IMPLEMENTING THE NEW URBAN AGENDA IN THE PACIFIC

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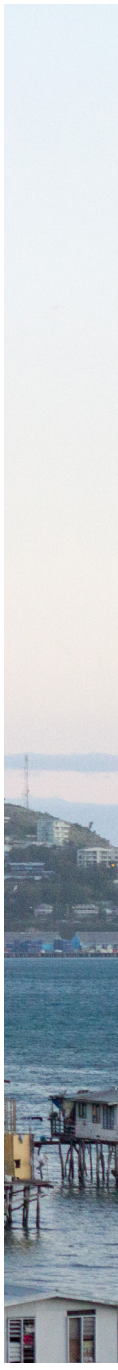


PRESENTATIONS SIDE EVENT 1

SIDE EVENT 1:

New waste and energy solutions in the Pacific

Host

Sponsors and Co-organizers

UN-HABITAT FOR A BETTER URBAN FUTURE

MONASH University

Commonwealth Local Government Forum

UNITED NATIONS ESCAP Economic and Social Commission for Asia and the Pacific

PACIFIC ISLANDS FORUM SECRETARIAT

rise REVITALISING INFORMAL SETTLEMENTS AND THEIR ENVIRONMENTS

PARTICIPATORY SLUM UPGRADING

compass housing services

SIDE EVENT 1:
New waste and energy solutions in the Pacific

Day 1 (1 July, 2019. Nadi, Republic of Fiji).

Organized by: EAROPH AUSTRALIA

Moderator: Mr. Clinton Moore, Vice President EAROPH Australia
Speakers:

- Dr. Jane Stanley, President EAROPH Australia

EAROPH Australia has formed a Technical Working Group to showcase some emerging technologies in the areas of waste, energy, and waste-to-energy that also have significant impacts in mitigating greenhouse gas emissions. Three case studies were presented to illustrate how these technologies could be customized within a business case for different applications. These were:

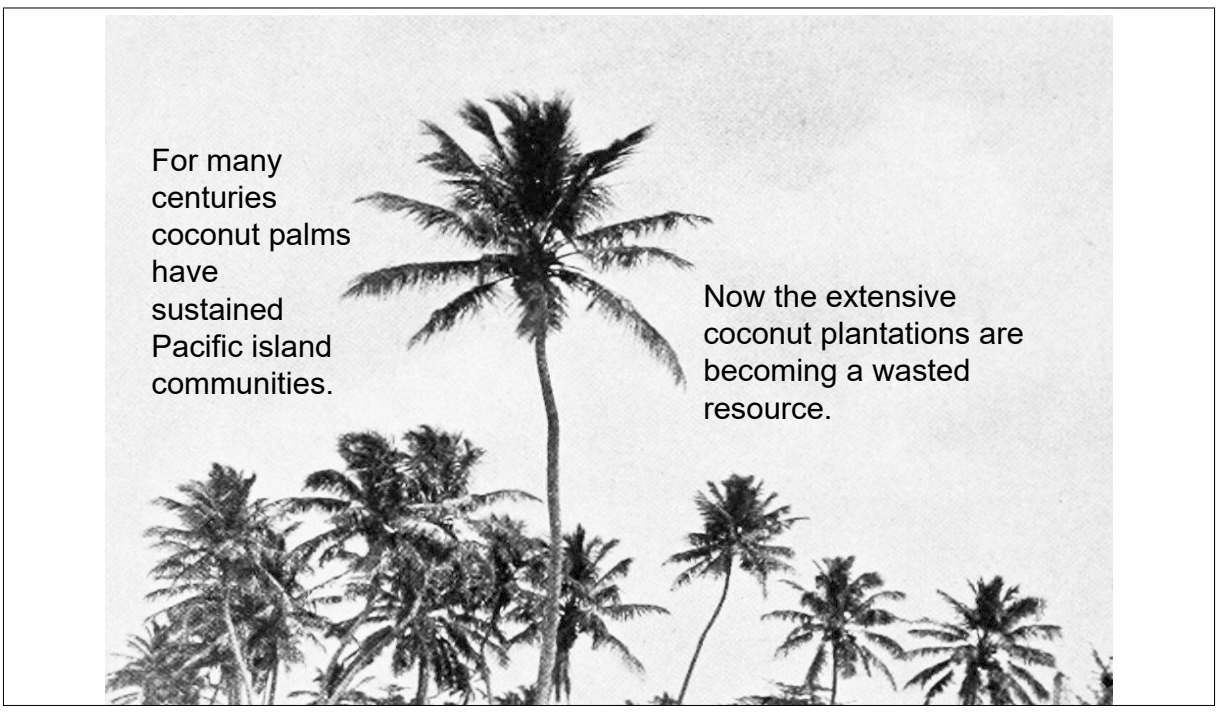
(a) Using a mobile small scale pyrolysis to process dead or dying coconut trees to produce energy that can power a sawmill for coconut timber as well as an associated copra plant (with husks providing more feedstock for energy). Byproducts are smart biocarbons that have significant applications for agriculture or bioremediation.

