

# Community Development Supports for the Waste to Energy Supply Chain in the Knysna Municipal area



13 APRIL 2023

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- ▶ Introduction
- ▶ Alignment with National concerns and EWSETA
- ▶ Knysna Waste to Energy : Feasibility and results
- ▶ Our Proposal and Support needed

# Our challenge



Energy crisis



Water  
scarcity



Waste



Slow  
economic  
growth



High  
unemployment  
rate

# Introduction



## Subcommittee - Water Waste & Energy



**CO-CO WASTE TO ENERGY**

**CO-CO solutions**

2018 /073803/07

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# Alignment with EWSETA



ENERGY AND WATER SECTOR EDUCATION AND TRAINING AUTHORITY

# KEY DRIVERS



**OUR MANDATE:** To anticipate, build and strategically plan and manage skills development and training needs in the energy and water sectors as directed by the National Skills Development Plan 2030



**OUR VISION:** Creating a sustainable tomorrow today, through skills



Energy crisis



Water scarcity



Climate change  
&  
Waste



Slow  
economic  
growth



High  
unemployment  
rate

## ENERGY ACTION PLAN

❑ President announced the Plan in July 2022, which seeks to outline plans to address electricity shortfall of 4000 to 6000 MW through five key interventions namely

1. accelerating maintenance of Eskom's coal-fired power stations
2. removing red tape to enable private investment in generation capacity
3. expediting procurement of new capacity from alternative sources such as renewables, gas and battery storage
4. Incentivize rooftop solar investment for businesses and households
5. Transform the electricity sector towards a competitive market to achieve long-term energy security.

# SKILLS DEVELOPMENT IS KEY TO A JUST ENERGY TRANSITION

“ As part of ensuring a just transition, we will need to put measures in place that plan for workforce reskilling and job absorption, social protection and livelihood creation, incentivising new green sectors, diversifying coal dependent regional economies, and developing labour and social plans as and when ageing coal-fired power plants are decommissioned ”

*President Cyril Ramaphosa*





# ENERGY STRATEGIC FOCUS

- Improved planning through collaboration with employers and industry association bodies
- Industry driven and relevant learning programmes to respond to emerging technologies
- Specializations
- National imperatives:
  - ✓ Just Energy Transition
  - ✓ Economic Reconstruction and Recovery Plan
  - ✓ District Development Model
  - ✓ Etc





6/28/2023

## ENERGY SKILLS ROADMAP

- ❑ Reskilling and upskilling of labour force to enable better equipped to navigate the energy transition at various points in the energy value chain.
- ❑ Demand driven energy skills development for future skills needs, with particular focus on jobs that will support a just energy transition.
  - Technical skills
  - New emerging skills/ specialisations
- ❑ Building on foundational skills throughout the education system to improve the adaptive capacity of the graduates.
- ❑ Alignment to National and District/ Local Municipal level strategic projects



ENERGY AND WATER SECTOR EDUCATION AND TRAINING AUTHORITY

# Knysna Waste to Energy Project

Environmental Contribution To Energy Crisis  
In South Africa



KNYSNA  
Municipality Munisipaliteit oMunipala





IT DRIES THE WASHING USING THE VERY  
LATEST TECHNOLOGY – A COMBINATION  
OF SOLAR AND WIND POWER




**CO-CO WASTE  
TO ENERGY**



2018 / 073003/07

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- 
- A. Background
  - B. Approach and methodology followed
  - C. Current scope and feasibility findings
  - D. Identification of the 'gap'
  - E. Risks and key success factors
  - F. Roadmap to establish a WtE facility in KLM
  - G. Roadmap scenarios
  - H. Summary

- ▶ The Waste- Electrical- Environmental - departments of KLM play a central role in the feasibility study of a possible WtE plant, as the feedstock needed for such a facility, is obtained from the activities in these departments. Energy generated from a WtE plant will be distributed by this department.
- ▶ Supporting departments, like Economic Development and Finance were also identified as stakeholders as they provided valuable information to the feasibility study.



## 1. Introduction: Brief overview of KLM demographics

## 2. Situation analysis of the relevant KLM Departments:

### 2.1 Waste department:

- 2.1.1 Types of waste identified in KLM
- 2.1.2 Quantity of waste in KLM
- 2.1.3 Current landfills in KLM
  - Old Place
  - Transfer station:
  - Knysna Recycling depots
  - Simola Private landfill
  - Sedgefield landfill
  - Illegal dumping sites
- 2.1.4 Tariffs
- 2.1.5 Costs of Waste handling in KLM
- 2.1.6 Conclusion



### 2.2 Environmental Department

### 2.3 Electricity department

# Waste type

Waste type:	Data Source:	Average/ month: (tons)	% of waste generated	Disposal Method:
<b>Domestic waste</b>	Petro SA.	1043.5	59.19%	To Petro SA
<b>Recyclables</b>	KLM	57.1	3.24%	Recycled
<b>Green waste</b>	Data reported to IPWIS	161.1	9.14%	Old Place Landfill
<b>Construction waste</b>	Simola	500	28.36%	Simola Landfill
<b>HCRW</b>	WCDoH	1.35	0.08%	No evidence found
<b>TOTAL:</b>		1763.05	100.00%	



# Cost of transportation

## TRANSPORTATION OF REFUSE TO PETRO SA (GREENS RECYCLING CC)

Month	2016	2017	2018	2019	2020	2021	2022
Unit (Ton)	12747.94	13460.06	12012.91	11419.91	10133.97	9893.67	8627.52
Average weight/month	1062.32	1121.67	1001.08	951.66	844.50	824.47	718.96
Total dumping fee at PetroSA		R 4,198,371	R 3,004,398	R 2,644,146	R 2,627,505	R 2,567,333	R 2,382,847
Dumping fee at PetroSA/ton	R 0	R 312	R 250	R 232	R 259	R 259	R 276

