



# Industrial Pretreatment, Collection System Management, and Wastewater-based Epidemiology (WBE)

NEWEA

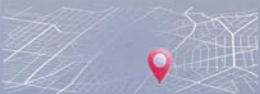
January 26, 2021





Boulder, Colorado

Tsur Yigal,  
Israel



kends® Clear Upstream

**We are passionate about making a positive impact on people's lives and the environment through improving wastewater quality around the world.**

## Who Are We?



**2012**

Founded

**12**

Global partners

**25**

Clients in major  
cities worldwide

**50+**

Employees

# Change of Perception

**Influent**

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**Resource**

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**Raw Material**



## The Challenge

An aerial photograph of a city, likely Dubai, with a dense network of buildings and roads. A semi-transparent blue grid is overlaid on the image, with several vertical red lines extending upwards from the city to the top of the frame. The overall image has a blue tint.

Seeing the full picture

So you can make decisions based on data

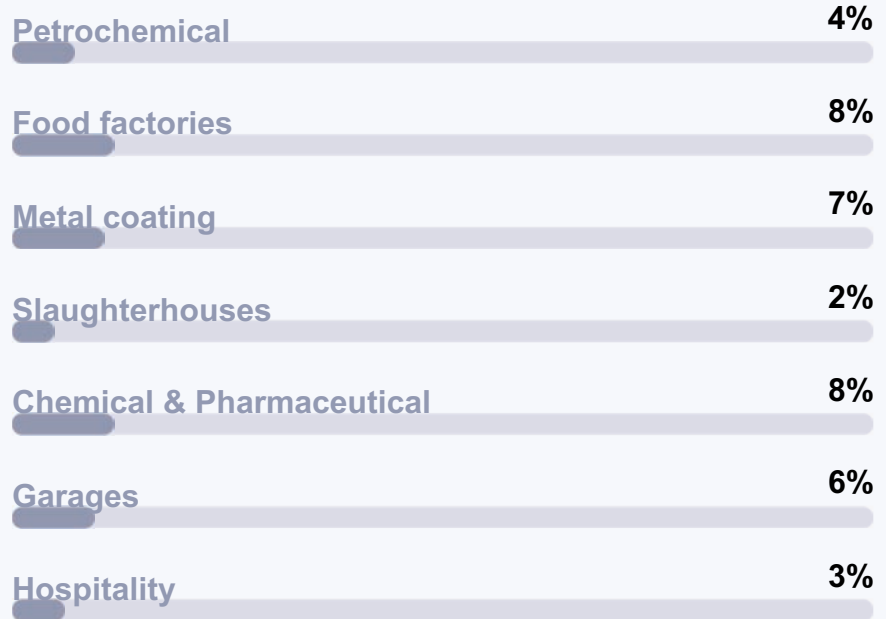




# Traditional Ways of Understanding Networks

## Pretreatment Program Results

This graph shows the proportion of random sampling finding pollution events.





