



Sustainable Manufacturing and  
Environmental Pollution

*Project on*

*Enhancing Uptake of Resource Efficiency & Cleaner Production in Enterprises  
with Piloting Membrane Technology and Financial Services for Wastewater  
Treatment in the Nairobi Rivers Basin*

**Policy Dialogue Workshop on Industrial and Institutional Pollution  
Prevention in the Nairobi Rivers Basin**

**Panari Hotel, Mombasa Road, Nairobi City County**

**4<sup>th</sup> October 2024**

**Policy Options for Pollution Reduction and Enhanced  
Compliance by Industry and Businesses in the Nairobi  
Rivers Basin**



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## 1. Introduction

### 1.1 Pollution and Resource use by Enterprises

The Nairobi River flows across Nairobi, the capital city of Kenya. This is the main river of the Nairobi Rivers Basin, with several parallel streams flowing eastward. These rivers join east of Nairobi and meet the Athi River, that eventually flows into the Indian Ocean. The rivers are mostly narrow and highly polluted from industries, sewerage companies and human settlement though there are current efforts to clean the rivers and improve the water quality.

The Basin is heavily industrialized, particularly along sections of the Nairobi River, Mathare River, and Ngong River, all of which flows through five counties of Nairobi, Kiambu, Kajicho, Machakos and Makueni. It's estimated that thousands of industries operate within the Nairobi Rivers Basin (Counties of Nairobi, Kiambu, Machakos, Kajicho and Makueni), straddling formal large-scale industries and informal small-scale sectors. **The exact number of industries and other businesses in the Basin contributing to this pollution is not known due lack of registration of Industries.**

Estimates based on submission of Environmental Audit reports to the National Environment Management Authority (NEMA) in 2023, indicate 4,300 enterprises discharging into the Basin:

- (i) Nairobi County has 3,600 enterprises submitting Annual Environmental Audits
- (ii) Machakos, Kiambu, Kajicho and Makueni have a combined 700 enterprises.

**From the Intervention Logic in Figure 2 below**, the Nairobi River has long suffered from pollution due to untreated or poorly treated industrial waste being discharged into the river. Many of these industries do not have proper waste treatment facilities, has low skills and not accessible to cleaner technology. Exacerbating the problem, is the fact that common wastewater treatment facilities managed by Water and Sewerage Companies (WSPs) and Export Processing Zones Authority (EPZA) are not effective in treating industrial effluents. Due to resource constraints, environment compliance and enforcement is inadequate. Moreover, industries and other institutions lack the skills and knowledge to evolved a methodology to reduce pollution from year to year. Various efforts have been made by the government and environmental agencies to reduce pollution and clean up the river.

