail in Batchelor et al 2019, the current dominance of biomass contributes to climate change. Climate change is high on the political agenda, and will affect us all. Over the next hundred years we are all likely to be losers unless changes are made and responses are significant and possibly dramatic. We are currently heading for the 3.5 degree scenarios by 2100[vi] [vii] that mean the poor get washed away by the rising sea, and while they will be the main casualties, we all will be affected by the forced migration, the reshaping of resources and the associated economic trauma.

The political economy of addressing climate change is beyond this paper, and beyond me personally. There has been political progress, but it is too slow, and may not come together in time. However, when we look at the Modern Energy Cooking Services (ie MECS the programme) agenda through the climate change lens we can see that it broadly lines up with the current need for action (which is agreed by some and resisted by others).

While some climate action requires international agreements to prompt change (eg Nationally Determined Contributions[viii]), consumer responses alone are enough in some arenas. For instance, it is said that regarding agriculture, if consumers in developed nations switch away from eating red meat, climate emissions would reduce, and climate change could be mitigated (a little[ix])[x] [xi]. No international agreement is required for this to happen – in theory. However, in terms of political economy, even with consumer responses, there are still

winners and losers. Red meat farmers will have to change the way they farm, and the lobbyists for the cattle ranchers can be well organised. [xii] [xiii] [xiv] At the time of writing (the first draft) the IPCC is meeting and expected to give a steer on how to mitigate red meat consumption as an action to mitigate climate change.

When we consider the role of modern energy cooking services, this can mainly be characterised as a series of consumer choices. Assuming supply chains are in place, and energy is generated renewably, it is consumers who will switch from biomass to modern energy cooking services. In such a scenario there are predictable winners and losers. Shifting from biomass based cooking will result in a potential loss of jobs in the charcoal and wood industry (for example see the attached articles for Tanzania[xv] [xvi] [xvii] and Kenya [xviii] [xix]), it may even be the case among small holder farmers who currently supplement their income by selling fuel to their neighbours. There are winners, those who will make a profit from offering the modern energy cooking service. The household payments for fuel will be redirected – from biomass to modern energy. These localised effects will be examined further below, but for this section we consider the international winners and losers.

In terms of Climate change, how much climate forcing domestic woodfuel use contributes very much depends on how the consumption of the wood is calculated. Drigo et al (2017)[xx] updated their 2015 work, which used 2009 data, to identify regions likely to suffer from overharvesting of woodfuel to supply woodfuel demand that originates from both local communities and distant urban centres. Their work assessed whether harvesting exceeds the natural ability of trees to regenerate. As such they identified areas which they designated unsustainable, and defined a degree of unsustainability. If the amount harvested exceeds the annual increment, then the region is utilizing non-renewable biomass (NRB). The ratio of the region's NRB to the total harvest of woodfuel is the fraction of non-renewable biomass (fNRB). They estimate that about half all wood harvested is used as fuel and suggest this represents approximately 9% of the global fuel supply (by energy). They also find that about one third of this fuel was collected unsustainably.

However, an IPCC Special Report draws attention to the role of short lived climate forcers (SLCFs), including black carbon, HFCs and methane.[xxi] Black carbon is the second most important factor in climate warming after carbon dioxide, and it is estimated that 20% of global emissions are from the incomplete combustion of biomass used in cooking[xxii]. Bailis et al estimate the combined climate warming effect of unsustainable wood harvesting and incomplete combustion of woodfuels to be approximately 1 GtCO2 equivalent (CO2e) in year[xxiii], accounting for approximately 2% of global emissions. They estimate that the climate forcing effects from woodfuels can be apportioned roughly equally between CO2 emissions (34-45%), black carbon (35%-42%), and gas emissions (CH4, CO, VOCs) (31%-37%). This implies that the total climate forcing effect of burning woodfuels is three times of that due to CO2 emissions. However, the short term effects will be higher still, as CO2 released from the combustion of sustainably harvested woodfuels will also remain in the atmosphere until eventually fixed as new forest growth. To put this 1.2Gt in perspective – the USA is said to generate 6 Gt per year. (It should be noted that Drigo et al suggest that their estimate based on their models is actually considerably less than the accept norm – so these statements are perhaps conservative and need further investigation).

Shifting the harvesting of unsustainable biomass would of course leave trees in place which in turn would further sequestrate more biomass. Whatever the actual figures, the reduction in harvesting of unsustainable biomass is a generalised win-win, with lower climate forcing emissions while increasing positive carbon capture.

Specific winners and losers in these scenarios include the loss of jobs in the charcoal industry, which could be replaced by converting them to producing other wood products. Rural people and farmers may be winners, as less deforestation could result in improved micro climates and agricultural production. Transport industry (those moving the charcoal) could lose out, but again they could be mitigated by moving other wood products. And the main winners would be households experiencing no harmful smoke and emissions. And of course we all win as the world takes a reasonable step toward climate change mitigation.

Most charcoal producers are not well connected politically, although sometimes land grab by the elite can be the basis of charcoal production. However, the utility is known by the political cadre and is either a source of rent or a legitimate tax payer. In either case, if their revenue increases by the sale of more power, then there should be enough political influence to push their agenda through.

This view of the impact of transitioning to modern energy cooking services on climate change does to some degree rely on the sourcing of renewable modern energy. This is influenced by two narratives - outlined here in sections 2.2 and 2.3 below.

3.2 Petroleum products or renewable energy

Our dependence on fossil fuel is at the heart of the climate change debate. There is an increasing need to move away from fossil fuel power generation to the use of renewable energy technologies. You would think that given that RE is now cost effective and actually decreasing in price all the time, that the shift to RE would be 'easy'. However, Ghana provides a clear example of how the political economy can hold back investment in renewable energy, and how the complexity of vested interests and institutional momentums can "obstruct this change".

Pueyo *et al*. (2017)[xxiv] identified why investment in renewable energy in Ghana was constrained. They identified four factors that were damaging the risk-return profile of investment. These included an unreliable off-taker, poor regulation, macroeconomic imbalances, and corruption. Each of these factors are strongly influenced by and influential on the political economy. The corruption is fuelled by rent seeking, the poor regulation by the quality of control. They also stated that scarce domestic finance and high returns expectations for short-term loans also contribute to the lack of investment – and they too are driven by individuals rent seeking.

Bawakyillenuo 2019 [xxv]drew on data from the in-depth interviews, to identify and refine the constraints down to three key 'constraints to RE investment in Ghana'.

Off-taker risk; in the case of Ghana there has been a privatisation of the revenue arm of the power sector. This in theory improves the management of revenue collection, but non-payment by debtors, particular government users, still constrain the realities. Bawakyillenuo 2019 goes on to propose policies addressing this off taker risk, including promotion of efficient technical practices and competitive off-take markets but notes that "All these policies sound reasonable – but this is the very nature of the political economy that 'reasonable ' policies are blocked by losers of rent." (ibid)

Regarding privatisation the data suggested that 'pushback' from the public has negative effects on governance due to the 'patron–client relationship' practices in developing countries. This is particularly true where there is a trade market for cost of electricity and votes (Barnett *et al*. 2016).

Inadequate power sector regulation; Bawakyillenuo 2019 states that setting up of a reliable and transparent full-cost tariff pricing system has been opposed on the basis that electricity prices will increase; and secondly, electricity is regarded as a public good. Given the emerging evidence from recent auctions of renewable energy which come in at lower prices than conventional sources, (this evidence of lower RE prices means continued reliance on thermal energy doesn't really make sense). Similarly Bawakyillenuo 2019 notes that the lack of full implementation of the RE Act (Act 832) is attributable to the non-incentivisation approach to RE development in Ghana. Renewable energy does not feature as an immediate priority when compared against thermal energy, and so there is a lack of political will to implement and regulate RE.

"You have one arm of government or ministry promoting a green agenda and the other doing something that contradicts it. Ghana signed up to the Sustainable Energy for All initiative and our president chaired a session in the UN on sustainable energy, but we are talking about coal. So there is a disconnection between various government agencies leading on policies on energy and environmental sustainability." (A senior officer at KITE quoted by Bawakyillenuo*)*

Lack of access to appropriate finance; It is said that the high risk of doing business coupled with the low portfolios of domestic banks makes it difficult for entrepreneurs to access loans. Financial instruments remain essential ingredients for the development of RE.

The purpose of this section is not to pick on or shame Ghana. The study on Ghana illustrates how the development of renewable energy in Sub Saharan African countries is constrained by the shape of the policy environment, and that policy environment is shaped by the political economy. Individuals and political actors each have their own reasons for doing or not doing something, and whatever the policy documentation may lay down, the realities and constraints can often be significant.

In terms of 'clean cooking' where clean is taken as bringing kitchen emissions (Household Air Pollution, HAP) into a safe zone, a commonly cited transition fuel is LPG. LPG is a by-product of fossil fuel processing and therefore many argue that it has to be disposed of wherever it is created. If it is not captured during operations, LPG will be ignited into the atmosphere as a waste product contributing to greenhouse gases. Some therefore argue that it is a transition fuel for household cooking, moving away from biomass induced HAP, and contributing less climate forcing emissions than biomass. Indeed LPG became part of the recommendations made by the 2018 Intergovernmental Panel on Climate Change[xxvi] as a mitigation measure to reduce black carbon emission. So while the aspiration in the longer term has to be renewable energy and a move away from fossil fuels, the reality of the presence of fossil fuel use during the coming 20 years could be leveraged to bring modern energy cooking services 'clean cooking' where clean means limited or safer HAP.