# Solution

Extract, Analyse, and Generate  
Insights from sewage networks



Detect



Track

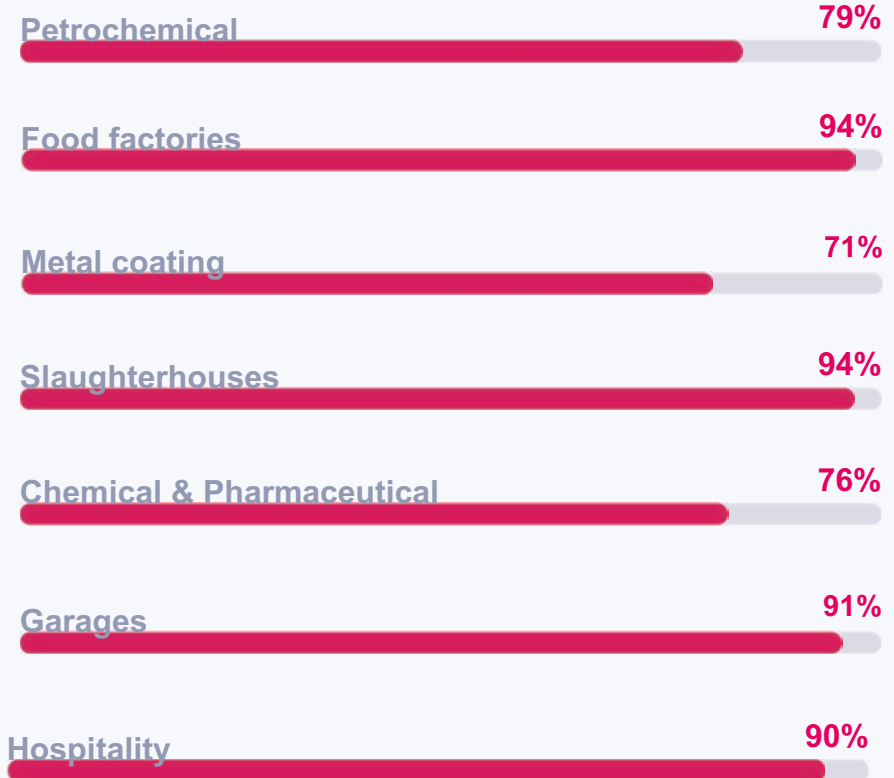


Impact

# Wastewater Intelligence

## Using Real-Time Data Inputs, and Live Analytics.

This graph shows the proportion of pollution events recognized by Sampling Automatically triggered by events.



# The Challenge

Influent

Resource

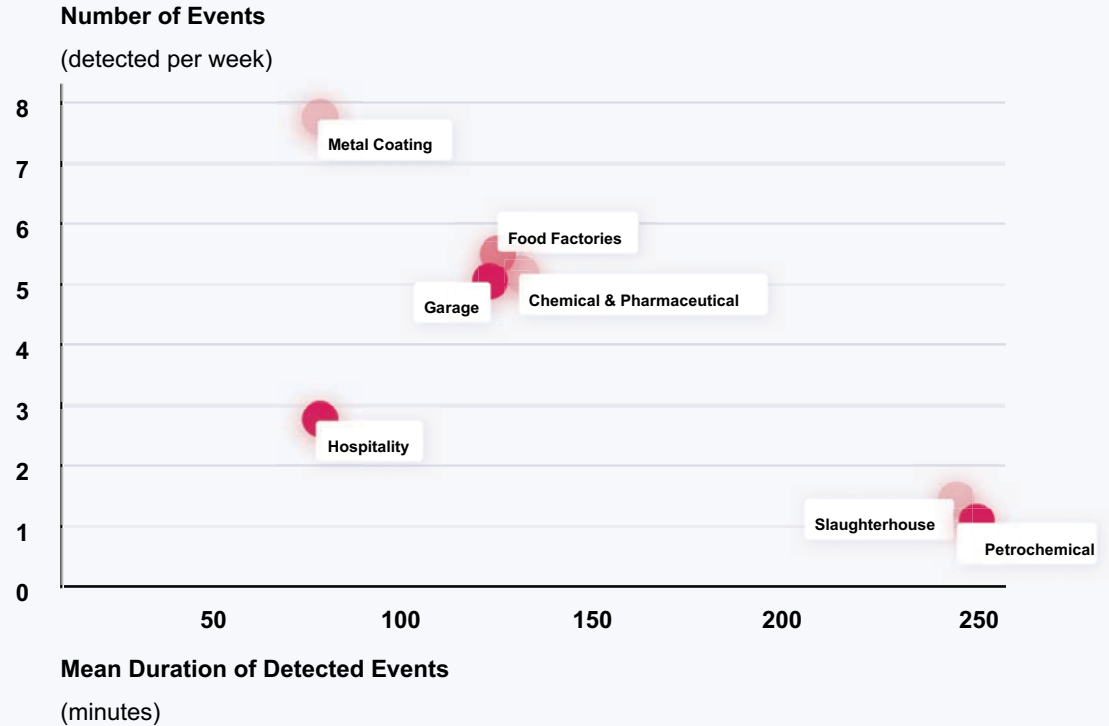
Raw Material



# Industrial Event Frequency & Fingerprinting

Harmful events are more common in some industries than others.

