Technology is Culture: Building a transdisciplinary team to address community energy and urban revitalization challenges

Mary Njenga,
Esther Obonyo,
Ruth Mendum
Email:
m.njenga@cgiar.org;
eao4@engr.psu.edu;
rmm22@psu.edu

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ENERGY, WATER SECURITY AND CLIMATE CHANGE IN AFRICA

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Why woodfuel?

In Sub Saharan Africa (SSA) 90% of the population rely on woodfuel (firewood and charcoal) for cooking and heating (IEA, 2006).

Globally 50 million tonnes of charcoal is produced annually and 60% is in SSA.

Charcoal industry annually in Africa is worth >US$ 11 billion employing >7m people in 2030 will be US$12 billion and 12 million people (World Bank, 2011, FAO, 2014).

Scarcity affects food and nutrition security. Change of diets, skip meals, not cook food properly

Negative impacts on health and the environment from inefficient practices

8 hours and a 50km round trip, Tanzania

Charcoal transportation in Ghana

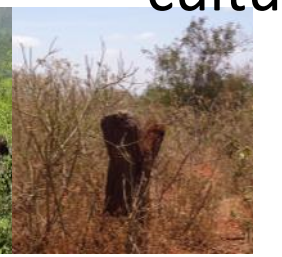
Firewood to a refugee camp, Kenya

57kg carried 3kms -6Km roundtrip, 1 day/week, Kenya

Charcoal stove

Aim: Shift from Business-as-usual culture Sustainable woodfuel systems

Selective one-off cutting of live hard wood species, leading to degradation & biodiversity loss



Farmer managed natural (assisted) regeneration)

Domestication of preferred Acacia trees (Photo by KEFRI)

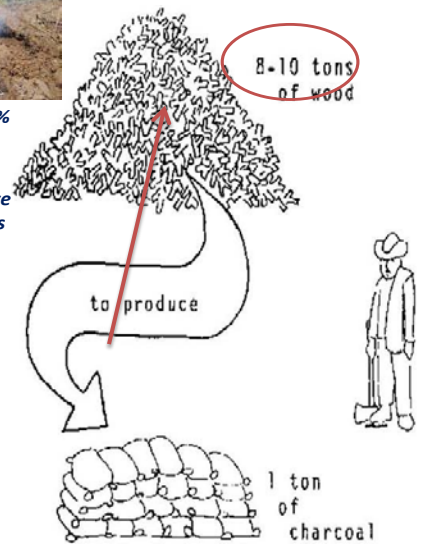
Tree nursery in refugee settlement in Uganda. ICRAF

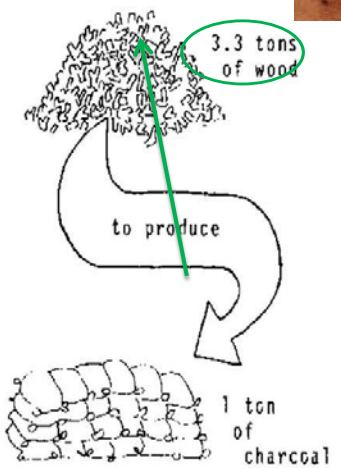
Earth Kiln – efficiency ±10% low capital, skills required, done on site