### 1.2 The Resource Efficiency and Cleaner Production Project

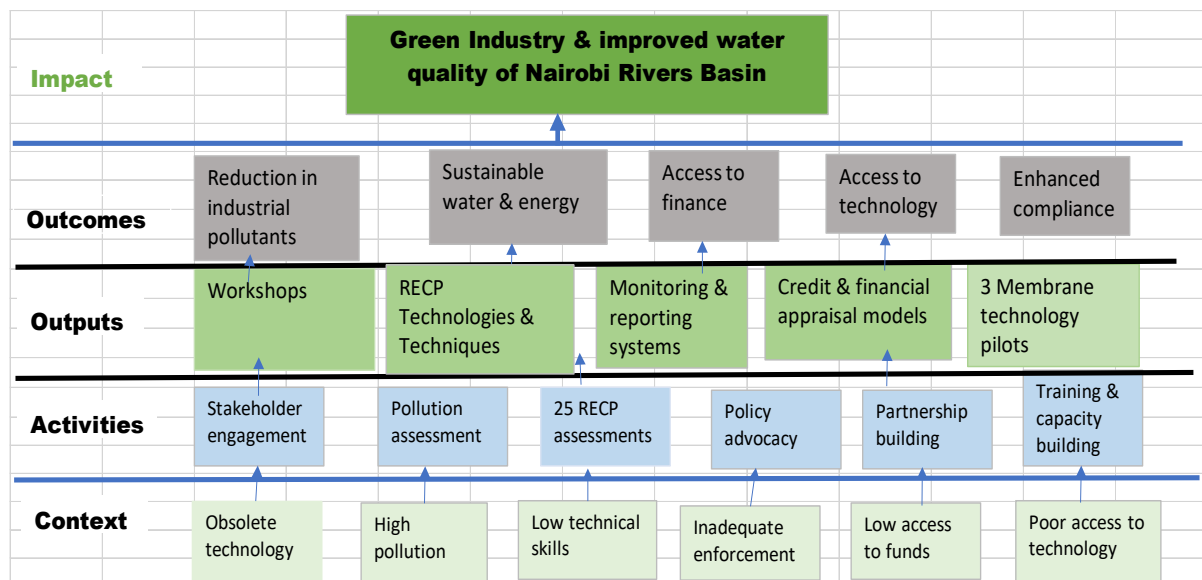
The Nairobi Rivers Commission has developed a Plan with several components to rehabilitate the Nairobi Rivers. In the rehabilitation Plan, is a sub-component on **Waste-to-Rivers led by the National Environment Management Authority (NEMA)**. This sub-component addresses among others, **Industrial and Institutional Pollution Control**. Under this sub-component, the Kenya National Cleaner Production Centre (KNCPC), with financial support of FCDO is implementing a Sustainable Manufacturing and Environmental Pollution Project (SMEP) titled; **'Enhancing Uptake of Resource Efficiency & Cleaner Production in Enterprises with Piloting Membrane Technology and Financial Services for Wastewater Treatment for the Textile, Tannery and Chemical Sub-Sectors in the Nairobi Rivers Basin, under the SMEP Programme**. This projects that runs from January 2024-June 2025 (18 months), is expected that **results from this demonstration project will lead to replication and scaling up to cover more industries in the Basin.**

The KNCPC project falls under the aegis of Sustainable Manufacturing and Environmental Pollution (SMEP) Programme funded by the Foreign, Commonwealth and Development Office (FCDO) of the United Kingdom and is being implemented globally in partnership with the United Nations Conference on Trade and Development (UNCTAD). SMEP Projects identify and invest in emerging technologies or processes that mitigate the harmful environmental and social impacts of pollution from manufacturing sectors. The SMEP initiative is implemented in South Asia and sub-Saharan Africa. It is managed by SouthSouthNorth (SSN) and Pegasys based in South Africa, and the International Centre for Climate Change and Development (ICCCAD) in Bangladesh.

The 18-month project, targeting manufacturing industries and other institutions in the Basin, will contribute to reduction of pollution generation from industry and institutions into the Nairobi River Basin. **The Intervention Logic entails baseline pollution determination of enterprises, training, in-plant assessments, stakeholder engagement and partnerships to identify waste prevention and minimisation technologies & techniques.** The project adopts the waste management hierarchy of prevention/avoid, minimisation, recycle, a finally treatment. To this end, the Centre is working closely with NEMA, the Nairobi Rivers Commission to support, on a voluntary basis, industries and other institutions to **promote the uptake of cleaner and efficient technologies & techniques to enhance efficiency and prevent pollution generation at production process.** The residual effluent is then sent for treatment in wastewater treatment plants. Within this Project, 3 industries in the chemical, leather and textile sub-sectors have been selected to pilot the treatment of industrial effluent using membrane technology.

The Cleaner Technologies identified as well as the membrane technology will be packaged into investment proposals to facilitate access to financing for possible scale-up. This project will also contribute towards environmental compliance of these enterprises discharging effluent into the Basin.

**Figure 1: Intervention logic for the RECP SMEP project**



### 1.3 Implementing Partners

There are five (5) Implementing Partners that are intervening at different levels.

**The Kenya National Cleaner Production Centre (KNCPC):** This is the lead Implementing Agency for the Project and is leading in stakeholder engagement, industry pollution assessment, in-plant RECP assessment, policy advocacy, partnerships, and training.

