



# LETSOLO

WATER AND ENVIRONMENTAL SERVICES  
"Engineered Solutions for Environmental Quandary"



Mr. Ishmael Phalane

Real-time Pollution Monitoring • Smart Compliance • Waste-to-Energy • River Rehabilitation

# INTRODUCTION

**"The good thing about science is that it's true whether or not you believe in it."**

**Cleaner air • Healthier rivers • Smarter regulation • Circular economy**



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# Slide 1

## Real-time Pollution Monitoring, Smart Compliance, Waste-to-Energy, River Rehabilitation.

- ❖ Gauteng requires an integrated environmental innovation programme that connects monitoring, analytics, compliance, circular-economy interventions and river rehabilitation.
- ❖ The province's dense urban economy, transport activity, industrial footprint, waste generation and highly modified river systems create interconnected pressures that cannot be managed effectively through isolated or periodic interventions.
- ❖ The central principle is to move from reactive environmental management to continuous, risk-based and data-driven management.
- ❖ Monitoring data should feed directly into dashboards, alerts, inspections, corrective actions and long-term investment decisions. The same platform should also recognise the links between air quality, stormwater, river flow, water quality, waste and land-use pressures.

# Slide 2

## Why Gauteng Needs an Innovation-Led Environmental Response

### ❖ Urban pressure

- Industrial activity, road transport, construction, mining-related dust and dense settlement patterns create overlapping environmental pressures.
- Pollution exposure is not uniform, and vulnerable communities can experience disproportionate impacts.

### ❖ Air quality pressure

- Traffic-related emissions along major transport corridors.
- Industrial and combustion sources in key economic zones.
- Dust from construction, mining, unpaved or exposed surfaces.
- Need for better spatial and temporal understanding of community exposure.

### ❖ Water and river pressure

- Urban runoff transports pollutants into rivers and dams.
- Sewer failures and illegal discharges can degrade water quality rapidly.
- Highly modified channels reduce ecological resilience and flood attenuation.
- Flood events can remobilise contaminated sediments and spread pollution downstream.

### ❖ Waste and compliance pressure

- High waste generation places pressure on landfill capacity.
- Fragmented datasets can slow enforcement and management decisions.
- Reactive inspections may miss short-duration pollution incidents.

### ❖ Recoverable waste streams are often treated as disposal problems rather than resources.

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## Proposed Gauteng Innovation Framework

### ❖ Sense

- Deploy real-time and near-real-time monitoring for air quality, water quality, weather, flow and selected waste indicators.

### ❖ Understand

- Combine sensor data with GIS, laboratory results, licence conditions, complaints and source information to create an integrated environmental operating picture.

### ❖ Act

- Use automated alerts and risk ranking to trigger investigations, maintenance, enforcement and corrective actions.

### ❖ Restore

- Apply circular-economy measures, river rehabilitation, wetland restoration and targeted catchment interventions.



# Slide 4

## Real-Time Pollution Monitoring

### ❖ Air monitoring network

- Monitor PM2.5, PM10, NO2, SO2, O3 and meteorological parameters using a combination of reference-grade stations and calibrated lower-cost sensors.
- Prioritise traffic corridors, industrial zones, schools, clinics and vulnerable communities.

### ❖ Water monitoring network

- Deploy telemetry for pH, electrical conductivity, turbidity, dissolved oxygen, temperature, flow and selected nutrient indicators.
- Prioritise urban tributaries and river reaches with repeated pollution complaints, wastewater risks or ecological stress.

### ❖ Operating model

- Sensor → secure telemetry → data validation → GIS dashboard → threshold alert → response team.
- Continuous monitoring should complement, not replace, accredited laboratory analysis. Its value is in early detection, trend identification and better targeting of sampling and inspections.

# Slide 5

## Smart Compliance Systems

### ❖ Digital compliance workflow

- Digitise permit, licence and authorisation conditions into structured requirements.
- Connect monitoring data, GIS layers, inspections, complaints and laboratory results.
- Automatically compare measured values against limits, trends and operating conditions.
- Generate risk-ranked alerts and assign responsible officials.
- Track corrective actions, closure evidence and management reporting.

### ❖ Potential applications in Gauteng

- Air Emission Licences
- Water Use Licences
- Waste Management Licences
- Stormwater controls
- Environmental incident reporting
- Complaint and non-conformance management

# Slide 6

## Waste-to-Energy Opportunities

### ❖ Landfill gas

- Capture methane from suitable landfill cells and use it for electricity or heat generation, with controlled flaring where energy recovery is not feasible.

### ❖ Anaerobic digestion

- Treat wastewater sludge, food waste and other suitable organic streams to produce biogas and a stabilised digestate.