In terms of the political economy it may be important to note that that acceptance and 'recommendation' by the IPCC will likely be used by the fossil fuel industry to justify its ongoing production of fossil fuels. In contrast, bioLPG as a substitute fuel to LPG should be considered. It is potentially renewable as it comes from biomass feedstocks, and since it is identical LPG in its chemical make up it could use the infrastructure, markets, and household equipment of the existing LPG value chain. However, ecosystems are complex and while bioLPG is renewable in climate change terms, it consumes precious land resources that may have an impact on food and wildlife ecosystems and markets.

3.2.1 More fundamentally – the world needs to wake up!

When we consider the transition to modern energy cooking services, such transition will be constrained by the presence of renewable energy (Grid or Off-grid). MECS will have to work with the broader context of RE development in each country, and that development is likely to experience its own complex political economy, with winners and losers. Those invested in petroleum products both financially and in their beliefs, could resist a transition to more RE, and MECS will have to keep that in mind.

"I don't even think the minister [former minister of power] ever thought of the renewable option ever as a credible option. His thoughts were all about how to get fuel and thermal plants running, whereas you don't need fuel for renewables." (A senior officer, ACEP) Bawakyillenuo 2019

It is worth noting that 2020 has been described as the start of the renewables decade[xxvii]. *The good news* from the assembly was that the installation of large scale renewables over the last few years has actually exceeded the commitments made at Paris. *The bad news* was that the Paris trajectory was not enough to mitigate climate change by 1.5 degrees, and that we need 5 times the investment per year in renewables to reach anywhere near mitigation of 1.5.

The good news was that renewable energy is now cost effective without any subsidies. Solar generating plant to be installed in Saudi Aribia recently won its auction on a 1.7 cents per kWh basis with a payback to the investors in 14 years. Ethiopia had just started a similar plant at 2.4 cents per kWh. At these costs, Solar can easily compete without any subsidies. *The bad news* is that the **fossil fuel industry is still subsidised by $5.2**

trillion[xxviii]! If those subsidies were taken away, there would be considerable pain for the consumer, but the age of renewables might have been with us by now. Similarly there was brief debate at IRENA assembly about the true cost of nuclear energy, which mitigates climate change but has its own set of problems.

3.3 Local manufacture or a global supply chain?

When action on the enduring problem of biomass cooking was considered as its own 'cooking sector problem', actors could focus on a relatively limited number of key constraints – the charcoal industry, deforestation, air pollution, labour constraints, gender inequities. While these are all important constraints they tend to focus at the household or land ownership level. Even improved cookstove manufacturers were designated 'nascent companies' – ie emerging companies with little political clout.

That 'locality of issues', the need to think in local terms and local employment, local environment, local economy, is perhaps best captured by considering the sourcing and processing of fuelwoods. Both firewood and charcoal, while detrimental to the global environment is a predominantly a local economy issue[xxix] [xxx]. The value chain of charcoal is captured in Figure 2

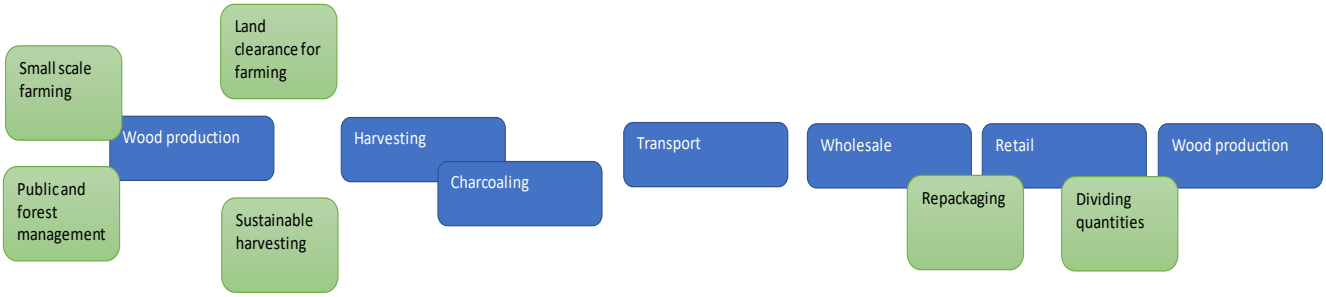


Figure 2 Value chain of Carbon (constructed from multiple sources)

It provides jobs to low skilled workers, its distribution is an industry employing many. Indeed, the author once spent a week in the suburbs of Addis Ababa with a poor family who made a bare minimum living by taking bundles of wood, making the sticks smaller, selling the sticks in smaller cohorts. Such workers have no political voice, and yet their household income will be affected by any shift away from wood and charcoal.

In contrast, many of the modern energy solutions rely on technology from the global market. In the case of LPG, the product in some countries is a by product from their domestic oil production (eg Ghana). However, even there, substantial profits are taken by international players, and the creation of unskilled jobs is very limited. LPG distribution systems tend to require more substantial retail skills and assets e.g. cylinder filling stations, trucks than the average charcoal seller.

When we then consider electrical cooking on the grid, the appliances tend to be made outside the country, although that could change, and if we consider renewable energy then renewables such as biogas, bioLPG and assembly of PV systems could all generate local economy jobs. It may be worth noting that TVs are now assembled in Kenya following on the growth of MKopa Solar Home Systems (although the majority of the kit is made outside the country), and there is significant manufacture of hotplates in Ethiopia – the point being that local manufacture of electrical devices is not impossible (even though factories in China making 20 million units a year almost by definition have distinct price advantages from their scale.)

Europe and the USA have debates about job creation and grid electricity. The claim is that distributed renewable energy creates many more jobs than an equivalent power production from a centralised generating plant (oil, coal, nuclear, hydro). While this sounds a considerable gain (to the employment market), again the

qualifications required to take up such jobs is generally higher than that found in the current charcoal and wood production systems.

As discussed above, avoiding cutting down trees does in itself provide an opportunity. While from a climate change point of view, the world can hope that many of the trees that would otherwise have been cut down are left alone to provide sequestration of carbon as mature trees, in terms of employment and jobs there are perhaps other wood products that could create employment for the displaced charcoal producers. Poles for building work, sustainable coppicing could provide raw material for plywoods, fibreboards, particle boards and veneers (also for building), sustainable harvesting could even contribute to the paper industry[xxxi]. The weakness of this argument is that there already exists a building timber market – flooding it with additional labour / suppliers would reduce revenues for these workers. If supply of wood products increased then prices would fall – good for the building trade, but bad for the supply industry.

Leaving the trees in place opens the opportunity for a more sustainable microclimate for agroforestry and agricultural systems[xxxii]. This potential increases agricultural incomes, and could compensate harvesters of wood, as they may have agricultural land but such increased agricultural income would not necessarily compensate charcoal producers for their losses. Transporting wood products could offset loss of business for transporters. Retailers could shift to engaging in and localised sale of pay as you go products for modern energy cooking services, much like agents of airtime shifted to being agents of mobile money.

So the charcoal production chain does not necessarily result in multiple losers from the transition. Our analysis here suggests that policy and action to encourage the transition to modern energy cooking services should include liaison with, and policies for, agricultural and agroforestry production including exploiting wood production in a most sustainable way.

4 The political economy of the current power sector

4.1 The African Power Sector

As briefly discussed above in petroleum or renewables, political pressures frequently undermine efforts to improve the power sector's performance (Barnet 2017).