# Availability per KLM ward

Ward	Fire risk	Hectares	Ha totally invaded	Dry Weight (55%) m <sup>3</sup>	Days stock (40t/day)	
1	High	87.75	0.3	19.257235	0.48	
2	High	15.94	0.81	124.39168	3.11	
3	High	97.05	6.65	2343.5358	58.59	
4	High	391.68	28.73	2317.9253	57.95	
5	High	228.65	13.16	998.51089	24.96	
6	High	139.48	14.97	1696.6261	42.42	
7	High	150.37	9.75	13654.629	341.37	
8	High	98.87	6.88	4443.4929	111.09	
9	High	39.74	2.94	7942.6334	198.57	
10	High	1263.26	100.42	7421.7859	185.54	
11	High	1086.21	87.55	15464.329	386.61	
TOTALS:		3598.99	272.17	56427.12	1410.678	Days

# Total costs per year

Item	Type of Waste costs	Period: Jan-Dec 2022
Illegal dumping	Various wards clean up and transport after illegal dumping.	R6 284 270.27
Knysna Domestic waste	Domestic waste transported to Petro SA	R7 627 306.56
Knysna waste	Transport of containers from refuse	R3 880 405.60
Bulk waste	Bulk waste transported by Transtech	R1 116 765.00
Bulk waste	Bulk waste transported by Ukhana	R1 587 567,57
Recycling	Recycling contract Knysna	R1 785 000,00
	<b>TOTAL FOR KNYSNA:</b>	<b>R 22,281,315.00</b>
Sedgefield	Sedgefield Waste station rental and work on waste area.	R1 277 039.05
Sedgefield	Transport of MSW from Sedgefield to Knysna before transport again to Petro SA	R937 930,60
Sedgefield	Hiring of equipment for Sedgefield & Smutsville waste	R230 236,30
Sedgefield	Tipper services & TLB	R161 820.00
	<b>TOTAL FOR SEDGEFIELD:</b>	<b>R 2,607,025.95</b>
	<b>TOTAL FOR KLM:</b>	<b>R 24,888,340.95</b>

Item	Type of Waste costs	Period: Jan-Dec 2022	Total costs saving
Illegal dumping	Various wards clean up and transport after illegal dumping.	R6 284 270.27	YES, at least 50%* R 3 142 135.13
Knysna Domestic waste	Domestic waste transported to Petro SA	R7 627 306.56	YES R7 627 306.56
Knysna waste	Transport of containers from refuse	R3 880 405.60	YES R3 880 405.60
Bulk waste	Bulk waste transported by Transtech	R1 116 765.00	YES R1 116 765.00
Bulk waste	Bulk waste transported by Ukhana	R1 587 567,57	YES R1 587 567,57
Recycling	Recycling contract Knysna	R1 785 000,00	YES, at least 50%** R 892 500.00
	TOTAL FOR KNYSNA:	R 22,281,315.00	R 18,246,679.29
Sedgefield	Sedgefield Waste station rental and work on waste area.	R1 277 039.05	NO, the waste station will contribute in bunkering waste for WtE plant
Sedgefield	Transport of MSW from Sedgefield to Knysna before transport again to Petro SA	R937 930,60	Initially NO
But when Sedgefield	Hiring of equipment for Sedgefield & Smutsville waste	R230 236,30	Yes (R230 236,30) due to WtE project that will use equipment in bunkering waste for WtE plant
Sedgefield	Tipper services & TLB	R161 820.00	Yes (R161 820.00) due to WtE project that will use equipment in bunkering waste for WtE plant
	TOTAL FOR SEDGEFIELD:	R 2,607,025.95	R 392 056.30
	TOTAL FOR KLM:	R 24,888,341	R 18,683 735.46

SAVING ?



# Technologies

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**Type of Thermal Process  
technology**

**Net Energy  
Production to grid:**

Mass burn incineration

514kWh

Pyrolysis

571kWh

Pyrolysis/gasification

685kWh

Conventional gasification

685kWh

Plasma Arc Gasification

816kWh

One large-scale waste-to-energy plant that operates from Athlone in Western Cape. The plant operates on the Anaergia technology (AD) with a capacity of processing 500-ton MSW per day. The plant converts usable waste (plant material, bio-waste and other non-plastic waste) into various products, including organic fertiliser, liquid carbon dioxide (CO<sub>2</sub>), compressed biomethane and recyclables. The rest of the of the MSW is accumulated and branded, refuse-derived fuel (RDF). (Source: (Mutezo, 2015; Mutungwazi et al., 2018; Strachan et al., 2017; Western Cape Government, 2013).

There are over **1700 thermal WtE plants worldwide**. More than 80% are located in the developed countries, led by Japan, France, Germany and USA. Majority of these plants are thermal waste plants, meaning that incineration is the major technology applied.

China is playing the leading role in technology development and has currently +-330 WtE plants, and they are mainly utilizing the newest technology.

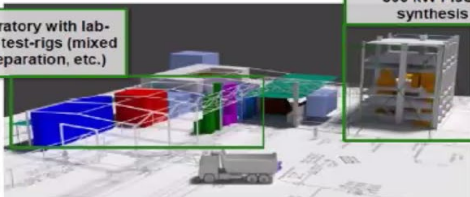
# Austria: Project Waste2Value

## 1 MW DFB gasification + synthesis: Waste2Value

New research location at industrial site Simmeringer Halde

1 MW DFB gasification demonstration plant (improved reactor design) + 300 kW Fischer-Tropsch synthesis pilot plant

Research laboratory with lab-scale synthesis test-rigs (mixed alcohols, H<sub>2</sub> separation, etc.)