rth Kiln – 10%

Extremely inefficient

Done on site where trees are cut





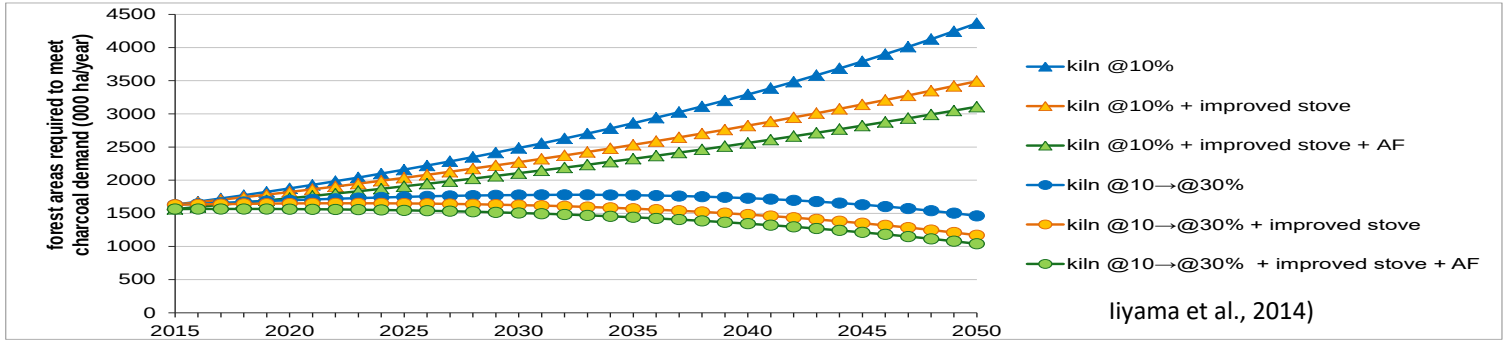
Sustainable harvest of wood on farm ex. agroforestry, reducing pressures on forests

Efficient kilns– efficiency ±30% but capital intensive, need skills,

Alternative biomass fuel from organic waste

Improved stoves, save up to 10-60% biomass, cleaner combustion

Open fire or inefficient stoves, causing indoor air pollution



Iiyama et al., 2014)

Biochar producing stove

Agender 2063-Energy of the African Union. Harnessing energy resources in Africa for modern, efficient, reliable, cost effectives, renewable and environmental friendly energy

Systems approach to mitigate climate change and improve livelihoods: To produce 1kg of charcoal=6-9kg of CO_2e. Sustainable wood management eliminate or result into net sequestration, efficient kilns reduce by 80% and efficient stove by 63% (FAO, 2017).

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Transdisciplinary (TD) approach in making woodfuel systems sustainable

Approach

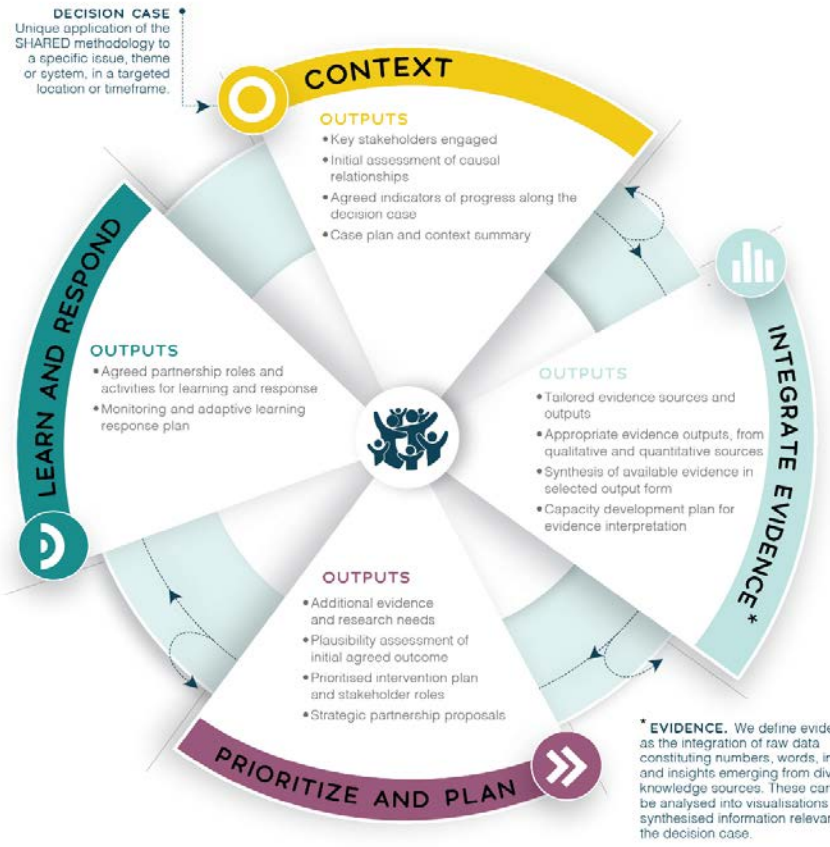
- Co-generation of knowledge,
- Co-creation of skills, innovations, technologies
- Co-learning,
- Mutual respect/trust
- Open mindedness
- Users as research partners
- Social and natural science methods
- Global north-south collaboration, south leadership