### ❖ Refuse-derived fuel

- Pre-process suitable high-calorific waste for controlled use in authorised industrial facilities where environmental safeguards are demonstrated.

### ❖ Resource recovery hubs

- Combine recycling, organics recovery, material sorting and energy recovery at strategically located waste facilities.

### ❖ Decision principle

- Waste prevention, reuse and recycling should remain the first priorities. Energy recovery should be used where it provides a genuine life-cycle benefit and complies with legal, air-emission and waste-management requirements.

# Slide 7

## River Rehabilitation Technologies

### ❖ Intercept pollution before it enters rivers

- Litter traps and trash booms.
- Bioswales and vegetated filter strips.
- Stormwater treatment wetlands.
- Oil and grit separation at high-risk sites.
- Sewer overflow detection and rapid-response systems.

### ❖ Repair river structure and habitat

- Bank stabilisation using bioengineering where appropriate.
- Re-meandering where space and hydraulic conditions allow.
- Riparian re-vegetation and invasive vegetation control.
- In-stream habitat enhancement and aeration where technically justified.



### Litter Trap



Litter traps capture solid waste such as plastic, bottles and debris, preventing them from entering downstream watercourses.

### Trash Broom



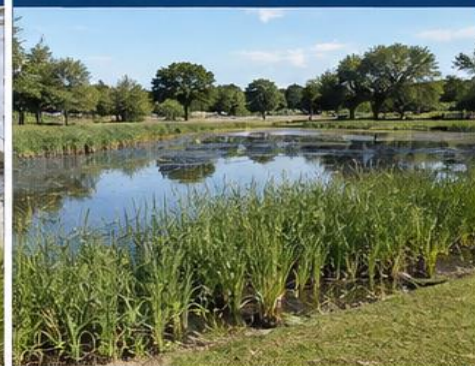
Trash brooms use floating brushes to collect and direct floating debris towards a collection point.

### Bioseales



Bioseales (bioswales) are vegetated channels that filter and treat stormwater through soil and plants, removing sediments and pollutants.

### Stormwater Treatment Wetland



Stormwater treatment wetlands use natural processes (plants, soil and microorganisms) to remove sediments, nutrients and other pollutants from stormwater.

### Oil and Grit Separation



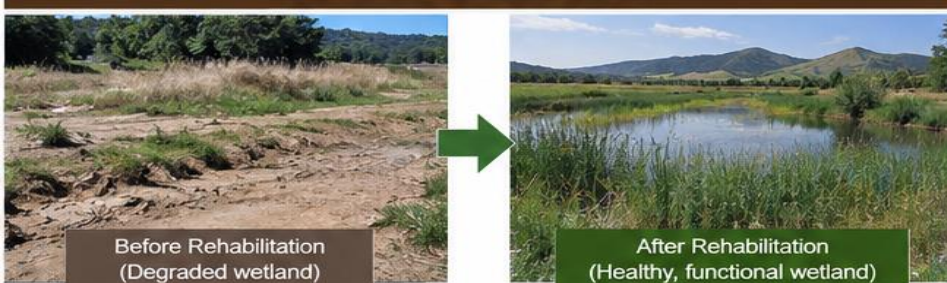
Oil and grit separators remove oils, fuels, sediments and coarse particles from stormwater before it is released to the environment.

### Sewer Outflow Detection



Sewer outflow detection systems use sensors and monitoring equipment to identify and alert on illegal or accidental sewer discharges into stormwater systems.

### Wetland Rehabilitation



Wetland rehabilitation restores natural hydrology, vegetation and ecological function, improving water quality and biodiversity.

### Bank Stabilisation



Bank stabilisation uses vegetation, rock armour and other engineering measures to prevent erosion, protect infrastructure and improve habitat.

# Slide 8

## River Rehabilitation Technologies

### ❖ Use data to prioritise investment

- Catchment risk mapping.
- Pollution source tracing.
- Before-and-after ecological indicators.
- Citizen reporting and photographic evidence.
- Maintenance dashboards for municipal teams.

### ❖ Illustrative Gauteng application and priorities

- The Jukskei, Klip and Hennops river systems and their tributaries can be prioritised using pollution risk, population exposure, ecological condition and potential rehabilitation benefit.