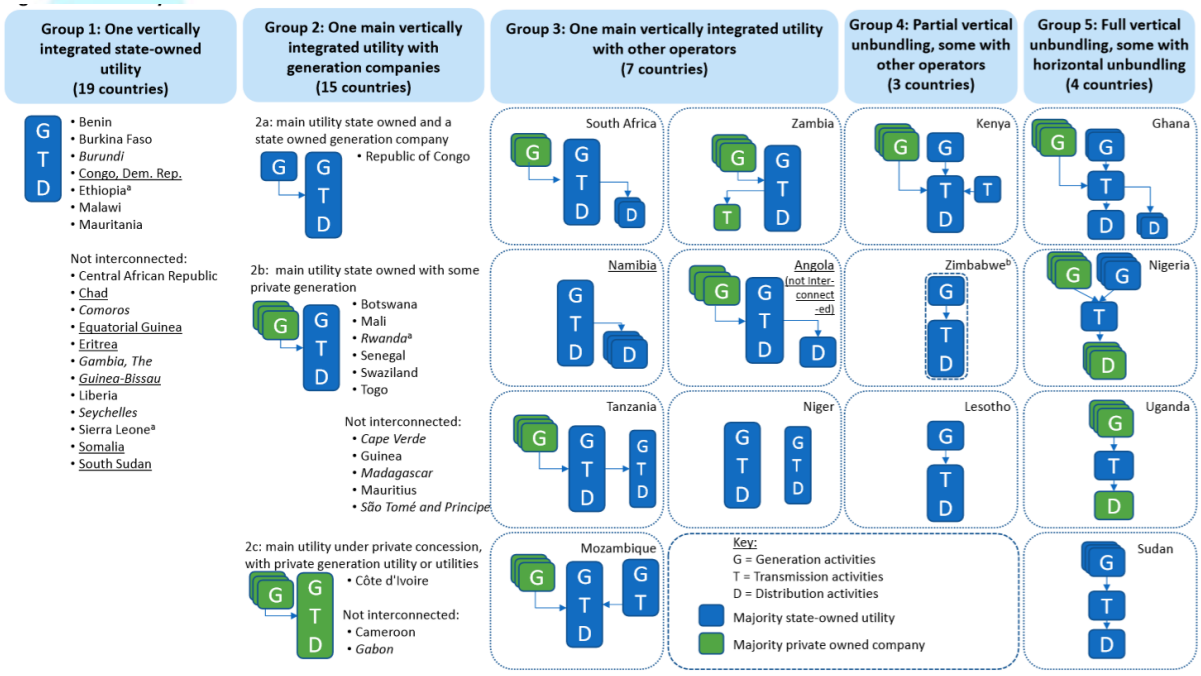
Until recently Sub Saharan Africa had a power sector that was unreliable, incapable of meeting both existing and potential demand, and financially unsustainable. This is beginning to change but the underlying political economy continues to have the effect of keeping the costs of supply high, whilst maintaining a downward pressure on tariffs and the revenues collected from users. During generation rents could be extracted during procurement, and that has often led to the wrong technology. During transmission, again rents are extracted during procurement and installation, contractors undertake poor quality work, leading to sub optimal design and high losses. As a large industry, and with a very visible presence in terms of distribution, there are political forces that seek to award contracts and jobs to political supporters rather than to the most efficient contractors. It is also common (in Sub Saharan Africa) for competitive tenders and employment on merit to be absent or ignored.

The political pressure for low electricity prices has meant that revenue gains were low. Increases in price can have profound effects on households and businesses, which create political pressure to promise unsustainably low prices. Added to these unrealistically low tariffs, there is failure to collect the revenues, and the result is often that the utility has little spare money to re-invest in the system. Regarding non collection, as described in the Ghana work above, some of the poorest paying customers are government institutions.

The result is that many power sectors have a financial deficit. Widespread corruption has led to investments that are either misdirected or insufficient. As Barnett et al state, these failures relate to capital investments as well as investments in operation and maintenance. They note that the long and complex supply chain in grid electricity systems, from energy source to final electricity consumer, poses a particular challenge. Rent seeking can be transferred to other parts of the system such that if there is a crack-down against corruption in one part of the chain, opportunities still remain in other parts of the system. The scale at which grid electricity operates necessitates large financial flows and concentrates management and decision-making in the hands of a relatively small number of people who are well-placed to capture resulting rents.

According to a summary by Eberhard and Godinho 2018 [xxxiii] and particular insights into Uganda by Meyer 2018 [xxxiv] most power systems in low- and middle-income countries across Sub-Saharan Africa and South Asia have retained state-owned utilities, with varying degrees of unbundling, regulation, competition and private participation, including independent power producers (IPPs). Attempts to reform the sector have been patchy and in Sub-Saharan Africa few have unbundled their power utilities. Wholesale and retail competition are entirely absent. This has relevance to the ideas behind MECS as it means that scaled implementation will have to be with the cooperation of an uncompetitive and perhaps weak institution.

The power sector as it stands in most countries is often a single large utility, which is a significant employer. This too is subject to the political economy as there is often pressure to protect or increase jobs. This also contributes to the unprofitability of the utility and can lead to overstaffing – resulting in many unfulfilled workers who do not have enough work to fill their time and grow to be 'less diligent' in their work. Figure 3 illustrates some of the ownership of the electrical infrastructure. In Group 1 the utility is a vertically integrated whole owned by the State, with all the possibilities of rent seeking across the whole value chain. Ghana, Nigeria, Sudan and Uganda (Group 5) have significant unbundling – and its interesting to note that in Uganda, the utility is said to be the only profitable utility in Sub Sharan Africa.



Source: World Bank staff illustration.

Figure 3 Electricity sector structures in Sub-Saharan Africa (Trimble et al 2016[xxxv])

In the Ghana example, the availability of local finance was a constraint to the inclusion of renewable energy in the generation mix. Most power sector investments in Africa are heavily dependent on external borrowing in foreign currency, whilst revenues are received in local currency. In some cases this is now proving to be an

opportunity rather than a constraint. China has aspirations to assist Africa, and wants to do so by contributions in kind, thus helping its own economy as well as the recipient economy[xxxvi]. This can result in them financing build operate and transfer generating plant.

Barnett et al 2017 note that the capital requirements of investments in grid electricity make it hard for firms to enter and exit the sector, and those that occupy particular positions in the supply chain often enjoy a natural monopoly that can be exploited to the detriment of customers, if prices and service quality are not subject to appropriate regulation. "Whilst official regulators are under pressure to keep the prices paid by users down, utilities demand prices that are high enough to cover costs and generate an acceptable return on investment." (ibid)

The result is that most SSA utilities are not selling electricity at a tariff that covers their costs. (with the notable exception of Uganda).

So the backdrop of the modern energy sector is one of unstable policy environments, ad hoc political interference and rampant rent seeking that puts off long-term investments and makes effective day to day management of the grid harder than it already is.

In Power, People, Planet: Seizing Africa's energy and climate opportunities[xxxvii], the Africa Progress Report 2015 was condemnatory of the political economy of the African power sector. "*Governance of power utilities is at the heart of Africa's energy crisis. Governments often view utilities primarily as sites of political patronage and vehicles for corruption, providing affordable energy can be a distant secondary concern. Far too much public finance is wasted on inefficient and inequitable energy subsidies. Governments spend US$21 billion a year covering utility losses and subsidising oil-based products, diverting resources from more productive energy investments.*"

4.2 Changes in electricity generation

The dominant highly centralised models of energy production and supply are gradually being challenged globally. Some people argue that there will be a potentially dramatic reorientation of our energy systems not least via the incorporation of renewable energy into the increasingly influential promotion of green economy transitions.

In Northern countries the debate centres mostly on questions regarding the ability of more decentralised approaches to accelerate low carbon transitions, to exert greater consumer control over energy consumption, to reduce system-wide losses and accelerate the development of new energy generation and other technologies that can make our use of energy cheaper, cleaner and more efficient. In most Southern countries the potential roles of more decentralised approaches in expanding access, increasing overall supply and making energy systems more reliable are of course much more central to the debate. Decentralised energy generation can sometimes mean adding energy into the grid, sometimes a stand alone off-grid (mini grids) or even home system, and sometimes various shapes and forms of combined heat and power. The scale varies, and so the political influence varies.

By putting energy production in the hands of small producers rather than a few big national/international companies or a centralised state utility some suggest that this 'democratisation of energy' will promote local democracy. The assumption is that there is a dispersal of democratic power. Local people/communities gain direct control over how they generate their own energy and what they then do with it. Greater democratisation is thought to be closely linked to greater choice and flexibility.

Of course in reality, undemocratic forms of centralised control may simply be replaced by undemocratic forms of local control. In Kenya, decentralisation of the budget to County level puts an onus on county governments to plan the energy supply, matching it to demand. The existing problems of rent seeking are transferred down

from National level to county level, multiplied by the 47 counties, and sprinkled with lower technical capacity[xxxviii]. Similarly even at the level of a mini grid, developers or community initiatives have frequently been characterised by unequal decision-making processes and operational difficulties with a lack of participative management practices.

Much of the shift to decentralised energy changes some of the location of the political economic inefficiencies but does not fundamentally remove such barriers.

Decentralised energy holds promise in 5 areas.

Transmission efficiency:- There is an assumption that a decentralised system will be inherently more efficient and therefore more sustainable. The flexibility in such systems will enable societies to meet the challenge of responding to global climate change and other sustainability objectives. There will be savings in avoiding transmission and distribution costs, generating electricity which can be used locally.

Increased Access:- At the heart of SDG7 and modern energy, is the idea to ensure access to modern energy for all by 2030. In larger centralised grid systems, the only way of accessing electricity comes from obtaining a connection to the grid. If the resources are not there to extend the national infrastructure then there is no access to the grid. Rent seeking from the major players is a significant barrier to extending the grid – the connection charge can be inflated with no competitive alternative available. On the other hand off-grid solutions are said to be the way forward, particularly those in very remote locations where extending the grid would be very costly. We will not discuss this in detail here, as it is covered in many other MECS publications, however we note it in the context of a changing political economy.

Reduction of risk:- Decentralised energy can reduce the scale of risk involved when large numbers of people/industries are all connected into one centralised grid. A single problem affecting the main grid could directly impact all people. If the same people were divided between say 10 mini-grids, the same single problem only 10% of the people.

Skilled local employment :- community-grids can constitute useful sources of skilled local employment. This contrasts with the large labour force in centralised energy systems. Labour disagreements within a single large state owned utility can not only impact energy supply within a country but can also affect supplies and push up energy prices elsewhere in the world because of the global energy market.