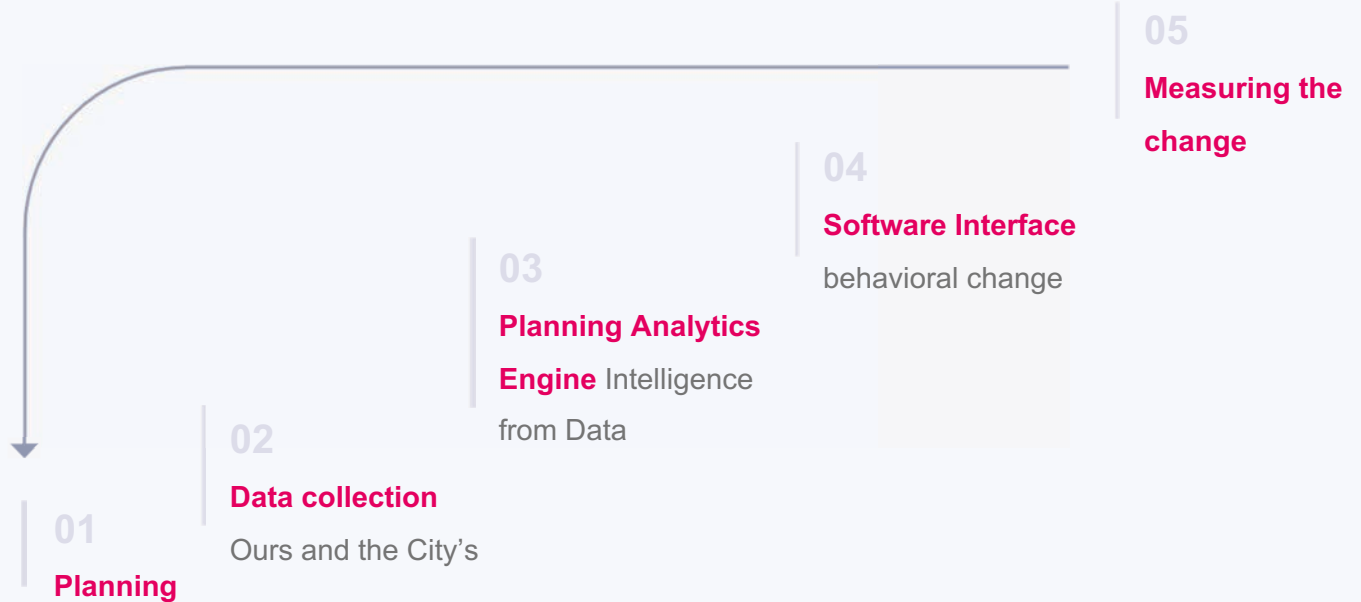
Below are the event frequencies for some key industries.