**Kanku Company Ltd:** This Company will undertake treatability analysis of the selected industries (chemical, textile and leather) followed by installation of customized membrane wastewater treatment technology to serve as pilots for the respective sectors.

**Fintech Frontiers Ltd:** Will be responsible for packaging the identified RECP technologies and the membrane technology wastewater treatment pilots into investment projects for submission to banks for possible funding and scale-up.

**National Environment Management Authority:** The Authority works closely with KNCPC to onboard industries and other enterprises, training and in undertaking in-plant assessments.

**Nairobi Rivers Commission:** The Commission enjoys coordination and convening powers and has mapped out relevant stakeholders. It is instrumental in bringing these stakeholders together and providing a platform for engagement.

## 1.4 Project objectives

The overall objective of the project is to reduce pollution load and enhance environmental compliance of enterprises and institutions within the Nairobi Rivers Basin.

Specifically,

- (i) Prevent and minimise pollution generation from enterprises at the production process level through Resource Efficient and Cleaner Production (RECP) technologies and techniques
- (ii) Implement 3 pilots for treating residual effluent arising using membrane technology after RECP intervention
- (iii) Develop Financing and Credit Appraisal Models to guide enterprises and financial institutions in financing RECP technologies and wastewater treatment technologies

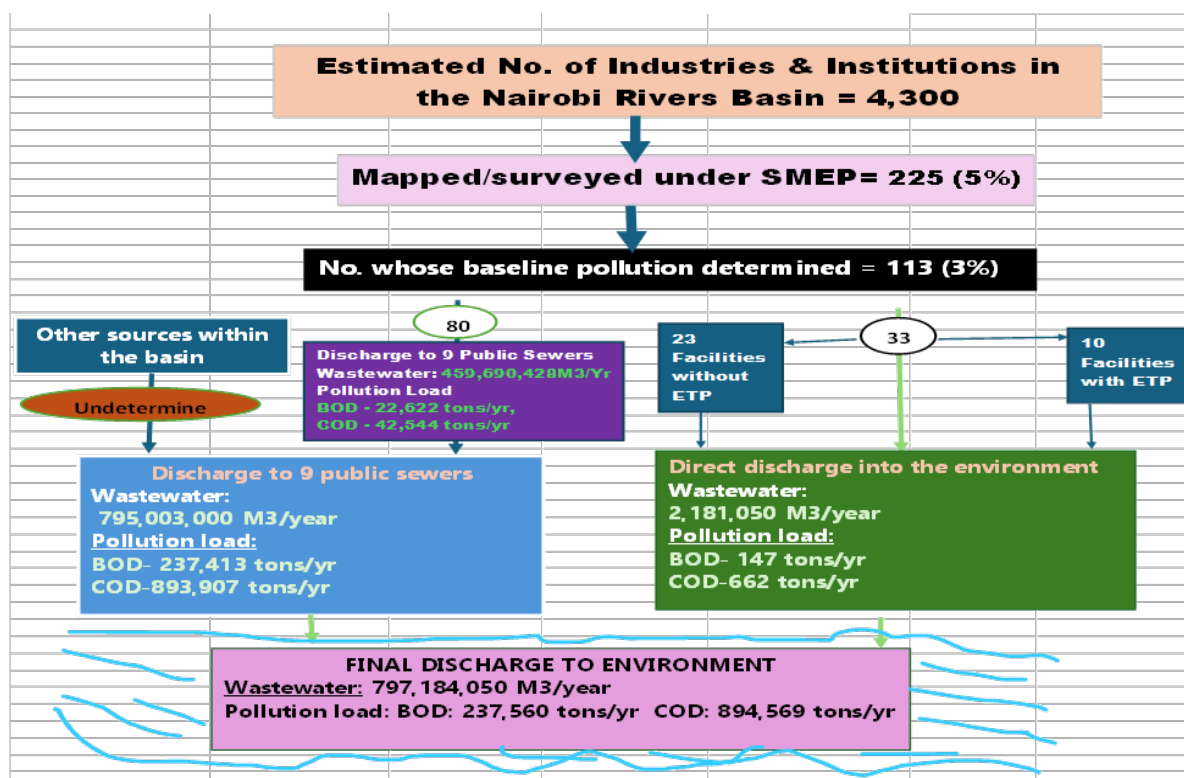
## 2. Achievements

### 2.1 Baseline Pollution from Industry and Institutions into the Nairobi River Basin

A total of **225 (5%) enterprises** have been mapped against an **approximate number of 4,300**. Wastewater effluent and baseline pollution load, in terms of Biological Oxygen Demand (BOD<sub>5</sub>) and Chemical Oxygen Demand (COD), from **113 (3%) of these enterprises has been determined**. **Eighty (80) enterprises discharge into the Water and Sewerage Treatment Plants (BOD<sub>5</sub> = 22,622 tons/yr; COD = 42,544 and effluent = 459,690,428 m<sup>3</sup>/yr) and thirty-three (33) discharge directly into the environment either with or without treatment (BOD<sub>5</sub> = 147 tons/yr; COD = 662 and effluent = 2,181,050 m<sup>3</sup>/yr (Figure 2).**

At the end of the project period, the success of the RECP project interventions will be measured against this baseline pollution to determine by how much pollution the industries have reduced.

Figure 2: Wastewater Discharge and Baseline Pollution into the Nairobi River Basin from 113 Industries and Institutions



## 2.2 Training of Industry and Other Institutions

To equip industries and institutions with skills and methodologies for continual pollution reduction, KNPC has trained ToTs from 70 industries and institutions. The training covered Resource Efficiency technologies and Techniques, Wastewater Treatment technologies and Green Financing. The ToTs from these institutions will work with KNPC to undertake In-Plant RECP assessments and implement Cleaner technologies and techniques.