Complex governance: - Some would argue that decentralised systems have a simplicity of governance and therefore have some advantage. However, without suitable regulation, they are vulnerable to questions of ownership, responsibility, affordability, security and resilience.

So the advent of decentralised energy systems changes both the generating and technical landscape, but also the political economic landscape. Ownership, rent seeking, regulation, are all changing, so initiatives supporting transitions to modern energy cooking services need to keep this in mind when considering how PEA might influence planning and roll out of modern energy cooking services.

There is also the concept of prosumers. With the advent of solar PV panels of household rooftops, and the changes required with electric vehicles, the ‘one way direction’ of a utility is changing. It used to be that the utility generated the electricity and the household consumed it. However now prosumers can be end-use consumers of electricity who produce their own electricity either to meet their own electricity needs or to export electricity to “the grid” (the electricity system), or some combination of both. There are discussions about utilising electric vehicle batteries as energy storage[xxxix]. These ideas further stretch the ‘decentralisation’ of energy production.

5 The role of key stakeholders

Who then are the key stakeholders that need to be considered, based on the narrative above? Table 1 provides an overview of the key stakeholders and speculates on their wins and losses.

Table 1 – Key stakeholders in the political economy for Modern energy Cooking Services, and how the advent of MECS may affect them.

Group	Possible wins	Possible losses
Politicians	Mildly visible benefits, feel good quality of life, job creation mitigates climate change, mitigates local environment issues and potentially changes the health balance in the country.	Barely newsworthy, losses of jobs in charcoal industry
Ministerial	Potential gains on revenue and welfare, potentially adds jobs, mitigates climate change, mitigates local environment issues and supports health objectives.	Adds complexity, requires inter-ministerial action plans
Civil Servants		Complexity to get things done – might affect career paths
Local authorities	Mildly visible benefits, feel good quality of life, job creation	
Regulators/Standards	Wins matching load and demand	Potential complaints, vulnerable population, additional workload
'Charcoal' Rent seekers		Charcoal exploiters losing, land owners potentially losing, no opportunity for rent seeking in actual proposition.
Treasury	Increased tax revenue from service delivery platforms and retailers	Increased demand for foreign exchange, importation. Inter-ministerial complexity of budgets.
Banking sector, Financial institutions	Opportunity to lend to institutions (PAYG) and to consumers microfinance	Would rather deal in larger sums.
Suppliers of the service	Revenue stream, data flows	Complexity and diligence
Fossil Fuel lobby	(LPG use can be seen as Fossil fuel win?)	Works against fossil fuel use, loss of revenue for dependent industry
Renewable energy lobby	Enhances RE revenue streams	
Climate change lobby	Enhances low carbon strategies, greater sequestration of carbon by uncut trees.	
Utilities	Enhanced revenue streams	Complexity of load management, need for higher quality and reliability.
Independent Power Producers	Enhanced revenue streams, increased load demand	Complexity of load management, Higher capital costs
'Charcoal' Rent seekers		Charcoal exploiters losing, land owners potentially losing, no opportunity for rent seeking in actual proposition.
Woodfuels harvesters	Opportunity to convert to 'healthier' wood products	Loss of jobs, revenue streams
Transporters	Opportunity to transport 'healthier' wood products	Loss of jobs, revenue streams
Farmers	Enhanced microclimates from uncut trees.	Loss of revenue (woodfuels)

Importers	Additional product lines	
Retail outlets	Additional product and service lines	Reduction in biomass stove sales
Youth	Employment opportunities	
Households	Improved quality of life	Learn new cooking skills
Women	Improved cooking experience, stronger kudos for using 'technology'	
Men	Greater opportunity for cooking	Feelings of loss of status because women using 'technology'.
China, India	Additional product lines	
Other manufacturing countries	No reason why they cannot have additional product lines	

In the following section we consider some of the key stakeholder groups and discuss their role in more detail.

5.1 Utilities

As discussed briefly above, the recent years have seen the introduction of new actors and technologies, including the 'prosumer' (producer–consumer) of electricity and small-scale embedded generation from roof-top solar photovoltaics (for example in South Africa[xl]). Small-scale embedded generation creates tensions between equitable and low-carbon energy transitions on the one hand, and on the other hand generating critical revenue from the country's wealthy consumers that cross-subsidises electricity services for the poor and other municipal public services.

It should be noted that South Africa is a little different in its delivery of electricity from many other countries as the municipality is responsible for the retail of electricity to the consumer. That makes for a small conflict of interest when considering energy efficiency – since selling electricity is an income stream for the municipality, why would they then lobby consumers to implement efficiency measures that reduce consumption. To be fair though, many municipalities have implemented strong energy efficiency policies and cities such as Cape Town have introduced compulsory use of solar on new builds.

Early attempts at power sector reform relied on external donor funding bundled as structural adjustment packages in which donors, notably the World Bank, insisted on a standard set of policies. These typically included unbundling of generation, transmission and distribution, setting up regulation, and opening up the sector to the private sector. Whilst this approach was driven by donors, a recent study shows that current power sector reform programmes are mainly driven by the need to improve performance, to attract investment, and to achieve financial sustainability[xli]. These reflect a growing motivation to address power sector reform within domestic political agendas.

In much of the above narrative we have focused on the possibilities of rent seeking by individuals within the system, but what Eberhard and Godinho point to are the wider contextual factors that prevent change and may stifle interest in MECS. In terms of the utilities themselves, there are contextual idealist factors as well as socio-political issues such as corruption and the weak institutional cultures and access to finance. For instance, subsidies are substantial, hard to remove and informally protected by vested political and/or economic interests. If subsidies are not removed, and cooking transitions at scale increase demand for electricity, it potentially means that government budgets will be stretched to provide the subsidy. They point out that State owned institutions often have labour unions and parties who oppose reforms that effect jobs particularly where it tries to tackle bloated and inefficient utilities. If the increased demand for electricity from modern energy cooking services exposes more of the weaknesses of the institution, and creates a crisis of profitability, then it may face resistance if jobs are effected. In theory more demand means more jobs, and more job fulfilment, but

the reality is that often a mindset has been created where work is undertaken inefficiently and an increased demand and consumer need for quality suggests a different way of working.

At a broader economic level political instability can put off investment, while authoritarian leadership can enable or constrain reforms depending on whether or not they serve the interests of incumbents. Market-based power sector reform, specifically privatisation, can therefore very much depend on the popular ideological beliefs. Strong communist, socialist, anti-colonialist and labour movements/political parties/civil society groups all can have a strong say in how the energy infrastructure might grow.

Similarly weak governance can then lead to inadequate legal structures for contract law and weak enforcement can deter investors. The literature suggests that poorly understood and uncharted informal institutions obscure the real distribution of political power and networks. And then of course we have the individuals who make up the institutions who undertake corruption, rent seeking and clientelism all of which deter investors further. Problems can affect the legitimacy of the government in the eyes of the public where the rising voice of exasperation at a poor quality of service just means people are even more reluctant to pay their electricity bill. This then leads to poor collection, non-cost reflective tariffs, and transmission and distribution losses that together prevent utilities from becoming financially viable and further undermine investment/privatisation.

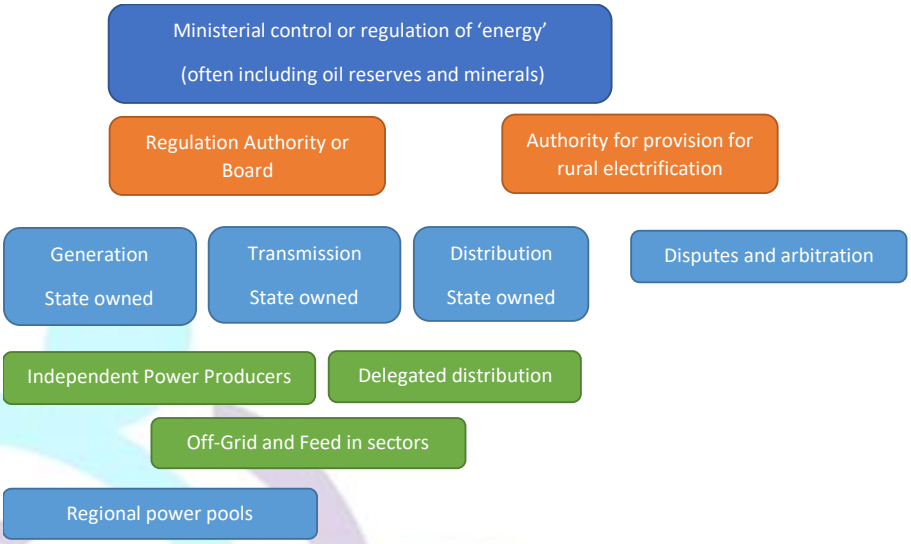


Figure 4 Key generalised stakeholders in electrical infrastructure (Authors)

In this political economic landscape for the electricity sector, an introduction and complication of modern energy cooking services may find resistance. If utilities are experiencing the problems of being a weak state owned institution, then a good quality cooking service may be hard to provide.