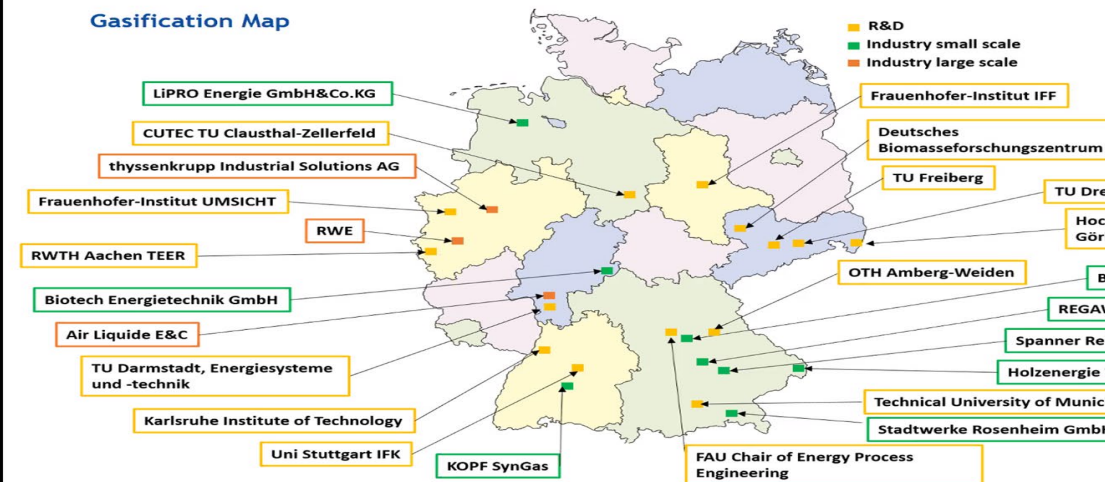


Now under construction  
April 2021 first tests planed  
May 2021 commissioning  
June 2021 operation



# Germany

## Gasification Map



# Italy - Gasification plants across Italy - 2019

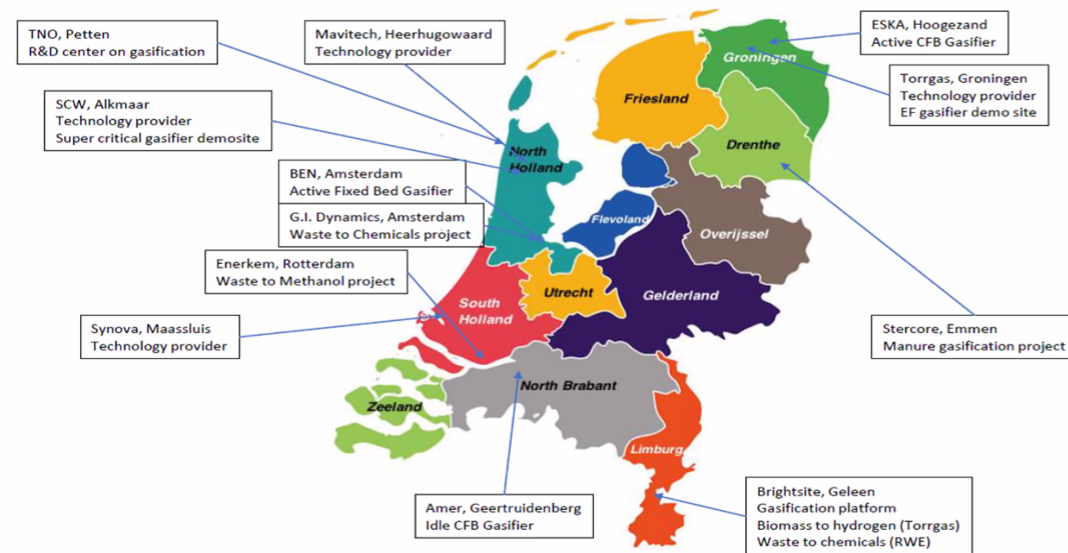


Year of ref.	2019
Total Power (kWel)	56674
Total Number	267

N° Plants, 2019



# The Netherlands



Wuhan, China (Wuhan Kaidi/Alter NRG, demonstration plant)	The plasma gasification unit was designed to process approximately 100 tons per day of <u>biomass</u> waste and convert it to clean syngas. The syngas is then converted into <u>diesel</u> fuel and other transportation fuels at the Kaidi facility.
Pune, Maharashtra, India (Maharashtra Enviro Power Limited)	A 72 ton-per-day plasma-based hazardous waste treatment plant, located in <u>Pune</u> , India, was commissioned in 2008. It is based on Westinghouse Plasma Corporation's (WPC) plasma technology and reactor vessel design. The produced gas was meant to immediately be combusted in a steam boiler driving a steam turbine producing up to 1.6 MW (net) of electricity.
Mihama-Mikata, Japan (Hitachi Metals Ltd.)	In 2002 a 28-short-ton (25 t) per day plant was commissioned in the twin cities of <u>Mihama</u> and <u>Mikata</u> . <sup>[5]</sup> The Westinghouse Plasma plants used a fixed bed gasifier with plasma torches in the bottom,
National Cheng Kung University - Tainan City, Taiwan (PEAT International)	The facility is able to handle 3-5 metric tons (3.3-5.5 short tons) of waste per day from a variety of waste streams, including incinerator <u>fly ash</u> , <u>medical waste</u> , organic industrial process waste and inorganic sludges. It can also process waste consumer <u>batteries</u> and other materials, including <u>heavy metal</u> sludges, and refinery <u>catalysts</u> (waste streams that would generate valuable metal <u>alloys</u> ), but no energy recovery efforts are reported.
USS Gerald R. Ford (CVN-78) Supercarrier - US Navy (PyroGenesis Canada Inc.)	A compact Plasma Arc Waste Destruction System (PAWDS) was installed by PyroGenesis Canada Inc. on board the aircraft carrier <u>USS Gerald R. Ford (CVN-78)</u> . The system was designed to treat 200 kg/h combustible solid waste without <u>energy recovery</u> .