## 2.3 In-plant Assessment

The Project targets to undertake 25 RECP In-plant Assessments. The RECP assessment will identify pollution prevention and minimisation technologies as well as techniques to reduce this baseline pollution to the extent possible.

## 2.4 Membrane Technology Pilot

After in-plant assessment and implementation of RECP measures, a membrane treatment technology has been set up in a Chemical factory to treat its effluent that is now recycled back to the factory to run non-sensitive process operations.

## 2.4 Investment Proposals and Green Financing

Industries will be assisted to package identified cleaner production technologies into investment proposals to help is sourcing funds for implementation. Further, the treatment technologies, including the membrane technology will be packaged into investment proposals to aid access to funding in the scale-up.

## 2.4 RECP Industry Award

At the end of the project, a Resource Efficient and Cleaner Production Award ceremony will be organised to recognize those enterprises that will have achieved the highest pollution reduction.

### 3. Policy Dialogue

As part of the project activities, a **policy dialogue** session has jointly been organised by **KNPC, Nairobi Rivers Commission and NEMA** planned on **4<sup>th</sup> October 2024**. The policy dialogue session aims at identifying the policy options that will enhance the uptake of cleaner technologies for pollution prevention and the membrane technology for wastewater treatment in the Nairobi River Basin.

#### Challenge

The 18-month project will cover only **113 (3%)** enterprises out of **4,300 estimated enterprises in the Basin**. This is a small percentage in relation to the industries in the Basin. The challenge lies in having these industries adopt pollution prevention technologies and techniques. A bigger challenge is that of replicating and upscaling to the more than **4,300 industries and other businesses** in the Basin.

Deliberate policy interventions will be needed to spur the uptake of ecological modernisation practices in industry. This workshop will be critical in coming up with some of these interventions to enhance uptake of RECP technologies and techniques as well as treatment (membrane) technology.

Potential policy options that can possibly be discussed include:

#### 1. Regulatory Frameworks

##### a. *Integrated Pollution Prevention and Control (IPPC)*

**Regulation:** Adopt an IPPC approach to manage emissions holistically. This involves not just controlling pollutants but also optimizing processes to minimize waste.

**BATs:** Define and regularly update the list of Best Available Techniques (BATs) for different industries.

**Permitting:** Integrate IPPC principles into the industrial permitting process. Require detailed pollution prevention as part of permit applications.