5.2 The inter-ministerial roles – Ministry of Energy, Ministry of Gender and Women's Affairs

It has been speculated that one of the reasons that there has been so little investment in the enduring problem of cooking with biomass, is that it is a women's issue. The national planning of energy access falls under the Ministry of Energy or the equivalent, while the issues of gender equality and the well being of women (may) fall under a Ministry responsible for "Gender and Women's Affairs". So when the African Union calls together Ministers to agree on the African Common Position for the Upcoming 63rd Session of the Commission on the Status of Women[xlii] there are no representatives for energy planning in the room.

This is one example which is repeated at international and national levels – where the technical infrastructure of energy access is often discussed and planned without due consideration of gender issues. And gender issues, social protection, public services and sustainable infrastructure to free up women's time are discussed and planned without due integration with infrastructure issues.

Inclusive growth and macroeconomic stability are key enablers for addressing gender equality, and therefore it is a challenge to get inter-ministerial committees and planning mechanisms to bring the traditional domains of the male of technology and infrastructure into the same room as those who are primarily concerned with inclusiveness. It has been known that the treasury, the purse of the government, has been out of step with individual ministries such as local government or even agriculture, and so it is a common political experience that silo thinking in government prevents change.

Who will be the winners and the losers should modern energy cooking services be discussed in inter-ministerial committees?

There will of course be politicians who have vested interest in infrastructure. Stories abound of subverting the contracting processes, of asking for action in their constituency to gain voter favour, and for special action for their own gain. There tends to be, even within donors, a bias towards the physical, the visible. Softer action that may benefit households but cannot be easily captured in a photo may find resistance.

Beyond that, there are also issues surrounding career paths of the civil servants implementing the Minister wishes. Ensuring contractors do what they promised is a more visible deliverable which can go on the civil servant's appraisal. The other feature of consultations is that it is a skill in itself[xliii] , one which may not be embedded in ministries focused on infrastructure hardware – engineers like to 'get on with it'. Long consultations with communities are such that the norm for community mobilisation is time consuming. In inter-ministerial consultations, there may be considerable mismatch in the priorities, language and time expectations between ministries. Engineers may feel they are losing time, while social scientists may feel they are not being listened to. Both can be potentially transformed into winners, by using the right language – consultations on the social behavioural aspects of modern energy cooking services could be framed as 'rapid prototyping' to engineers informing the design specifications of both the units and the load profiles for their infrastructure, and concerns from engineers about mitigating peak loads and ensuring supply chains can be framed as enhancing user experience to the inclusivity expert.

There may also be implications of modern energy cooking services on the economy that create differences between ministries, and particularly the treasury may be a loser. For instance, the treasury will likely be looking to maximise tax revenues. However, modern energy cooking services may involve importing equipment that would benefit from tax exemptions. Similarly, modern cooking fuels may need subsidies at first to make the transition attractive. And finally, it may require foreign exchange, where previously the charcoal industry was all in local currency. These issues will affect dialogue between ministries and the treasury.

Table 2 Political interest and MECS

Government body	Reason for political economic interest 2020	Possible additional reasons for political economic interest 2030 (but dependent on geo politics)
Office of the President. Office of the Vice President. Prime Ministers Office. 	Oversight, wellbeing of population and economy	Fulfilment of Nationally Determined Contributions to Climate Change International standing as leader to a low carbon world. Spin offs for industry, economic growth and a satisfied middle class
Ministry for Agriculture, Animal Industry, & Fisheries 	Deforestation, oversight of forests, wood and charcoal production, interest in economics of the farm.	Development of biofuels, phase change materials and non-polluting energy products. Using off-grid for cooking, enhances viability of grids and increases opportunities for (agriculture value chain) productive and process use
Ministry for Communication & Information Communication Technology	No direct interest, but reach of telecoms may affect PAYG options. Possible light involvement through consumer awareness campaigns?	Service packages regularly on offer by telecoms agencies, including bundled cooking services.
Ministry for Disaster Preparedness & Refugees 	Energy and fuel in refugee environments critical. May also be interested to mitigate deforestation.	Increased refuges due to climate crisis, requires deeper attention to energy and fuel.
Ministry for Education & Sports 	Interested in getting children to attend schools, particularly girls. Also may be interested in higher education that feeds personnel into an energy industry.	More technology in the home leads to greater technological inquisitiveness? Familiarity with electric and electronics leads to greater use of learning materials.
Ministry for Energy & Minerals 	Key interest in MECS, and its demands on energy infrastructure.	Significant demand on grid infrastructure. Increased efficiencies able to match supply and demand Decentralised generation leading to decreased costs through learning.
Ministry for Finance, Planning, & Economic Development 	Potential key interest in mecs as factor changing the demands on foreign exchange, investment and energy security.	Financial security likely to come from energy security. Increased investment due to assured proven increased returns.
Ministry for Foreign Affairs 	Liaison with donors, and with supplying countries. Potentially China of particular interest.	Being part of an ever-changing global value chain. Significant alleviation of health concerns associated with biomass cooking.

Ministry for Gender, Labor, & Social Affairs 	A key ministry for Women's affairs, and the drudgery of women's domestic life. Safety for collecting wood. But also the role of women in the supply chain. Wellbeing of the whole household. Wellbeing of children and release for school particularly. Youth unemployment.	By 2030 in some communities, the balance of household life might lead to changing social norms.
Ministry for Health 	Potentially a key stakeholder – biomass cooking cause significant respiratory illnesses, and could be considered a huge public health problem. Mecs could alleviate pressure on the health service.	Significant alleviation of health concerns associated with biomass cooking, leads to reduce burden on the health system.
Ministry for Defence	No direct interest	
Ministry for Justice & Constitutional Affairs	No direct interest	
Ministry for Internal Affairs 	Potential stakeholder engaged in supervision of local government. Local government could be key stakeholder for local action and uptake.	
Ministry for Lands, Housing, & Urban Development  Ministry for Local Govt	Urban development – air pollution, industry, housing design.	Urban planning now considering the demands on energy infrastructure, the consequences on the health system, and the implications on food retail.
Ministry for Security	No direct interest?	
Ministry for Trade & Industry 	Localised industry, assembly of devices, renewable energy industry, energy infrastructure	Supply chains in place for modern energy cooking services. Energy infrastructure includes both centralised and decentralised planning for cooking demands
Ministry for Water & Environment 	Environment – key stakeholder in land use, air quality	Closely allied to agriculture and urban planning, the decreases in deforestation are improving the watersheds, and the decreases in air pollution are improving air quality.
Ministry for Works & Transport 	Routing for energy infrastructure	Integrated planning matches road development with energy infrastructure. The presence of electric vehicles has created new demands on energy infrastructure and also new opportunities for supporting modern energy cooking services even in remote locations.

5.3 The role of men in decision making

The world is characterised by male dominance. Varying from culture to culture, even in modern western societies, gender disparities in pay scales, and proportions of women in senior decision making roles betray an ongoing male bias.

This is all the more so in senior roles in energy infrastructure.[xliv] Getting to Gender Equality in Electricity Infrastructure: Lessons from Electricity Generation, Transmission, and Distribution Projects examines the social and gender footprint of large-scale electricity generation, transmission, and distribution projects. Baldinger 2018[xlv] summarises some of the issues in the sector and notes that much of the gendered focus in the energy sector has been as micro-entrepreneurs working in the off-grid or cooking parts of the value chain. If MECS is to encourage gender equity throughout the energy sector as a part of bringing cooking into energy access discussions, then schemes to attract qualified women, including diversifying recruitment practices, capacity building and networking for existing female employees, and improving promotion paths for female employees all become very important. Political economy often focuses on rent seeking – gaining benefit, by both legitimate and illegitimate means. When we consider employees of utilities, they gain when there is a clear career path that they can use to provide for themselves and their dependents. So while gender concerns for MECS may focus on the intra household dynamics of decision making, the wider infrastructure will need to ensure that women and men have equal chances of gaining benefit through career development.

However while keeping the macro gender disparities in the energy sector in view, the idea of MECS touching intrahousehold decision making will be a subject of considerable research. Technology is (said to be – a challengeable assumption) traditionally the domain of men, while cooking is traditionally the role of women. Who then decides to purchase a MECS. Is it the man, who is willing to spend money on technology, or the woman who wants to improve her cooking environment. This seems true for both developed economies such as Europe[xlvi] and emerging economies such as Ethiopia[xlvii]. We will not discuss details here as this is a major subject of MECS covered in other briefing notes.

5.4 Youth employment and youth activism

It may seem strange to put Youth as key stakeholders for such a specific intervention as modern energy cooking services. However, youth unemployment has become a critical issue in Africa and Asia, and youth activism is becoming a force for change in the climate debate.

Youth employment[xlviii] can be characterised by a disenfranchised social group. Youth are the losers of the existing economy. There just are not enough jobs being created to keep pace with the population growth and the number of young people coming onto the job market. Girls and young women make up the majority of the world's 621 million young people who are not in education, employment or training. By releasing women and girls from the drudgery of (biomass) cooking, with all the implications on collecting fuel, health impacts, slow cooking and a single focus on domestic chores, more time is released for education, employment or training. While employment and training may be dependent on the infrastructural context, most situations now have basic schooling, and it is often socio cultural issues that prevent girls attending school. If modern energy cooking services were to release time, and enable women to fulfil their house keeping obligations in significantly less time, then in theory the gender balance may be partially addressed, and educational opportunities may be taken up.