# How Do We Impact

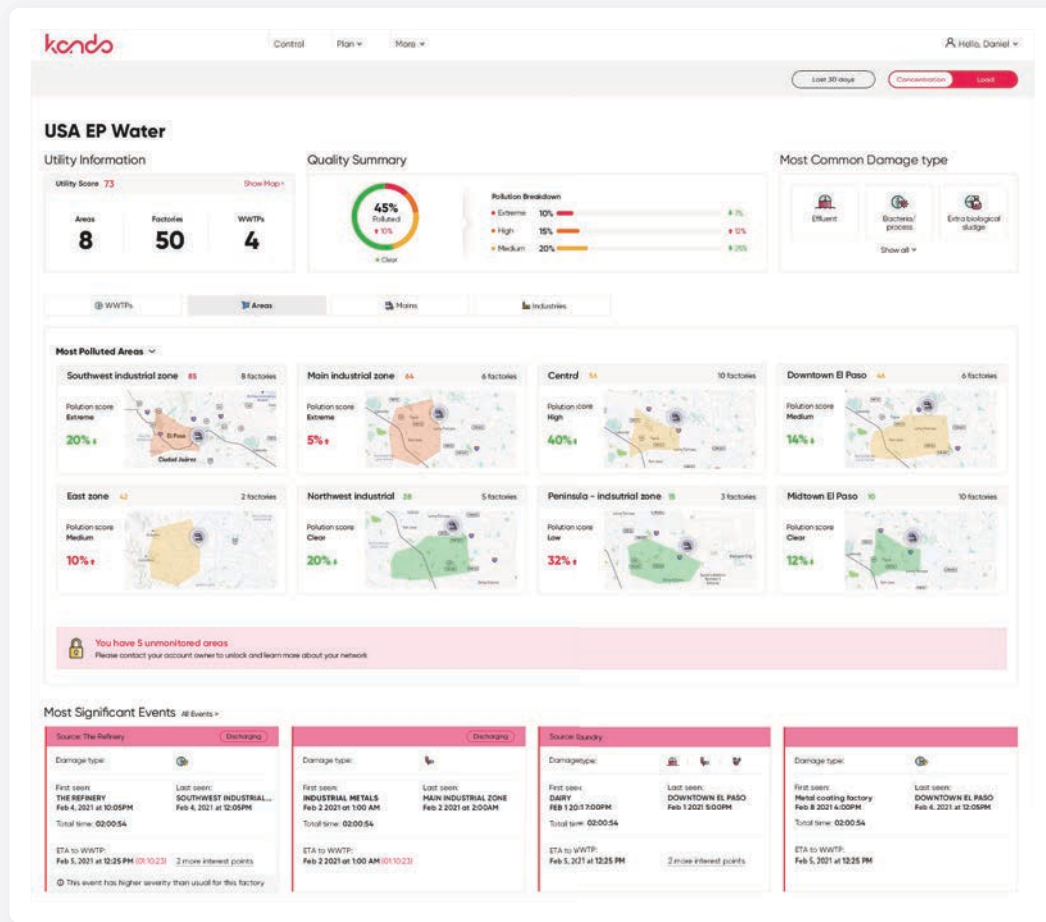
## Product strategy

Automated process



## Prioritized Visualization

- Prioritize Zones by Impact
- Drilldown to Zone of interest
- Simplified impact indexes



## Event Details

- Event Detection
- Source Pinpointing
- Impact Prediction
- Estimated Cost Of Damage

The screenshot displays the 'kends pulse' interface. On the left, the 'Event Details' panel shows the following information:

- Event Details:** Live status.
- Severity:** Medium, High, Extreme (Extreme is selected).
- Damage type:** Pipes/Infrastructure, Process damage.
- ETA to WWTP:** Feb 5, 2021 at 12:25 PM (01:10:23). High chances of reaching the WWTP.
- First seen:** THE REFINERY, Feb 4, 2021 at 10:05PM.
- Last seen:** THE SOUTHWEST INDUSTRIAL..., Feb 4, 2021 at 12:05PM.
- Total time:** 02:00:54.
- Sampling:** The Refinery (Oct 4, 2021 at 10:05PM; Sep 29, 2021 at 10:05PM).
- Source: The Refinery:** Sector: Refinery, Status: Discharging, Start discharge time: Feb 5, 2021 at 12:25 PM (1:12 hours ago). A 'More information' button is present.

On the right, a map shows a red line indicating the event's path from a source pin (a refinery icon) near Lakeside, Texas, towards the south. The map includes labels for 'Lakeside', 'Tigua', 'San Jo', 'Loma Terrace', 'RESIDENCIAL LA FLORIDA', 'Delip Colonia', 'Spark's Addition Number 3 Colonia', and 'Hillcrest Manor'. Major roads like I-10, I-45, and FM 76 are also visible. The interface includes navigation controls at the top and bottom.