Item	Quantity	Unit	Calculation
Feed	20	Tpd	
Moisture	10	%	
Ash	10	%	
Parasitic load	417	kW	
Quantity gas produced	22 553	kg/d	
	29 808	m <sup>3</sup> /d	
Gas calorific value	11	MJ/kg	
Energy in gas	248 090	MJ/d	22 553*11
	2 871	kW per sec	248 090/ (24*3600)
Electricity generator efficiency	27.3	%	
Electricity generated (Gross)	784	kW per sec	2 871*27.3%
Electricity generated (Nett)	367	kW per sec	784-417
Un-recoverable energy losses	172	kW per sec	6% of 2 871
Reject energy available	1 915	kW per sec	2 871-784-172
Steam generation efficiency	80	%	
Heat/steam energy available	1 532	kW per sec	1 915*0.8
Electricity before parasitic load*	940	kWh/ton	784*24/20
Electricity after parasitic load	800	kWh/ton	667*24/20

ENERGY AVAILABLE

Type of waste:	Ton available /day(wet)	Ton/day to WtE (dry)
MSW	50	25
Sludge	70	31.5
Green waste	10	5
Biomass	87	39.15
Haz waste	10	10
TOTALS:	227	110.65

## 6 modules of 20 ton per day

- Module 1: dedicated to sewage waste.
- Module 2: dedicated to MSW.
- Module 3: Balance of MSW, green waste and sewage
- Module 4: dedicated to biomass.
- Module 5: dedicated to biomass.
- Module 6: dedicated to hazardous waste of KLM and neighboring towns?

# Households to benefit

Modules:	Output per hour in kWh	Own usage in kWh	Sellable usage in kWh	Average usage/ day in kWh	Sellable kWh/day	Amount of house holds
1	940	140	800	20	19200	960
2	940	140	800	20	19200	960
3	940	140	800	20	19200	960
4	940	140	800	20	19200	960
5	940	140	800	20	19200	960
6	500	140	360	20	8640	432
TOTALS:	5200	840	4360	20	104640	5232

In addition, due to the modular nature of the technology, containerized module processing 10-tons of waste can be deployed in wards where illegal dumping occurs for example in Wards 6 and 11 ( Hornlee) and Ward 3 and 7 (Nekkies). This will give 960 households in each ward electricity.



# % of KLM own Power

## KLM Eskom Summary of All Municipal Accounts 2021/2022

Month/Year 2021/2022	Total kWh	Total MVA	Total Cost Excl'd VAT	Wte KWH capacity 104640 KWH day	Plus Plant Solar of 1 MW	Total
JUL 2021	15 291 808	33 403,41	R 26 360 131,51			
AUG	14 540 931	30 579,02	R 27 103 259,58			
SEPT	13 457 002	28 924,27	R 16 343 097,46			
OCT	12 878 592	27 966,09	R 14 103 453,20			
NOV	13 240 168	28 138,39	R 16 040 866,56			
DEC	15 489 608	31 600,80	R 18 262 199,40			
JAN 2022	15 031 757	28 333,58	R 17 577 594,52			
FEB	12 997 379	28 874,79	R 23 087 530,39			
MAR	14 255 465	28 338,22	R 17 054 207,58			
APRIL	13 972 541	23 752,22	R 14 520 590,40			
MAY	14 445 977	32 196,08	R 17 183 723,44			
JUN	14 379 562	33 873,13	R 27 144 340,94			
<b>Totals</b>	<b>169 980 790</b>	<b>355 980,00</b>	<b>234 780 994,98</b>	<b>37 670 400,00</b>	<b>1 000 000</b>	<b>38670400</b>
Contribution to Total Knysna Electrical grid			23%	38 415 658,54		