That does not in itself address the key overall problem of youth unemployment. After basic schooling, employment and training are not always available. Modern energy cooking services could create new opportunities in a food industry and release time for improved agriculture. Adoption of modern energy also can create a mindset of using technology and change from the past that in itself may create a more entrepreneurial and problem solving spirit[xlix]. Innovations in modern energy cooking could generate a culture of innovation.

Youth activism[l] [li] [lii]. Youth are also faced with another long term lose situation, one which they seem to be responding to globally. The nature of climate change is that it will severely impact the world in another 20 years, and it is the current youth who will have their lives potentially crippled by the carbon industries mistakes. Young people are beginning to understand this and are beginning to lobby politically. Extinction agenda is a phenomenon arising in 2019 as this is being written, with very young advocates such as Ms Thunberg taking the lead while still in high school. While there is currently little evidence that youth in Africa have taken up the call, in terms of a political economic analysis, this is a potential key stakeholder who may learn the voice of their Northern counterparts, and may begin to express themselves within the next few years. This could be a driving force for change, and have its emphasis on a low carbon world.

5.5 Charcoal investment – jobs, guns and gangs.

As discussed above, the preservation of trees does in itself lend opportunity for alternative employment from the same resource. However, not all the charcoal value chains are hard working people intent on providing for their family. There have been many stories about land owners and rent seekers who use charcoal as a reason to threaten others. [liii] [liv] [lv] Then there are rent seekers along the value chain. In Malawi, as charcoal is moved from point of production to the markets traders experience a private taxation by public officials. These officials include people on duty at roadblocks, Traffic Police and the Police 997 Emergency Service, who often demand payments in cash or in kind before they will allow charcoal traders to pass. In one study bribes accounted for 12-20% of the final price of charcoal.[lvi] The same study found that at the retail markets, although charcoal is unlicensed, market officials from the Ministry of Local Government charge charcoal sellers the standard market levy. Thus, one ministry of government declares production illegal while another allows traders to sell it within its premises and generates revenue from the trade.

At the risk of drawing too much on one study, the same study notes that approximately 92,800 people owe their livelihoods to charcoal. This figure includes 46,500 producers, 12,500 bicycle transporters, 300 other transporters and 33,500 traders. Any shift from charcoal will have to find alternative employment for a disparate and scattered value chain, and perhaps come up against some patches of intense illegal rent seeking.

5.6 Min of Agriculture – deforestation

A potential key stakeholder is the Ministry of Agriculture. Deforestation due to unsustainable wood and charcoal harvesting is a major contributor to land degradation.

According to Drigo et al 2017 over half the wood harvested worldwide is used for fuel consumption in traditional cooking and heating (they state that this is 9% of global primary energy). They undertake a detailed analysis of consumption and supply, and conclude that approximately 33% of woodfuel harvested was unsustainable. (They note their estimates are lower than the figure taken for many carbon markets). By unsustainable they mean that nearly all landscapes produce a measurable increment of woody biomass either as new growth or as new growth from previous disturbances and if annual harvesting exceeds incremental growth, it is unsustainable, leading to a decline of woody biomass, forest degradation, and net carbon emissions. They define the wood harvested in excess of the incremental growth rate as non renewable biomass (NRB). In the figure below they illustrate fraction of the NRB.

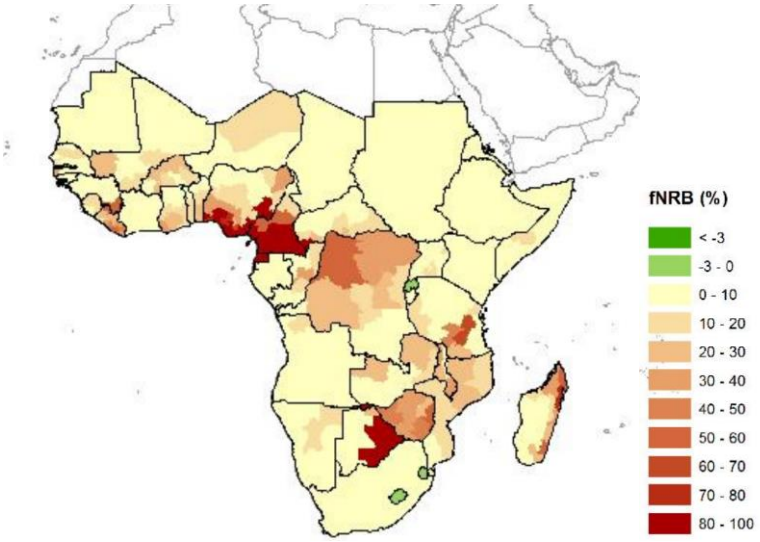


Figure 5 Estimates of the fraction of Non Renewable Biomass (fNRB) Drigo et al 2017[lvii] Percent of total harvesting for energy uses.

For the Ministry of agriculture, and indeed the Ministries responsible for water and the environment, the issue of deforestation is often a top priority. Loss of the 'woodshed' (the landscape covered by trees) can lead on to loss of the watershed. The longer term consequences are significant for the countries agriculture and urban conurbations.

While this section has just touched on some of the key stakeholders and on their key issues, the list is by no means exhaustive. The reader is reminded of Table 1 and the long list, and the call of the paper is for further research to ensure that all the winners and losers of mecs are addressed as much as possible. Before concluding the paper, the next section discusses four common myths that many stakeholders currently believe.

6 The politics of certain mythologies

The following four myths affect many stakeholders. By definition a myth has an element of truth, but the whole myth is not backed by evidence, and is subject to change. The following myths will affect all the above stakeholders and will need to be addressed if change is to occur.

6.1 Pay as you Go makes Solar PV home systems cost effective.

Myth 1:- There is an assumption among development workers that Solar Home Systems are 'a great way' for increasing access to modern energy and decreasing carbon dependency. This meme has considerable momentum, and yet evidence does not always support it.

Solar Home Systems initially reached customers who could not access the grid. They offered an alternative to kerosene lights and indeed if one compared the expenditure on kerosene with the cost of the system, it seemed very favourable to consumers. Rapid uptake of systems suggests it hits a good note with consumers[lviii], and many discuss the cleanliness of the system. After creating an anchor product in lights, solar home systems have expanded to give enough energy to run products such as television and refrigerators. The growth of the solar home system was very much dependent on the finance arrangements, and many would characterise SHS sellers such as MKopa not so much as a solar company as a loan company[lix]. Pay as you go approaches make SHS 'affordable' (micro payments). But affordable is not the same as cost-effective. To some degree customers must feel SHS are 'cost-reasonable' giving a net benefit over alternatives or sales would not persist – but this is not the same as saying that SHS are providing electricity at a comparable tariff to on grid systems, and in their existing form could be repurposed for cooking.

As we consider now using solar home systems for high power and higher energy demand, we will need to acknowledge that we cannot compare such products to the price of the grid. In 2018, the retail price of solar home systems meant that if the system lasted 5 years or even 10 years, the price per kWh was significantly more than the grid.

System name	System price	Battery useable capacity per day	Assumed max use for 5 years (kWh)*	Price per kWh for 5 years US$.	Price per kWh for 10 years
Mobisol	$1090	420Wh	766.5	1.42	0.71
Green light planet	$590	120Wh	219	2.69	1.35
Mkopa (600 designed for TV)	$695	52Wh	94.9	7.39	3.7
d.light design	$565	77Wh	140.53	4.04	2.02
BBOX	$320	72Wh	131.4	2.44	1.22

Table 3 Calculation of price per kWh of common Solar Home Systems found in Africa (2017).

*this is a very generous – system works every day of the year to maximum capacity – no allowance for rainy days.

The largest single cost component of solar home systems is the battery, followed by 'soft costs' (including customer acquisition) and other hardware (e.g. wiring, appliances)[lx]. While the price of energy storage is coming down, the cost of customer acquisition is unlikely to change. However, as a proportion of a more expensive 'cooking' system, soft costs become a smaller proportion of the whole price.

At the same time the landscape is changing. For instance, in Bangladesh where Solar Home Systems grew rapidly[lxi], the grid is being extended and becoming within reach for the many. Integration with the grid is being explored for the 6 million stand alone systems, but this is not a simple task.

The point here is that while Solar Home Systems for low power and low energy use have been lauded as a product that improves the quality of life for the poor, **the current designs and models are not yet scalable to include cooking.**

Similarly in mini grids, the current cost per kWh is often high, except where the government insists it is the same as the grid – in which case the mini grid operator can barely recover their costs.

This is included in this paper on political economy because the myth is often championed by key stakeholders – that off-grid can rapidly increase access for those that do not have access. This championing is at the expense of the more simplistic idea that if on-grids were strengthened both in terms of reach and reliability, that mecs from electricity could replace many biomass cooking uses. The oft quoted example is that in Kampala 95% of households are connected, and 70% still cook with charcoal. There doesn't need to be an emphasis on a solar home system to get a significant scaled response away from charcoal.