(b) A model for eliminating landfill through (i) removing green waste for separate accelerated commercial composting, using a low cost process for controlling temperature and moisture, producing a consistent high quality product; (ii) processing woody waste by taking the mobile pyrolysis plant to where the waste is being created; (iii) processing remaining mixed wastes to produce high quality biodiesel through either pyrolysis or depolymerisation; (iv) mitigating landfill methane emissions using smart biocarbons from the small scale pyrolysis plant; (v) mining the existing landfill using the same process.

(c) A review of the different actions that dairy farmers (as an example) can take to reduce greenhouse gas emissions, with identification of those that are cash positive for the farmer and potentially eligible for claiming carbon credits.

COCONUT POWER

Dr. Jane Stanley, President EAROPH Australia



TURNING A PROBLEM INTO A RESOURCE

- **many coconut trees are at the end of productive life (60% of coconut palms in Fiji are "senile")**
- **dead or dying trees harbour disease and vermin (rotting timber is home to beetles, snails and rats)**
- **... so younger trees become less productive**
- **... so the coconut industry becomes less profitable**
- **... so less investment and further decline .....**

THIS IS A HUGE WASTE OF RESOURCES

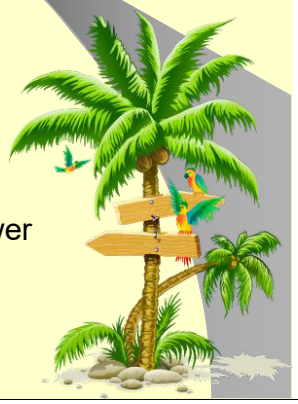
WASTE ⟹ ENERGY

Small pyrolysis machine can process waste timber and husks

- produces energy
- produces smart biocarbons for making soils more productive plus organic pesticides

Plant processes 2 tonnes of logs per day

- 1 tonne per day high quality biochar
- 2.5 tonnes per day wood vinegar
- over 3MW per day electricity or thermal power



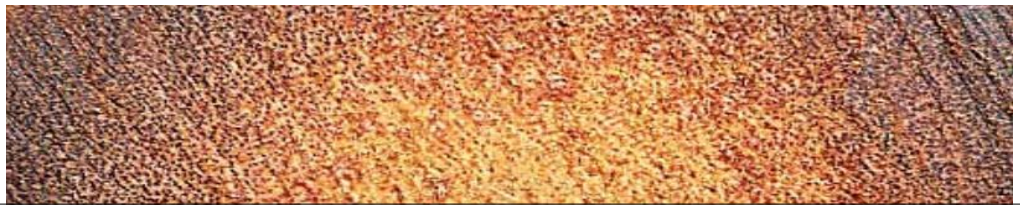
Pyrotech Energy

Shipping container size

- **can be moved between sites**
- **add dryer, chipper and generator for complete processing on site**