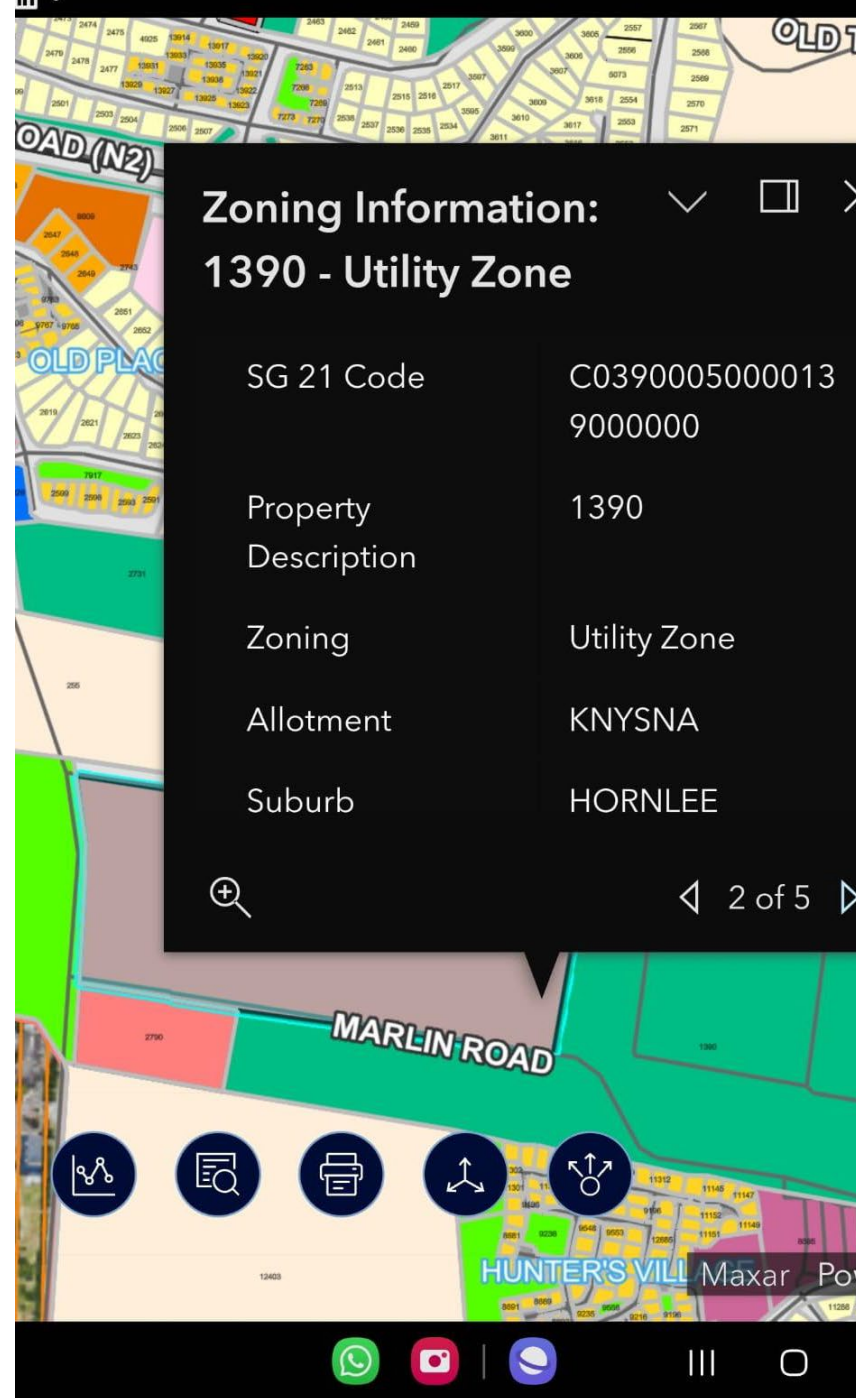
23%

# Jobs

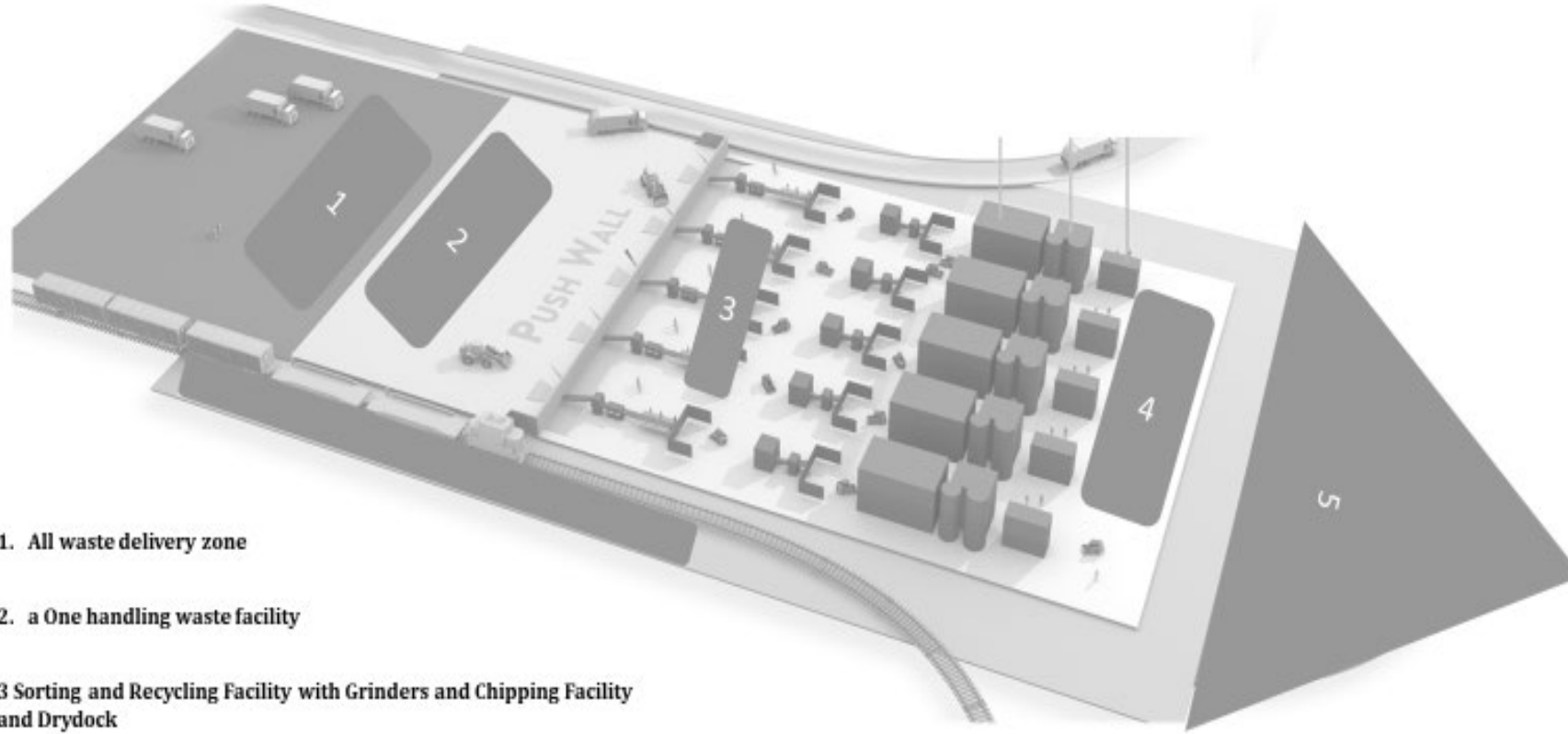
## SKILLS

Position	Number	SMME teams
Plant Manager	1	
Maintenance and Operations	2	
Finance	1	
HR and Admin	1	
Electrical Manager	1	
Feedstock facility Managers	4	
Feedstock facility Operators	16	
General cleaning	6	
<b>Biomass cleaning SMME</b>		50
<b>Biomass cleaning SMME TEAMS</b>		250
<b>Biomass transporters</b>		5
<b>Biomass transport teams</b>		25
Agricultural facility	6	
<b>TOTAL:</b>	<b>338</b>	