6.2 We have to focus on the rural off-grid market

Building on the myth above, the is the **Myth 2** that off-grid modern energy could encourage rural users to utilise modern energy cooking services. While this is a hope, particularly of the MECS programme, this myth needs a reality check. There is a disconnect between the provision of off-grid modern energy and the payment experience of households for goods. Rural households are used to growing their own food and collecting their own firewood. Firewood may be available from land they own or from the commons. However, the point is

that the payment mechanism for the firewood is that of time not money. Money does flow within a rural economy, but for peripheral items – salt to flavour food, airtime for the phone.

When modern energy cooking services were first discussed, the proposition was that renewable energy technology would reach a cost point equivalent to payments made for biomass fuel. This is becoming true within the urban and peri urban economies, but it fails to acknowledge the disconnect between fuel collection within rural economies and the potential substitution with modern energy cooking services. Even Payment as you Go (PAYG) which breaks down the capital investment into monthly, weekly or even daily charges, still represents a real monetary expenditure.

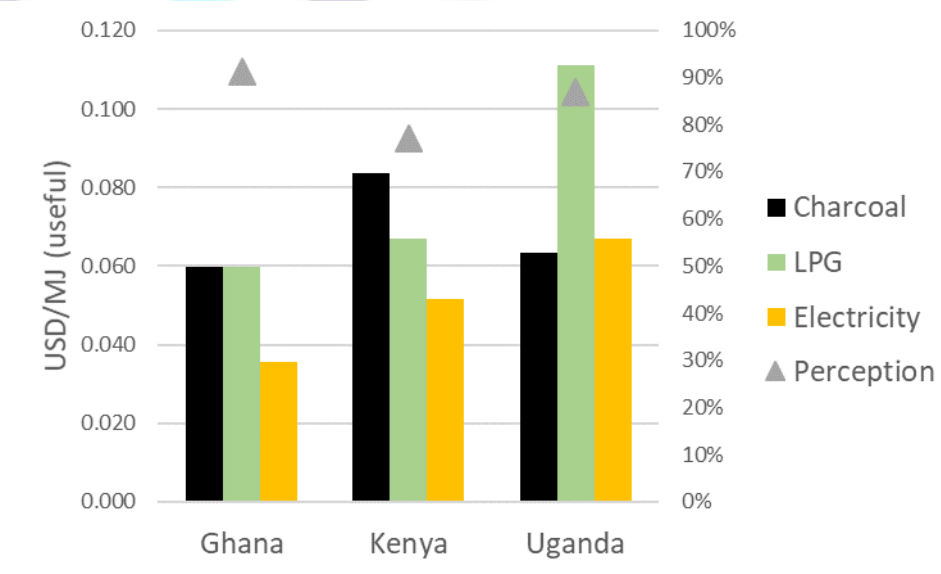
6.3 The myth that electric cooking is expensive

In addition to the realities of emerging opportunities for cooking with electricity is the **Myth 3** that electric cooking is expensive and sometimes considered inconvenient. For example, recent studies in Ghana[lxii], Kenya, and Uganda[lxiii] consistently found that the majority of respondents[lxiv] **believed** that electricity was expensive for cooking.

When people say it is expensive, they seem to have two features in mind. Sometimes development workers say that it is expensive compared to the 'free' collection of wood. This is technically true – there is a greater monetary cost to electricity than to the use of labour for collecting a common or free resource – as long as the opportunity cost of the labour is not monetised. This has been discussed in the previous section.

In many debates to date, there is the belief that electricity would cost more to cook meals than LPG cylinders or charcoal sold in urban areas. However, this is not necessarily the case. For example, Source: *authors' own*

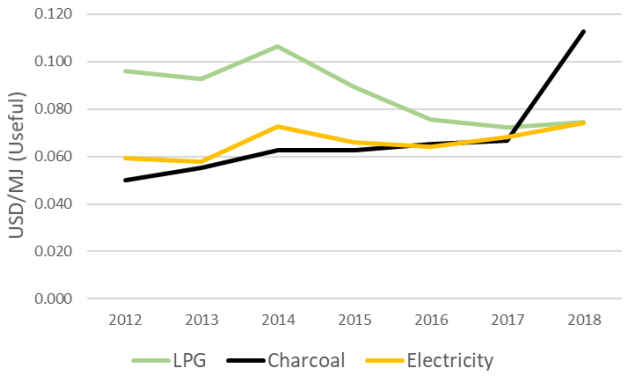
Figure 6 shows the relative costs of 'useful' cooking energy based on fuel prices prevailing at the time of studies in Ghana, Kenya and Uganda[lxv]. Relative energy costs are based on calorific values for each fuel[lxvi]. The cost of 'useful' energy then takes into account the efficiency of fuel conversion in a cooking stove, based on example overall rates of conversion[lxvii] - this represents the actual costs when cooking a meal. The figure shows that, based on these assumptions, electricity is in fact the cheapest fuel for cooking in urban areas in Ghana and Kenya. Only in Uganda does charcoal offer a competitive cost of cooking with this type of comparison. However, when we include energy efficient cooking appliances the situations changes further, making electricity very cost-effective. (See forthcoming paper by EMSAP and MECS on Cooking with electricity)



Source: authors' own

Figure 6 Relative cost of cooking with common fuels

The belief may be based, at least partly, on historical prices. In Kenya, for example, there has been considerable volatility in the retail prices of cooking fuels over recent years. Over the last five years, the price of LPG has dropped by roughly 30%, but in the same time period the price of charcoal has almost doubled. Figure 7 shows that LPG has historically been a more expensive fuel to cook with than charcoal, but this has been reversed as a result of price changes in 2018. There will always be a lag between price movements and changes in perceptions of cost. However, this argument does not fully explain beliefs about the expense of electricity, simply because it is not clear that electricity was actually substantially more expensive to cook with than charcoal prior to 2018.



Source: authors' own

Figure 7 Trends of relative costs of cooking with common fuels (Kenya)

This is of significance to the political economy because currently **such a belief affects many stakeholders**. Not only does it make for resistance among policy actors, it makes for resistance among consumers.

6.4 Burning trees is thought to be climate neutral?

In the section on climate change, we raised the challenge of defining how much carbon is actually released from firewood and charcoal consumption. [lxviii] The world's forests are estimated to absorb around 2 Gt CO_2e each year[lxix]. Charcoal production accounts for 17% of woodfuel harvested from forests[lxx]. However, figures like this are only estimates, based on complex modelling, limited empirical data, and a huge number of assumptions. There is variability in the forest contexts found across the globe, such as types of trees, age of forest, state of forests (e.g. intact, sustainably or unsustainably harvested). Then there is considerable variability in the models used. For example, Malhi et al[lxxi] (2011) showed that different models gave estimates of standing biomass in Amazonian tropical forest ranging anywhere from 108 to 450 $tC.ha^{-1}$. When estimating the carbon dioxide sequestration capacity of trees not harvested for woodfuels, it depends on the type of woodland where the woodfuel is taken from. If wood is harvested in a sustainable manner from natural forests, then impact on the carbon dioxide sequestration capacity will be negligible. However, if an isolated tree is felled, then the sequestration capacity of that tree is lost forever. Even what happens to a tree when it is felled varies according to how harvesting is done. In commercial logging, only the stem and large branches will be removed as timber products (including woodfuels). The residue of leaves, smaller branches, stump are roots are left, either to be burnt in situ or left to rot. In either case, the carbon content of this woody biomass is released to the atmosphere as CO2 over a relatively short period of time. However, much charcoal production is informal, using trees sourced locally from savannah or grasslands. In these processes, much more of the tree will be used, leaving

less residue in situ but this has little effect on the amount of CO2 released, as the additional woody biomass harvested tends to be burnt in one way or another as feedstock, fuel for charcoal conversion, or fuelwood.

The amount of woodfuel used in producing charcoal varies according to the conversion process used. The conversion efficiency of crude, informal processes can be as low as 10% (by weight)[lxxii], compared with over 35% for modern, industrial processes. Burning charcoal releases CO2 into the atmosphere, irrespective of whether the wood used in charcoal production was harvested sustainably or not. The amount of charcoal energy used by a household varies considerably depending on types of foods cooking, cooking practice, and fuel stacking. Among households that use charcoal only for cooking, household consumptions range from 50 to 80 MJ/household/day (median values from urban households in Zambia[lxxiii] and Tanzania[lxxiv] respectively). An estimate of 70 MJ/household/day amounts to an annual consumption of 0.85 t/yr of charcoal. Combustion of this charcoal would release 2.35 tCO2/yr in the kitchen. However, it can be assumed that all of the carbon contained in the wood feedstock used to produce charcoal will also be released to the atmosphere in the process. Based on a conversion efficiency of 15% (by weight), this means that household consumption of charcoal will result in the release of 10.5 tCO2/yr – this includes CO2 released in the kitchen plus that released in the charcoal production process.