## Collecting the Data



Controller



IoT Unit installed  
in a manhole



Automatic Sampler

### Parameters:

- PH
- Temperature
- Conductivity
- Oxidation-reduction potential (ORP)

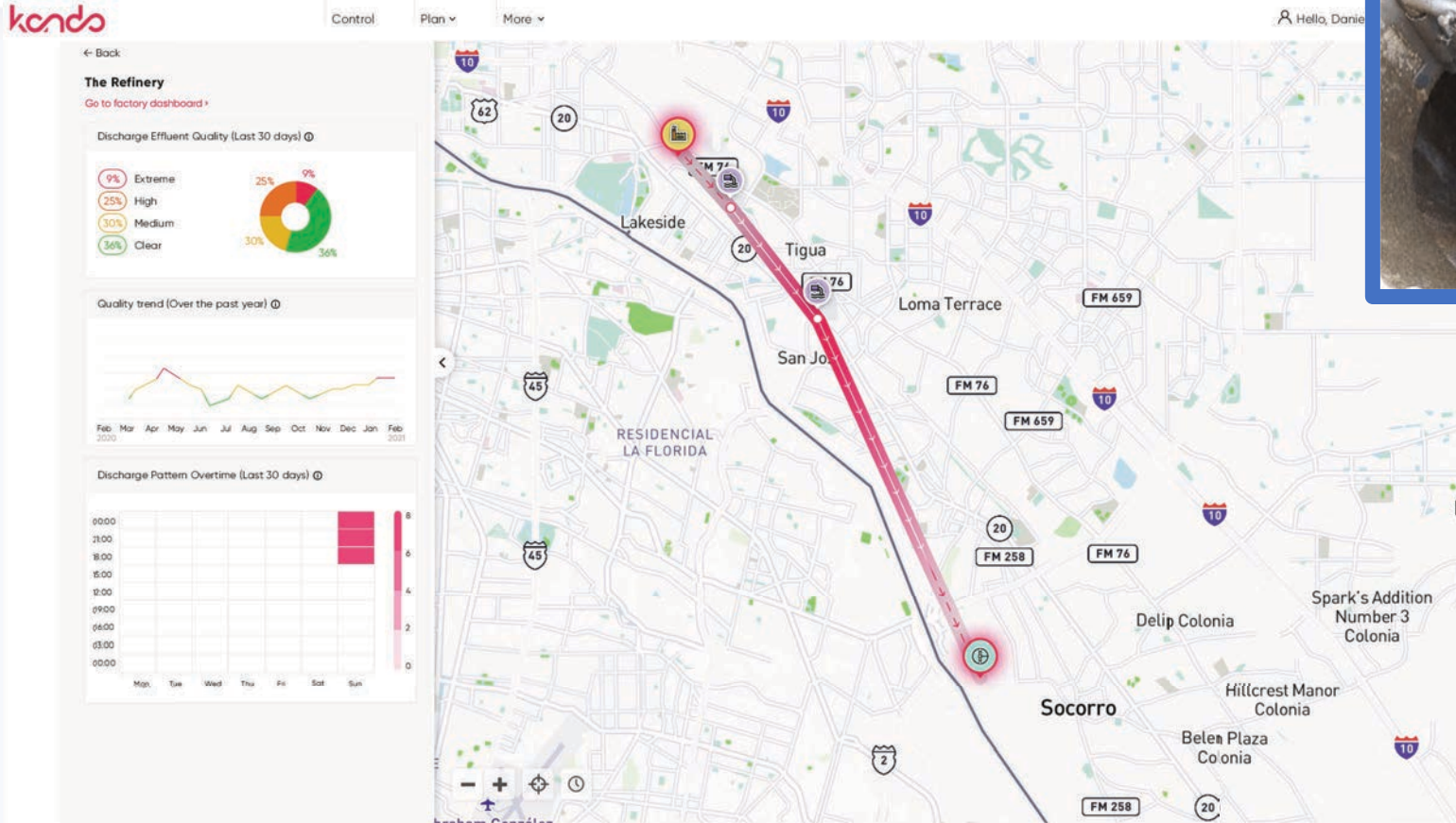


## Collecting the data

Our innovative proprietary Fluorescence reflectometry sensor with AI communicates data to the cloud to allow us to identify changes in water quality in the underground sewage pipe.