# Location Of The Knysna Total Recovery Centre.



# A all in one Total Recycling Complex TRC™



**1. All waste delivery zone**

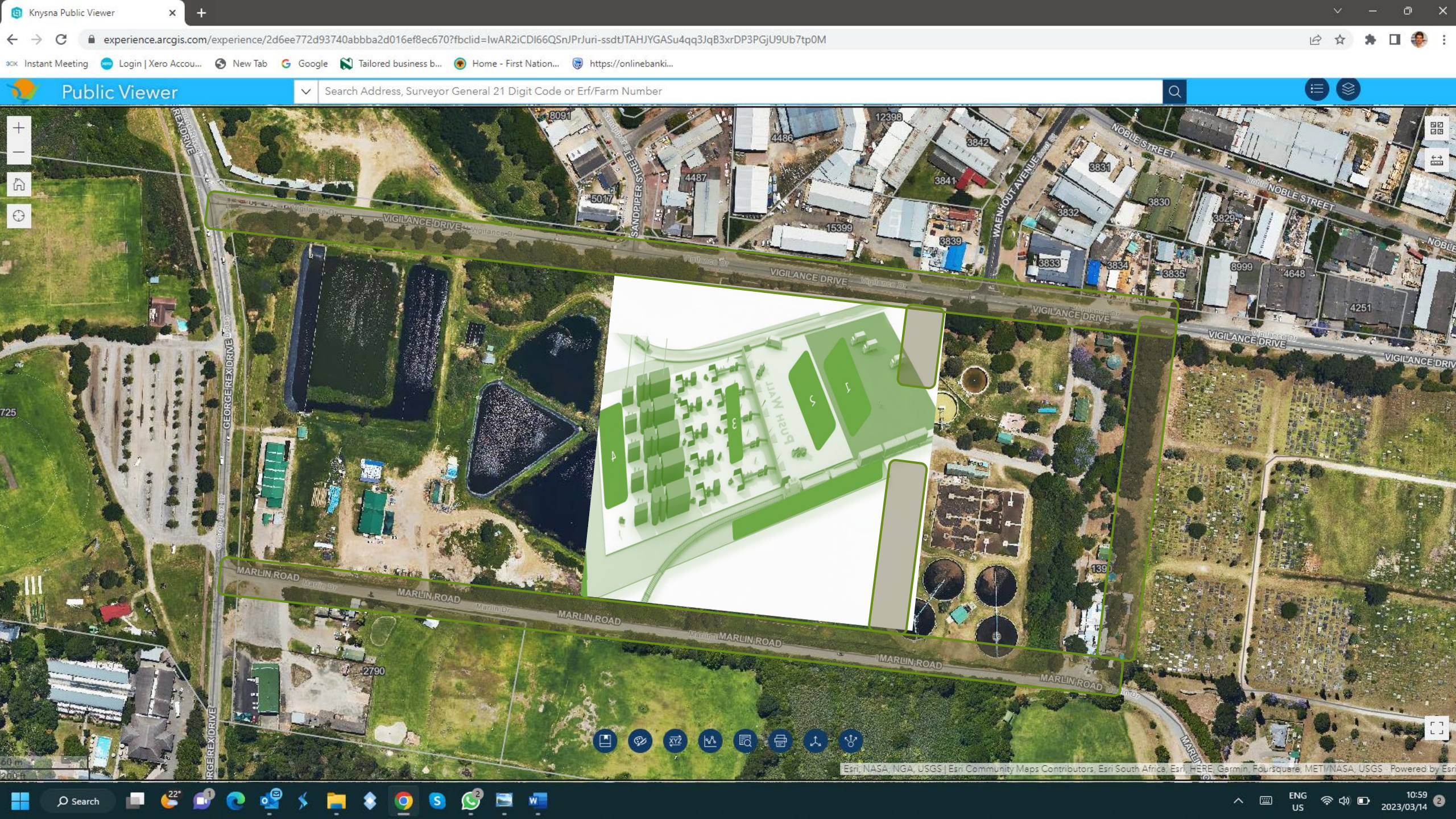
**2. a One handling waste facility**

**3 Sorting and Recycling Facility with Grinders and Chipping Facility and Drydock**

**4 Modular Gasification units with Syngas Generators**

**5 Sub grid tied system**







ECONOMIC	HEALTH/ENVIRONMENTAL	ENERGY
Reduces cost to landfill	Create nett negative GHG profile	Generates electricity to compliment Eskom supply
Generates income from recycling	Use biomass from invasive plants	Newest and most effective technology application
Save costs - transport, R+M on trucks etc.	Reduces the need for new landfills	Can provide 20-25% of total energy consumption
Helps to earn subsidies and/or avoid fines for non-compliance	Eliminates landfill odour and destroy contaminated and hazardous waste	Modular system - ensure constant energy generation
Job creation	Clean-up the river beds and banks	Provides thus viable, effective alternative to fossil fuels
Promote SMME's		Uses readily available fuel sources as feedstock
		Reduces transportation energy by treating waste locally rather than shipping to distant landfills

## Addressing Knysna waste problem

- Effective handling of Waste
- Saving cost
- Provide own electricity

Job creation

Developing SMME's

Environmental benefits

challenge' of South

## Knysna energy island - A hybrid solution wage and solid

- *Solar technology*
- *Soduim battery technology*
- *Hydro energy technology*
- *Wind turbine technology*

Procurement



**CO-CO WASTE  
TO ENERGY**

**CO-CO  
solutions**

2018 /073803/07

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# Our Proposal and Request for Support





# DEVELOPMENT OF SUPPORT SMME's to the KLM Waste to Energy Plant

## AIM OF THE PROGRAMME

- ▶ In the present economic climate, students are increasingly required to have skills and abilities which will increase their employability and become self-employed. Entrepreneurial education and training provide individuals with the ability to recognize business opportunities, gain self-esteem, knowledge, and skills and to act on them. It includes an opportunity to commercialize a concept, manage resources, and initiate a business venture. This New Venture Creation training will cover business disciplines such as management, marketing, information systems and finance. Entrepreneurs are critical for economic growth and development and to curb the high rate of unemployment in the country.
- ▶