# Environmental Monitoring Instruments and Telemetry System



ENVIRONMENT  
PEOPLE  
BRIGHTER TOMORROWS

MEASURE | CONNECT | PROTECT A CLEANER, HEALTHIER TOMORROW



## Monitoring Instruments

ACCURATE MEASUREMENTS  
FOR A HEALTHIER ENVIRONMENT



**Portable Multiparameter  
Water Quality Meter**  
(with Probe)



**Automatic  
Weather Station**  
(Rainfall, Temperature, Humidity,  
Wind Speed/Direction, Solar Radiation)



**Flow Meter**  
(or Level Sensor)



**Groundwater  
Level Logger**



**Sampling Bottle / Field Kit**  
(Water, Soil or Air Sampling)



## Telemetry System

FROM FIELD DATA  
TO SMART DECISIONS

### Sensors

(e.g. water quality, level, weather)



Water Quality  
Sensor



Level Sensor



Weather Sensor



Flow Meter



**Data Logger**  
(with Solar Power)

GSM/Radio  
Telemetry  
(3G/4G/5G or LoRa)



View live data



Receive alerts



Generate reports



Access anywhere



Cloud  
Server



**Remote Dashboard**  
(Real-time Data, Alerts, Reports)



### Real-time data collection

Timely, reliable information



### Remote monitoring and alerts

Be informed, respond faster



### Improved environmental compliance

Support sustainable management

# Slide 9

## Measuring Success



**LETSOLO**

WATER AND ENVIRONMENTAL SERVICES  
Tailored Solutions for a Sustainable Tomorrow

CLEAN  
WATER  
HEALTHY  
COMMUNITIES  
BRIGHTER  
TOMORROW

Litter Traps



Trash Broom



Bioseales



Stormwater Treatment Wetland



Oil and Frit Separation



Sewer Outflow Detection



Wetland Rehabilitation

Before

After



Bank Stabilisation

Before

After



Environmental Monitoring Instruments & Telemetry System



### Key performance indicators

- ✓ Detection time from pollution event to system alert.
- ✓ Time from alert to investigation or corrective action.
- ✓ Number and duration of unresolved compliance actions.
- ✓ Trend improvement in priority river indicators.
- ✓ Waste diverted from disposal and energy recovered where viable.
- ✓ Availability and quality of validated public information.



CLEANER  
CATCHMENTS



HEALTHIER  
ECOSYSTEMS



SAFER  
COMMUNITIES



SUSTAINABLE  
OPERATIONS

*Partnering for a Resilient Tomorrow*

# Slide 10

## Expected Benefits for Gauteng

### ❖ Environmental and governance benefits

- Earlier warning of pollution incidents.
- More targeted and efficient enforcement.
- Cleaner rivers and better prioritisation of rehabilitation investment.
- Lower landfill burden through recovery and appropriate energy utilisation.
- Improved infrastructure planning through common datasets.
- Greater transparency, accountability and public confidence.

### ❖ Long-term vision

- Position Gauteng as a living laboratory for practical, data-driven environmental innovation in Africa.



# Environmental Solutions for Cleaner Water and Healthier Communities



People | Environment | Progress



## Litter Traps

Capture solid waste before it enters stormwater systems.



## Trash Broom

Collects floating debris from rivers, dams and canals.



## Bioseales

Natural erosion control and sediment capture.



## Stormwater Treatment Wetland

Uses natural processes to remove pollutants from runoff.



## Oil and Grit Separation

Removes oil, fuel and sediment from stormwater.



## Sewer Outfall Detection

Real-time monitoring to detect and alert on abnormal discharges.



## Wetland Rehabilitation

Restores natural ecosystems, improves water quality and enhances biodiversity.



## Bank Stabilisation

Protects riverbanks from erosion and maintains channel stability.



## Environmental Monitoring Instruments & Telemetry

Measure water quality, flow, rainfall and air quality with real-time data transmission.



CLEANER WATER



HEALTHIER ECOSYSTEMS



SAFER COMMUNITIES



SUSTAINABLE FUTURE

*Integrated Solutions.  
Lasting Impact.*

# Slide 11

## Closing Message

- ❖ Gauteng does not need more environmental data in isolation; it needs connected data that leads to action.
- ❖ Start with focused pilots, prove the value, scale what works and measure environmental outcomes.
- ❖ The programme should connect four actions:
  - SENSE,
  - COMPLY,
  - RECOVER and
  - RESTORE.

| Category         | What to Measure                              | Desired Direction                                     |
|------------------|----------------------------------------------|-------------------------------------------------------|
| Detection        | Time from pollution event to telemetry alert | Target 15–60 minutes for telemetry-enabled parameters |
| Response         | Time from alert to investigation/action      | Progressively reduced through SOPs and escalation     |
| Compliance       | Repeat exceedances and unresolved actions    | Downward trend over time                              |
| Water quality    | Priority-river trend indicators              | Improvement in targeted reaches                       |
| Circular economy | Waste diverted / energy recovered            | Increase where technically and legally viable         |
| Transparency     | Availability of validated public information | Clear dashboards and periodic performance reports     |



**“We borrow the Earth from our children rather than inheriting it from our ancestors.”**



# Thank you

Mr Ishmael Phalane

Letsolo Water and Environmental Services