ENERGY ➡ ECONOMIC DEVELOPMENT

- **Coconut wood is increasingly popular**
- **used for floor overlay and parquet tiles**
- **older timbers best**
- **maybe 50% yield from "senile" palms**
- **domestic and export markets.**



ENERGY USE FOR TIMBER

- Milling
- Kiln drying
- Waste processed for more energy


MAXIMISING VALUE FROM THE RESOURCE




THEN USING ADDITIONAL ENERGY FOR REVITALISING COCONUT PROCESSING

- **edible fresh coconuts**
- **value added food products**
- **coconut oil, etc etc**

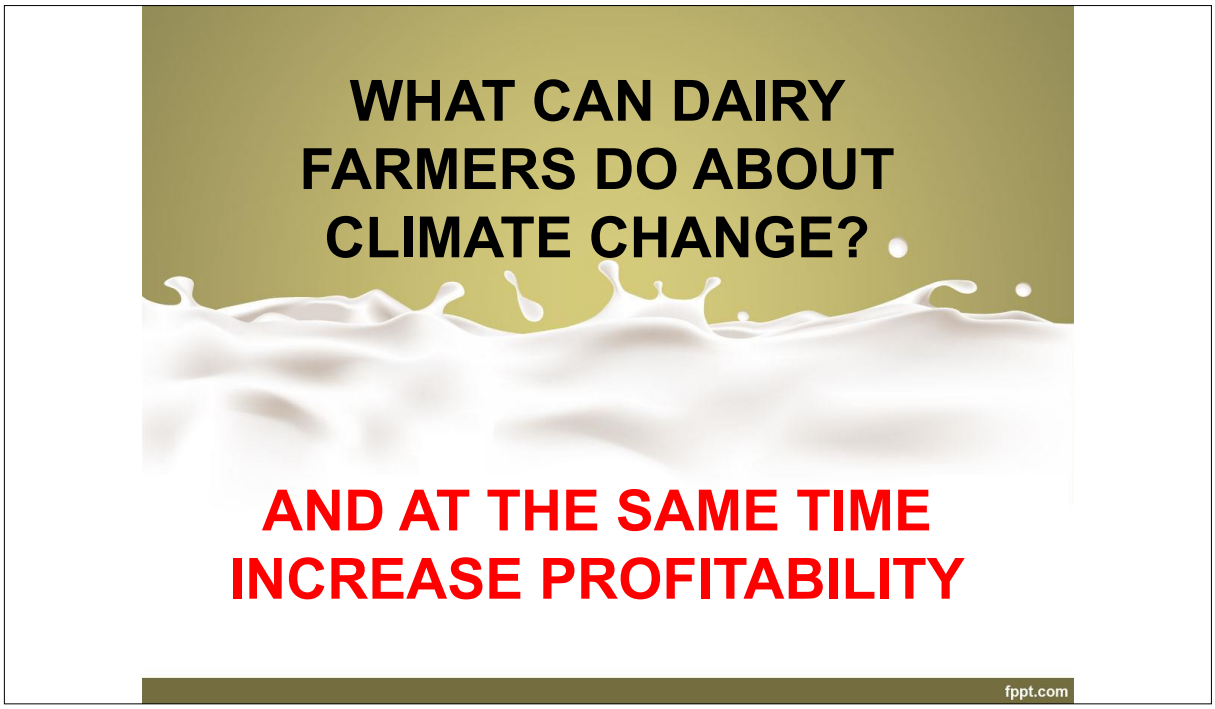
- copra meal as animal feed
- husks have been a problematic waste stream but now they can be fed back into the pyrolysis process.