Estimating the impact on the carbon cycle from harvesting woodfuels is not straightforward. In any ecosystem, carbon sequestration capacity of tree growth is offset to some extent by heterotrophic respiration, which includes respiration of everything else in the forest apart from trees, including animals, root respiration, and other organisms living in the soil. **Gathering deadwood** from a natural forest could, therefore, have a positive effect by reducing CO2 released from rotting woody biomass. **Cutting wood in an unsustainable manner** that results in deforestation would result in a loss of carbon sequestration capacity, but possibly not much. **Cutting down a young forest**, in which growth rates are high and woody debris is limited, would result in a substantial loss of carbon sequestration capacity. On the other hand, **cutting down a mature, natural forest** would have a lower impact on carbon sequestration capacity, as growth rates in this kind of forest would be slower and tree mortality and heterotrophic respiration would be higher, resulting in a lower overall sequestration capacity. **Cutting down an isolated tree** represents the clearest impact on carbon sequestration capacity. Assuming any deadwood is regularly gathered for use as fuelwood, then felling the tree would result in a loss of carbon sequestration capacity approaching the net primary production of the tree (i.e. all the biomass accumulated in the tree).

The point is that while our instinct is to say that preservation of trees is good for the environment, it is not actually that straight forward. And stakeholders such as owners and managers of forests will have room to argue their case for managed harvesting.

7 Conclusion

The emerging strategy promoting transitions to modern energy cooking services will inevitably generate winners and losers. As discussed by Barnett et al 2018, in the existing systems of energy provision, rent seekers who get locked out of one part of the system can often find rent in another part. A decentralised energy production is a threat to this behaviour, and therefore will tend to find significant resistance to change. Nevertheless the emerging global narratives are gaining sufficient strength that such behaviour will have to be challenged. Decentralised energy production is becoming so cheap, the need for mitigating climate emissions is so great, and the global economy becoming so strong that the old ways of centralised 'rent seeking' generation may be overtaken.

The best way to conceive of the emerging innovations being explored in the MECS programme is to consider the technological shifts experienced within the telecom sector. Consider the landline infrastructure approach of the 20th Century, and the current mobile approach of the 21st Century. Even as recently as the 1990's the concept of transforming Africa by the introduction of mobile phones was only a dream in a few people's minds. UK investment through the Commonwealth Development Corporation enabled the first mobile phone operators to begin operations in Sub Saharan Africa. This ultimately led to a move away from an incumbent landline single telecom provider, to an ecosystem of mobile network operators, each having investment from host governments mixed with private sector investment. The old rent seeking in 'extra charges' to get connected to a landline evaporated in the emerging ecosystem of more choice.

Consider also the shift in the financial sector created by investment in 'mobile money'. Strategic research on the early use of mobile phones, enabled an innovative new approach to be conceived and applied. UK Aid (DFID) invested in the both the initial research and support for the innovation in technologies, policies and private sector responses required to take it forward. This too created winners and losers. When mobile money gained scale in East Africa around 2007, the banks became worried that their business would be lost. In late 2008, there was a lobbying attack from the banking industry seeking to shut down the MPESA service. In response, the Central Bank did an audit of the MPESA service at the request of the Ministry of Finance and declared it safe and in line with the country's objectives for financial inclusion. Of course, now the financial inclusion that MPESA has brought to the many is shared with the banks; banking registrations are growing and integrations with mobile money are common.

Great change worries the incumbents, but if handled correctly the existing winners don't need to become losers.

Modern energy cooking services may **operate with either the older infrastructural system** using new technologies to strengthen and balancing the system without rent seekers necessarily losing out, **or with new systems**, i.e. cheaper renewable energy, decentralised configurations, energy storage. There are opportunities in both and therefore the transition is **not necessarily a major threat to the existing rent seekers**. They may or may not become aware of the role of modern energy cooking services. They may just see it as additional demand on the system, in the same way that light bulbs and televisions are at the moment. We may therefore conclude

that modern energy cooking services is unlikely to tip the political economy of electrical infrastructure as described in Barnett et al 2018 one way or another.

It may **change the balance of employment**, resulting in an associated effect on national economies. Reduction of wood and charcoal production (for fuel) could result in many unskilled workers losing their sources of income. Policy and political actors will need to weigh up the societal benefits of moving from biomass against associated loss of employment. If this is taken into account early enough it may be possible to mitigate the effects – particularly where the unfelled trees, whether agroforestry, wild wood or manage forests, could be adapted to greater value production. For instance, without the need for charcoal production, the sustained environment may be used for higher quality timber production, or create environments that combined with agriculture both mitigate the effects of climate change (greater soil stability, micro climates, etc) and generate more food production (longer term fruit trees, shaded permaculture, etc).

It may improve the quality of life for households. This is of course the ultimate goal of the approach – that households, and women in particular, are no longer affected by indoor air pollution, and that cities and urban areas have their outdoor air pollution somewhat mitigated by not having biomass emissions either within the city or nearby. If it becomes affordable, reliable, sustainable and available for all, then modern energy cooking services could potentially release considerable time for other activities. This is not just in the fuel gathering or purchasing, but in the cooking process itself. As discussed, McKinsey Global Institute [14] states that much of women's unpaid work hours are spent on fuel collection and cooking. The report explores the economic potential available if the global gender gap embodied in such activities were to be closed.

It may contribute to the Nationally Determined Contributions for climate change, and thus be attractive to politicians and youth alike who are focused on the future.

It may improve the economy of the country!

8 Recommendations

Conclusion:- Modern energy cooking services may **operate with either the older infrastructural system or with new systems**, and as such **is not necessarily a major threat to the existing rent seekers**.

Response: -What this means in practical terms is that those working to transition economies to modern energy cooking services need not plan how to overcome rent seekers blocking their plans. Rather than a need to identify and spend energy on high level policy actors who may block modern energy cooking services, those working in modern energy cooking services can work with either older or new infrastructural approaches. There will be a need to be aware of rent seeking in the transitions of old to new generating capacities in order to **avoid accidently getting drawn into unnecessary conflict – by being associated with an elite that is advocating for a particular infrastructural configuration.**

Conclusion: It may **change the balance of employment**.

Response: - Modern energy cooking service advocates should engage with a considered impact of their work on agroforestry, forests and the management of wild wood. By linking their work to alternative forestry outputs using trees no longer used for charcoal production, they **could mitigate the unemployment effects of a move away from a charcoal industry**. This will not be straight forward since much charcoal production and sale is illegal. The current producers are unlikely to engage with programmes to improve their lot until the lack of demand has driven the price of charcoal down and they have already lost their means of income. There are also rent seekers in the value chain who may have political influence. While these 'losers' will be upset over the shift away form charcoal, they will likely gain other rent from a different part of the illegal logging chain. Similarly, renewable energy closely associated with new infrastructural configurations and decentralisation tends to create new jobs, and a higher employment per kWh than conventional systems. As the transition to modern energy cooking services works synergistically with renewable energy technologies, **employment opportunities will open up, particularly for the youth, and associated training programmes should be a part of that transition**.

Conclusion: **It may improve the quality of life for households.**

Response: -The findings of the McKinsey report show that if women were able to more fully participate in the labour market, as much as $28 trillion, or 26 percent, could be added to the global annual GDP in 2025. This $28 trillion is quite frankly a staggering figure, and covers much more than labour released solely from fuel collecting and domestic chores (cooking). However, even a part of this figure represents an opportunity for inclusive growth and social provisioning. It could also be diverted and be used for greater rent seeking by the elite across society as a whole. The proponents of modern energy cooking cannot guide where this time saved and financial gain is directed – or should they? It has been shown in the cooking work so far that those women who already have a business opportunity are able to leverage time saved on domestic chores into increased income. Perhaps the programme should consider **advisory services alongside the roll out of modern energy cooking services.** If these are 'services' they will likely have feedback loops and call centres. Such services could synergise with finance mechanisms for loans and business advice for making use of the time saved.

It should also be noted that intra household decision making is thought to be male dominated. Early and inconclusive research suggests that modern energy cooking services are likely to be taking up after joint decision making within the household, and there is an expressed hope that quicker cleaner cooking may even encourage a societal shift, and that men may do more of the cooking.

Conclusion: **It may contribute to the Nationally Determined Contributions for climate change**

Response:- Climate change is a cross cutting issue that governments will need new approaches to tackle. Zero carbon economies by definition include all sectors of the economy and so inter-ministerial groupings will need to come together to ensure cross government working. This is true for modern energy cooking services as a strategy. Section 4.2 showed the range of ministries that need to be involved, and hinted that both the treasury and the president or prime ministers office will be key to coordinating the responses. Parliamentarians and legislators also have a key role for changing the landscape of cooking in their country. The programme needs to engage with high level policy forums to ensure the longer terms views are taken into account. The conclusion also included politicians and **youth**. Youth have a particular role to play in climate change, to ensure their own future. The programme needs to keep this in mind and to invite youth activists to attend meetings and be involved as much as possible – they are the longer term scaled strategy implementors.

Conclusion: **It may improve the economy of the country**!

Response:- Finally, while the above has focused on the climate change aspect, its important not to forget that this alternative strategy will likely improve the economy of the country and to bring this aspect to the attention of stakeholders. Presidents and prime ministers, treasury, the cabinet – need to know the effect of modern energy cooking services on the economy. In the same way transforming the banking system with enhanced financial inclusion through mobile money has led to GDP growth in countries that have adopted it at scale, so too modern energy cooking services would release time from women and girls, and as McKinsey say, could result in trillions of more labour available on the market that could enhance and grow the GDP.

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