Energy Efficiency within Agro-ecology: A Case of the University of Johannesburg.

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1. Snippet into the Future

Rapid Urbanisation

More than 80% of Africa's population will be urbanized by 2050 (WEF, 2020).

Cities consume the most **energy** (75% primary energy). Biggest GHG emitters too.

Growing interests to incorporate more green lungs, with special focus on urban agriculture (curb emissions & easy access to fresh produce).

Food Security

Demand for and cost of food is also expected to increase due to limited arable land – challenging food security.

Entrepreneurs and civil society driving innovations to encourage innovations supporting urban agriculture.

Energy is required for innovative and decentralised food production linked to lighting, heat and processing.

Access this energy? Type of energy? Clean? Efficient?

2. Case Study: The Centre for Ecological Intelligence (CEI)

Who We Are

CEI incorporates the collective and convergent understanding of agroecology, entrepreneurship, waste management, small enterprise, precision engineering, sustainable food systems within the water-energy-food nexus all of which contribute to addressing the complex issue of food and nutrition security in its broadest scope.

What We Do

CEI is well positioned to support and enhance UJ's values of inspiring the communities in which we work to transform problems into possibilities. Our interventions are innovative, practical and carried out in a collaborative and inclusive approach to pursue knowledge and build community wealth and health.

CEI acts as a link between community outreach and substantive projects.

3. Our Agroecological Pilot Project

1. The APB Food Systems Hub provides a unique opportunity to showcase how renewable energy supports food security.
2. CEI works with Civil Society and Private Sector to set up a pilot projects that incorporates renewable energy and water efficiency options to enhance energy supply & efficiencies at the APB Flagship site.
3. Interventions effectively and efficiently managed with rigorous monitoring and evaluation.

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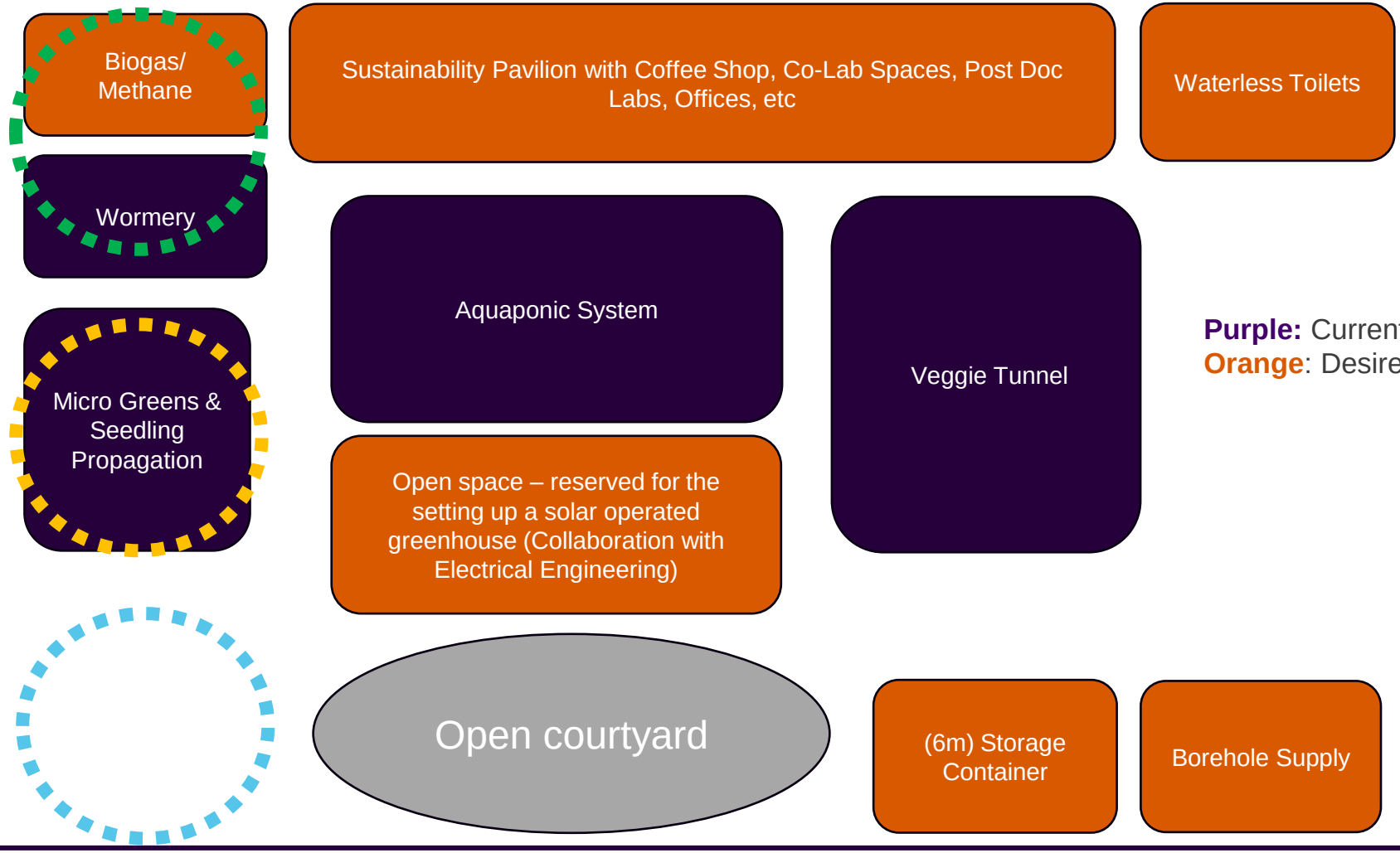
4. Current Site and Opportunities