- ▶ This qualification will help to facilitate the entrepreneurial mind-set of students in the TVET sector and encourage self-employment. Having a culture to create a new business venture is a critical aspect of this entrepreneurial training and students will be encouraged to take the risk of starting a business.



# KEY AREAS OF FOCUS AND OBJECTIVES OF THE PROGRAMME

- ▶ The purpose of the New Venture Creation programme is to develop the appropriate skills and knowledge required by a person for the establishment and development of a small to medium business venture, and address the economic, administrative, and behavioral (psycho-social) barriers that contribute to success in starting and sustaining the venture.
- ▶
- ▶ Learners attempting this New Venture Creation Programme will be equipped with selected technical, business, managerial and personal skills, and strategies to help them succeed. The successful learner will develop a sound foundation for the application of these skills and knowledge to explore a diverse range of entrepreneurial opportunities.

# TRAINING PROGRAMME FOR THE NEW VENTURE CREATION

## NQF LEVEL 4 (QCTO-SETA ACCREDITED) QUALIFICATION



### SOUTH AFRICAN QUALIFICATIONS AUTHORITY REGISTERED QUALIFICATION:

#### Further Education and Training Certificate: New Venture Creation

SAQA QUAL ID		QUALIFICATION TITLE		
66249		Further Education and Training Certificate: New Venture Creation		
ORIGINATOR				
Task Team - New Venture Creation				
PRIMARY OR DELEGATED QUALITY ASSURANCE FUNCTIONARY			NQF SUB-FRAMEWORK	
SERVICES - Services Sector Education and Training Authority			OQSF - Occupational Qualifications Sub-framework	
QUALIFICATION TYPE	FIELD		SUBFIELD	
Further Ed and Training Cert	Field 03 - Business, Commerce and Management Studies		Generic Management	
ABET BAND	MINIMUM CREDITS	PRE-2009 NQF LEVEL	NQF LEVEL	QUAL CLASS
Undefined	149	Level 4	NQF Level 04	Regular-Unit Stds Based
REGISTRATION STATUS		SAQA DECISION NUMBER	REGISTRATION START DATE	REGISTRATION END DATE
Reregistered		SAQA 06120/18	2018-07-01	2023-06-30
LAST DATE FOR ENROLMENT		LAST DATE FOR ACHIEVEMENT		
2024-06-30		2027-06-30		

*In all of the tables in this document, both the pre-2009 NQF Level and the NQF Level is shown. In the text (purpose statements, qualification rules, etc), any references to NQF Levels are to the pre-2009 levels unless specifically stated otherwise.*

This qualification replaces:

Qual ID	Qualification Title	Pre-2009 NQF Level	NQF Level	Min Credits	Replacement Status
23953	Further Education and Training Certificate: New Venture Creation (SMME)	Level 4	NQF Level 04	162	