TD R&D Team

- Bioenergy scientists
- Sociologist and gender researchers
- Environmental & architectural engineers
- Systems and climate change scientists
- Social and agricultural economists
- *Community researchers*
- Capacity development
- Advocacy and communication
- Policy makers
- Development practitioners and funders

TD in R&D to make woodfuel systems sustainable

StakeHolder Approach to Risk-informed and Evidence-based Decision Making



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SHARED the decision-making hub

Measuring gases and particle concentrations from cooking with wood fuels

?

Participatory kitchen laboratory

Women researchers

Students studying design and materials (Sweden, Pennsylvania State University, USA) working with cooks mainly women in improvement of cooking systems

20% fuel conversion to biochar by gasifier stove. Gasifier save 40% fuel, reduce CO by 40% and $PM_{2.5}$ by 90% Njenga et al., 2016 . *Support:* VR, FORMAS, Swedish Council of Sciences

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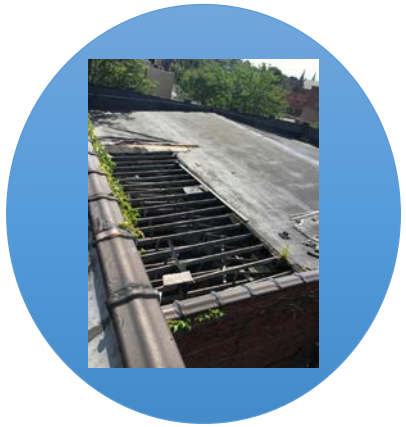
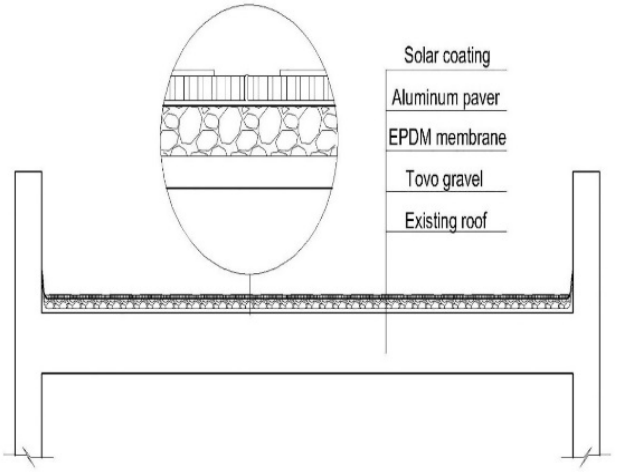
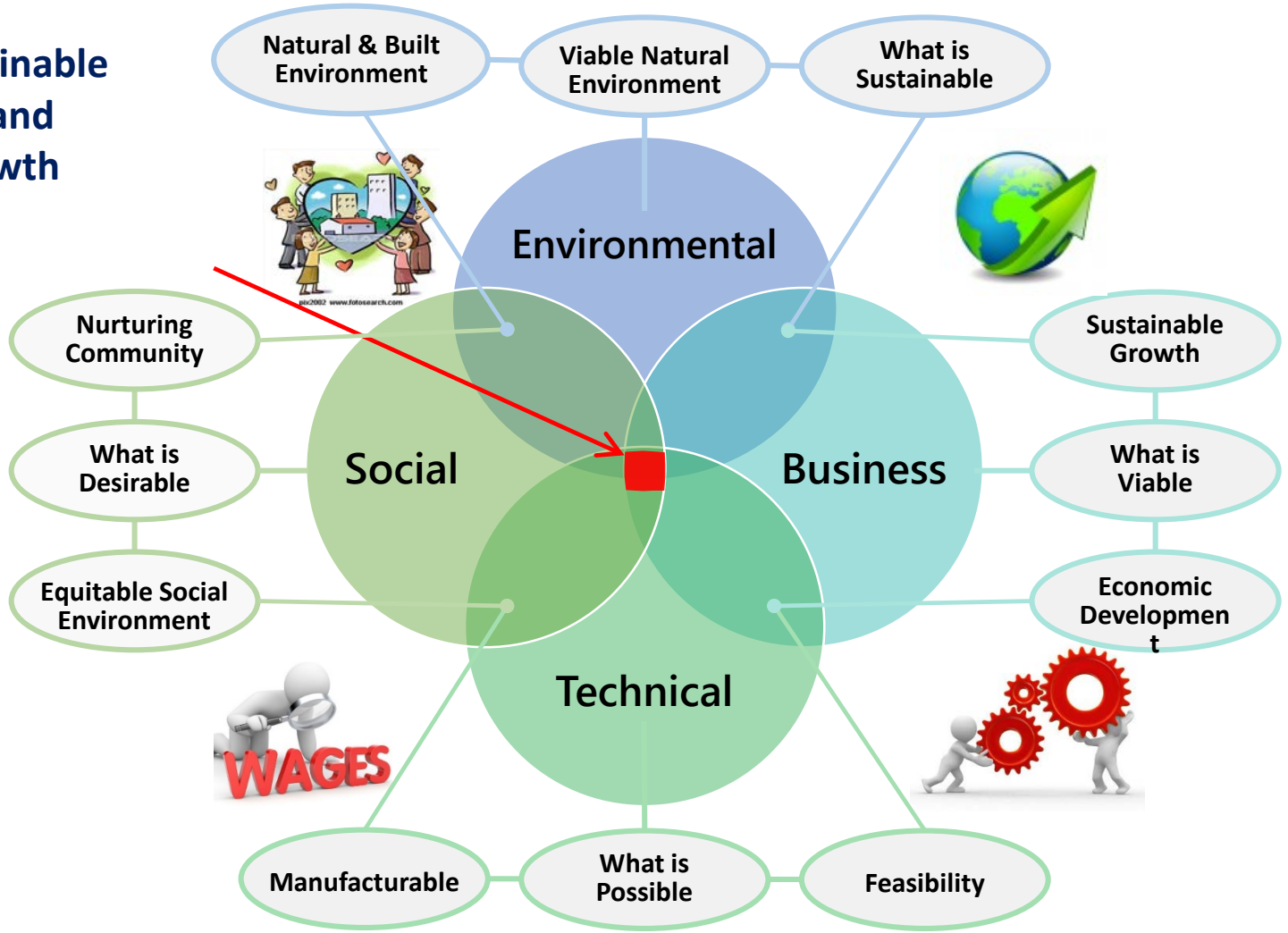
Goal: Improve the physical, economic and social infrastructure of New Kensington, Pennsylvania to support the vision of business development

TD for sustainable innovation and societal growth



Energy generating re-roof concept





Re-roofing only solves one aspect of the problem hence the need for TD approach

As researchers or practitioners what are the possible interactions/collaboration with practitioners resp. researchers to improve/upscale your activities

- Systems approach for sustainable woodfuel including knowledge generation, innovation development and assessment of social, economic, technical, institutional and environmental impacts

- Training resources/knowledge and capacity development (stakeholders, post graduate research projects) and solution focused communications

- Influencing policy and planning

- Transdisciplinary (TD) and stakeholder engagement approaches for sustinable woodfuel systems

What are the potential aspects of the research that can be transformed into practice?

- Sustainable wood production -agroforestry (agriculture with trees/climate smart agriculture), farmer managed natural and assisted regeneration
- Effiecient and gender responsive technologies in wood processing into charcoal
- Resource recovery and reuse (RRR) for energy. Processing organic residues for biomass (briquettes) and liquid energy.
- Effective and inclusive marketing of woodfuel
- Efficient consumption technologies that respond to users needs and cooking culture