Below are renderings of the site and required infrastructure to fully become a flagship site:

Green: Onsite Waste Management using agro-waste from veggie tunnel as primary feedstock

Amber: Desired/Proposed Infrastructure

Blue: Proposed Waste Water Management & Reticulation System



Purple: Current Infrastructure
Orange: Desired/Proposed Infrastructure

5. Data Collected: Energy Use and Efficiencies

Electrical Load @ APB

CEI APB Site Electrical Load Analysis

Date Generated: 05/10/2022

Compiled by: Tanaka Mugweni

*calculations are based on pumps and heaters working at full capacity, actual usage is typically lower. Results shown are the maximum values

Supply Voltage (V)	240

Sr.No	Appliance	Quantity	Rating (Watts)	Total Rating (Watts)	Load Current (A)	Run Time/Day (h)	Daily Consumption (kWh)
1	Jebao MDC1500 Water Pump	7	30	210	0,88	24	5,04
2	Submersible Water Heaters	19	500	9500	39,58	24	228,00
3	Aquaponics Air Pump	1	600	600	2,50	24	14,40
4	Peripheral Pump (Aquaponics)	1	370	370	1,54	24	8,88
5	Peripheral Pump (Irrigation)	1	370	370	1,54	0,5	0,19
	Totals			**11050**	**46,04**	**NA**	**256,51**

- Current daily usage (worst case) = approximately 250 kWh = R 550 per day in electricity costs.

PV System & Load Analysis

- System was greatly undersized and uses gel batteries which have shorter life span compared to Lithium batteries.
- Batteries have probably lost significant capacity.

Requirements to be More EE

- Switching to a off-grid system would require significant capital and exhibit limited ROI unless alternative heating methods are employed as heating is the most energy intensive task at APB.
- Need for alternative heating technologies in aquaponics as loadshedding makes it hard to efficiently regulate temperatures.
- Biogas is a viable planned alternative.
- Wind energy is also an exciting prospect as the site experiences steady winds. Would need further analysis to determine feasibility.

6. Partnering for Shared Benefits

Benefits for UJ

Environmental:

1. Reduce reliance on grid/have back up
2. Reduce produce loss
3. Promote circular economy & food security
4. Improve output

Social:

1. Capacity & Skills Development for students
2. Inspire multidisciplinary research projects
3. Align with UJ's SDGs mandate

Economic:

1. Promote entrepreneurship
2. Sustainable new jobs along value chain

Benefit for Private Sector

Environmental:

1. Showcase impact of solar on food security
2. Reduce GHG associated with sustaining agro-projects

Social:

1. Skills development for staff
2. Inspire new offerings
3. Align with mandate to work with tertiary institutions

Economic:

1. Sustainable job and create new ones along the value chain
2. Address SGDs

Thank You & Interaction

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