# Creating a Language | from Sensor to Value



# Challenges



Passive to  
**Active**

Sensors  
**to Data**

**Communication**  
in the organization

## Impact

Empower our clients to take actions based on data and insights, **so that they can fulfill their goals and vision.**

Our customers act more effectively to reduce risk, save costs, and improve their service, which in turn, impacts public health.



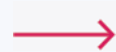
56%

of monitored factories saw improved quality in terms of intensity and duration, leading to a...

49%

improvement in total wastewater quality

# Success Stories



# Water Reuse | El Paso Water, TX

## Background

Prolonged droughts and depleted groundwater levels led El Paso Water (EPW) – which provides water and sewer services to **800,000 customers** – to integrate Direct Potable Reuse (DPR) into its water supply portfolio. The plan would see secondary effluent from the Roberto Bustamante Wastewater Treatment Plant (RBWWTP) go through an Advanced Water Purification Facility, before redistribution to consumers.

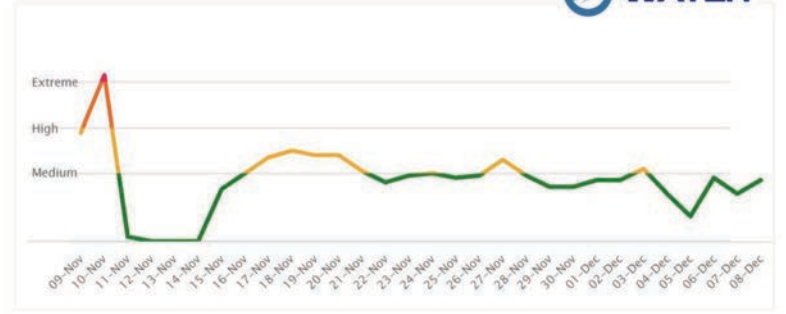
## Project Description

RBWWTP's sewershed includes **25 Industrial Users**, including **petrochemical, metal coating, and food processing factories**. These often discharge high strength wastewater to the collection system. To ensure the flawless and cost-effective treatment needed to support DPR, EPW wanted to identify abnormal discharges before they reach the RBWWTP. **EPW partnered with Kando to gain real-time visibility over the sewershed.**

## Outcome

Using Kando Pulse, EPW operators can identify and respond to high-strength wastewater, protecting advanced purification processes and ensuring high-quality outputs, suitable for DPR. EPW also identified sources of pollution in the the network, enabling them to work with specific dischargers to reduce pollution at source. **EPW evaluates that reducing these polluting discharges can save up to \$500k/year of energy and operational expenses.**

Quality Over Time



Graph: Pollution reduction over time as measured in Kando Pulse



Mr. John Balliew

*“Extracting data continuously and remotely from the wastewater collection network and using advanced algorithms to analyze the data and understand the pollution sources, allow El Paso Water to control the wastewater quality 24/7 and protect the public health.”*

President/CEO | Executive Services, El Paso Water

# WWT Process cost | NTMWD, TX

## Background

The North Texas Municipal Water District (NTMWD) provides drinking water, wastewater, and solid waste services to **1.8 million citizens across North Texas**. **NTMWD** also service more than **125 significant industrial users (SIUs)**. This case focuses on the Rowlett Creek Wastewater Treatment Plant (RCWWTP), a 24 MGD plant, receiving influent from both municipal and SIU users.

## Project Description

The RCWWTP is permitted to discharge up to 5 (winter) or 2 (summer) milligrams per liter of ammonia nitrate to the river. During **early 2021, high levels of ammonia and phosphorous were observed at the plant**, requiring high dosage of Magnesium Hydroxide. To meet standards while lowering the increased costs associated with high chemical dosing, **NTMWD sought to track the sources of nutrients using Kando's management system**.