CLOSING THE LOOP

NUMBER CRUNCHING

- around US $1.5M for pyrolysis plant plus chipper and generator
- payback period should be less than five years
- provide power to communities beyond the grid
- far less greenhouse gas emissions than power from fossil fuels (addressing climate change)

Dr. Jane Stanley, President EAROPH Australia



- planting trees
- processing dead timber
- putting carbon into the soil
- using less energy
- using renewable energy
- processing dairy wastes
- supplementing feed

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Benefits for the farmer:

- microclimate
- soil retention
- water quality

Benefits for CO2 reduction:

- significant if large areas

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Benefits for the farmer:

- reduced fire risk
- productive land

Benefits for CO2 reduction:

- better than open burning
- energy replaces use of fossil fuels
- biochar as a byproduct for soil carbon or fodder supplement

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Benefits for the farmer:

- water retention
- reduced acidity
- improved fertility

Benefits for CO2 reduction:

- reduced nitrous oxide emissions (300 x C02) from fertiliser use

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Benefits for the farmer:

- reduced farm costs
- good return on investment

Benefits for CO2 reduction:

- opportunities to optimise and store thermal energy (= 2/3 energy on dairy farms)

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USING RENEWABLE ENERGY

Benefits for the farmer:

- peak shedding reduces energy charges
- reliability
- pays for itself

Benefits for CO2 reduction:

- replaces energy from burning fossil fuels

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Benefits for the farmer:

- treated effluent better for soils
- biogas to heat water
- pays for itself (just)

Benefits for CO_2 reduction:

- avoids emissions from spreading effluent on land
- replaces energy from burning fossil fuels

SUPPLEMENTING FEED (BIOCHAR OR SEAWEED)

Benefits for the farmer:

- more efficient feed conversion
- healthier cows
- putting carbon into soils
- can put drums in the paddocks

Benefits for CO_2 reduction:

- less methane from cow burps
- less emission from dung & urine
- less emissions from soil


THE AVERAGE DAIRY FARM IN AUSTRALIA CAN REDUCE CO2 EMISSIONS BY AROUND 800 TONNES PER YEAR
COST NEUTRAL
credits currently worth around $10,000 per year, potentially worth $80,000 to the global community
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ELIMINATING LANDFILL

Dr. Jane Stanley, President EAROPH Australia

waste → resource recovery → energy → reclaiming land

ELIMINATING LANDFILL

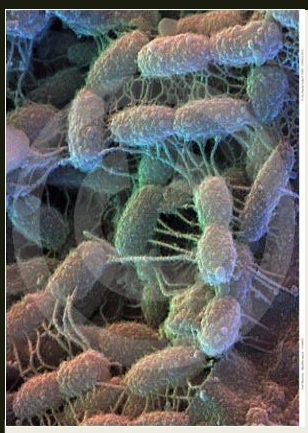
turning a problem into an opportunity

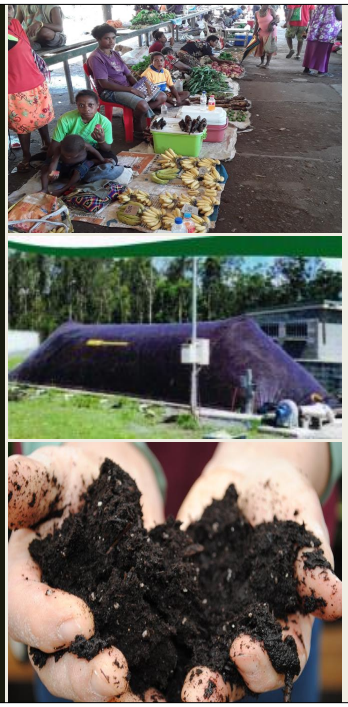
WHAT'S THE PROBLEM?

Landfill takes up more and more land that could be used more productively with additional problems being:

- unsightly and smelly conditions affect neighbours
- waterways can be polluted
- resource recovery is made more difficult (now and in future)
- methane emissions from rotting garbage is a significant contributor to greenhouse gases

1 tonne of methane is equivalent to 23 tonnes of carbon dioxide as a greenhouse gas