##### b. *Enforcement and Compliance Mechanisms*

**Inspection Regime:** Revisit the compliance and enforcement approach, and point industries in the direction of RECP by well-trained personnel. Strengthen, the risk-based approach to prioritize inspections based on the pollution potential of different facilities.

**Penalties:** Create a tiered penalty system based on the severity and frequency of violations. Include measures such as mandatory corrective actions, public disclosure of violations, and increased monitoring for repeat offenders.

**Transparency:** Develop a public database of compliance records and enforcement actions to increase transparency and public accountability.

#### 2. Economic Instruments (Section 57 of EMCA)

##### a. *Pollution Taxes and Levies*

**Design:** Set tax rates based on pollutant types, quantities, and potential environmental damage. Use economic modelling to determine appropriate tax levels.

**Revenue Allocation:** Direct tax revenues towards environmental projects such as river restoration, pollution monitoring, and public health initiatives.



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#### b. Subsidies and Financial Incentives

**Green Technology Subsidies:** Offer financial support for the adoption of clean technologies, such as advanced filtration systems, water efficiency and energy-efficient processes.

**Tax Credits:** Implement tax incentives for businesses that demonstrate significant environmental improvements, such as reduced emissions or enhanced waste recycling.

### 3. Technological Solutions

#### a. Advanced Pollution Control Technologies

**Wastewater Treatment:** Promote the use of advanced treatment technologies like membrane bioreactors, which offer higher efficiency in removing contaminants.

**Emission Controls:** Require the installation of high-efficiency scrubbers, electrostatic precipitators, and other advanced systems to control air and water emissions.

**Innovation:** Support pilot projects and demonstration plants to showcase new technologies and encourage their adoption across industries.

#### b. Industrial Process Optimization

**Resource Efficiency:** Encourage practices that optimize resource use and minimize waste, such as closed-loop systems and lean manufacturing principles.

**Waste Reduction:** Promote the adoption of waste minimization techniques, including material substitution, process redesign, and recycling of by-products.

**Training:** Provide training and technical assistance to industries on best practices for process optimization and waste reduction.

#### c. Infrastructure Development

**Wastewater Infrastructure:** Invest in expanding and upgrading wastewater treatment facilities for Water and Sewerage Companies as well as Common Effluent Treatment Plants to handle increased industrial discharges and improve treatment efficacy.

**Monitoring Systems:** Implement real-time water quality monitoring systems that provide data on pollutants and enable quick responses to pollution incidents.

**Public-Private Partnerships:** Engage private sector partners in developing and maintaining infrastructure, leveraging their expertise and investment capabilities.

### 4. Collaborative and International Efforts

#### a. Partnerships with International Organizations

**Technical Support:** Partner with international organizations (e.g., UNEP, World Bank) for technical expertise, best practices, and capacity-building initiatives.

**Funding Opportunities:** Seek grants and funding from international donors and development agencies to support pollution control projects and infrastructure development.

**Knowledge Exchange:** Participate in global forums and networks to exchange knowledge, learn from other countries' experiences, and stay updated on emerging trends and technologies.

#### b. Research and Knowledge Sharing

**Global Networks:** Join international environmental networks and initiatives to collaborate on research, share best practices, and develop innovative solutions.

**Innovation Hubs:** Create or support innovation hubs focused on environmental technology and pollution control, fostering collaboration between researchers, businesses, and policymakers.

**Conferences and Workshops:** Organize and participate in international conferences and workshops to disseminate research findings, showcase successful projects, and discuss emerging challenges.

### Conclusion

Successfully preventing industrial pollution in the Nairobi River Basin will require a multi-layered approach that integrates regulatory measures, economic incentives, technological advancements, community involvement, and international co-operation. With the support of NEMA, stakeholders can create a robust framework for

reducing pollution, safeguarding water quality, and promoting sustainable industrial (green industry) practices. This comprehensive approach will not only protect the Nairobi River Basin but also serve as a model for other River Basins facing similar challenges