# **New Ventures to be Created** with the NVC programmes in support of the **Knysna Waste to Energy Project**

Alien clearing and protection of biodiversity

Logistics to WtE plants

Small Team\ operating businesses

Maintenance engineering for WtE plants

Manufacturing processes for wind tower

Logistics of wind towers

Maintenance engineering for Wind tower units

Installation teams for units

Small business operators

Energy Performance Certifications

# Area of Skills Deployment

Waste to Energy

Hybrid energy

Solar PV

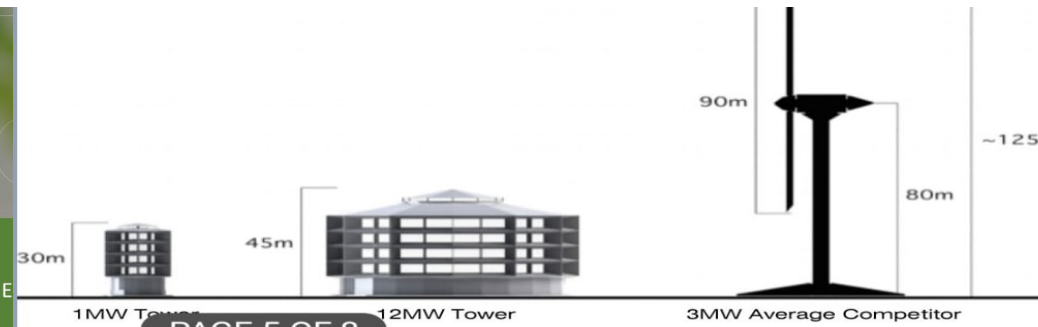
Hydro

Wind turbines

Wind Towers

Manufacturing capacities in green energy

Energy Performance





# OTHER AREAS



Demand-side  
Management



Gas-to-Power



Wind towers



Energy Markets



LPG



Energy Performance

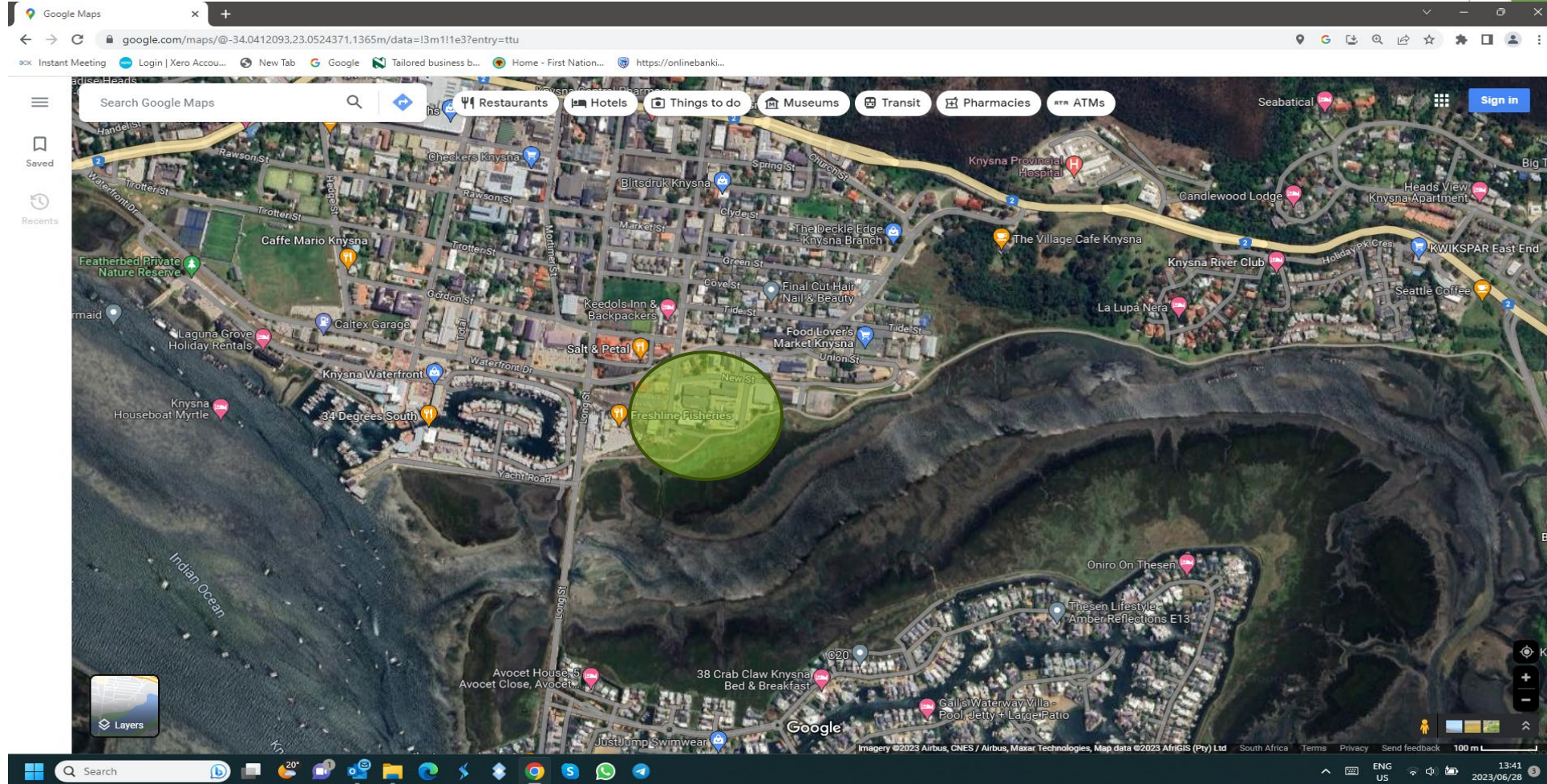


Gas Master Plan



Nuclear

# What do we need











Saved

Recents

Search Google Maps



Restaurants

Hotels

Things to do

Museums

Transit

Pharmacies

ATMs

Sign in



Google

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Thank you

Be the  
difference