Step 1 Composting green wastes

- collect green wastes from markets (ban plastic bags) eg 13m^3 per day in Port Moresby
- add organic waste from other industries eg abattoirs, sawmills, piggeries, sugar mills
- best quality compost if feedstock, moisture and temperature controlled
- accelerated composting eg 4 weeks rather than 6 months (some processes have 24 hour turnaround)
- NCDC chose FABCOM as the most cost effective option

put the nutrition back into the ground and reduce greenhouse gas emissions

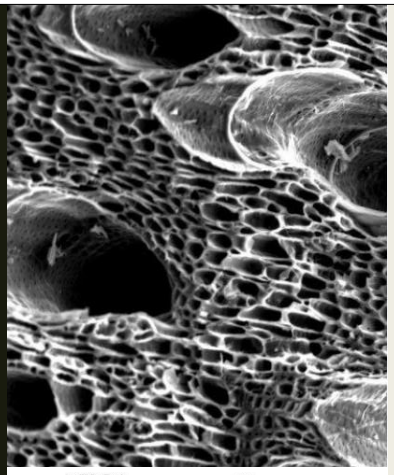
Process the timber where it lies

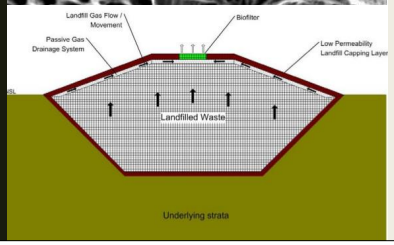
Step 2: Energy from woody wastes

2T per day mobile pyrolysis plant produces:

- 250kg biochar* *(hold that thought)*
- 1,000L wood vinegar (organic pesticide)
- syngas and/or pyrolysis oil for energy (over 1MW per day)

keep it out of landfill and create a valuable foundation for economic development





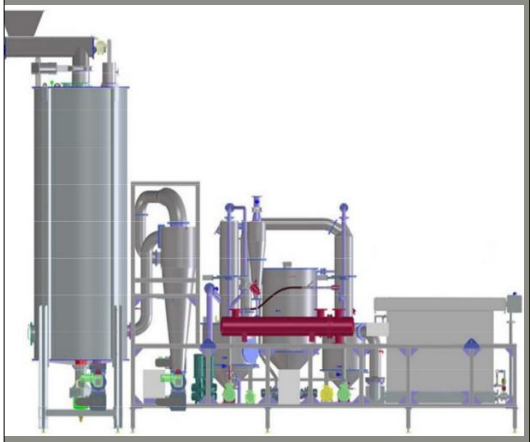
Biochar has many uses

- water filtration (as activated carbon)
- fodder supplement for cows (self regulated)
- increasing soil water retention (drought proofing)
- increasing beneficial micro-organisms in soils (mix 10% with compost)
- bioremediation (addressing pollution)

Step 3

Use as a landfill cover or in treatment cells to absorb and modify gases, reducing greenhouse gas emissions

everal technology options
pyrolysis or depolymerisation



need guarenteed volumes

Step 4 Pocessing garbage

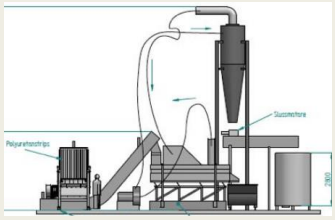
Divert mixed household waste, plastics etc
eg 50T per day @ 15% moisture
produces 4-8ML biodiesel per year
(depending on technology)

Some processors will provide 100% capital
if there is a contract to purchase the biodiesel at a guaranteed price
(it pays for itself)

particularly attractive for countries which rely on imported diesel for their power

Step 5 Mining existing landfill

- more biodiesel produced from existing waste stockpile
- may require subsidy if mixed with soil and gravel
- might be 10-20 year programme



let's get rid of it completely

IN SUMMARY

1. **Compost the organics** off site as a food production resource.
2. Use **mobile pyrolysis for timber wastes** to produce biochar/wood vinegar (used in agriculture) and energy (for new economic activity).
3. Divert the remaining waste stream to produce biodiesel/electricity using **pyrolysis or depolymerisation of garbage**.
4. Apply **biochar remediation** to suppress greenhouse gas emissions from existing landfill.
5. **Mine the remaining stockpiles** to recover the land for productive use.

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Pacific Urban Platform

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http://www.fukuoka.unhabitat.org/info/news/puf.html