## Outcome

During the project, Kando Pulse detected several pollution events, and lab results confirmed high levels of ammonia (57.9 mg/L and 62.8 mg/L) – almost twice compared to RCWWTP baseline levels (32 mg/L). Joshua Boyd, plant operator for **RCWWTP indicated that early warning of pollution event can lead to chemical savings of up to \$25k/month**.



Rowlett Creek WWTP



**Graph:** Pollution over time as seen in Kando Pulse., including 2 peaks where lab results indicated elevated levels of ammonia.

# Network Visibility | MSDGC, OH

## Background

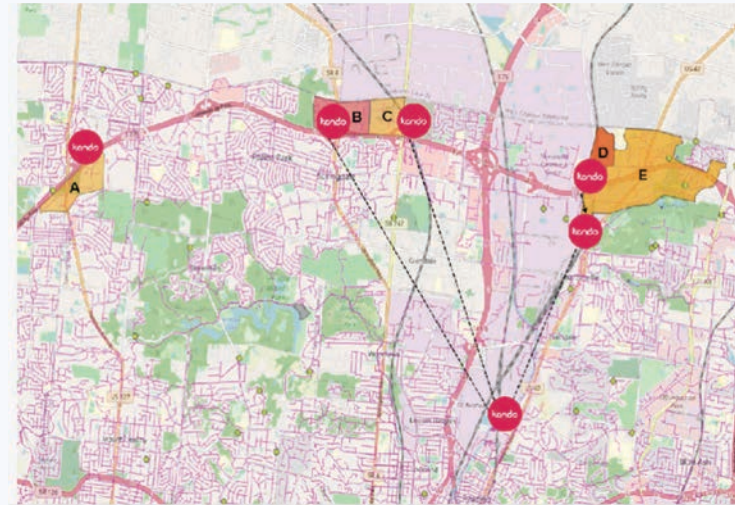
The Metropolitan Sewer District of Greater Cincinnati (MSDGC) is a tech-savvy utility that has invested in numerous efforts to turn its collection system into a “smart sewer”, minimizing combined sewer overflows (CSO) during storm events. Serving **850,000 customers** and **150 permitted industrial users**, the utility transports **160 MGD** through a **3000 km network** to seven WWTPs.

## Project Description

To expand and support its “Smart Sewer” goals, **MSDGC have partnered with Kando to improve the quality of wastewater flowing in its collection system.**

Kando Pulse was installed in five industrial areas around MSDGC’s network to provide wastewater treatment plant operators with advanced warning of pollution events in the sewershed.

Specifically focusing on trade effluent quality, Kando’s system uses machine learning tools, network modeling, and lab analysis to identify and profile pollution events, and trace them back to their sources. With detailed oversight over the effluent discharged to their system, MSDGC can work with contributors to improve their pretreatment processes and minimize the impact of contaminated wastewater.



*The project area (East Branch Mill Creek, upstream of of SSO900)*



# Sludge Quality | City of Houston, TX

## Background

The City of Houston serves a population of **2.1 million people**. It operates **39 WWTPs** and 6,100 miles of sewer lines, treating an average of around **250 MGD**. The city of Houston also services about **140 permitted industrial users**.

## Project Description

As part of the City's ongoing efforts to collect and use data from the collection system, Houston initiated monitoring of five industrial areas upstream of its 96<sup>th</sup> street WWTP. **The goal of the project is to identify unpermitted discharges and track them to their source.**

Preliminary results have **successfully traced heavy metals to several sources in the project area, potentially changing the quality of the sludge produced** by the 96<sup>th</sup> street WWTP. Identifying the source of illicit discharge will improve the wastewater and sludge quality.



*Graph: Pollution level as measured by Kando's system. Samples are collected and analyzed at the lab when the pollution is high (red)*

# Solution

Extract, Analyse, and Generate  
Insights from sewage networks



Detect

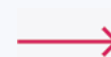


Track



Impact

# WBE - Wastewater-based Epidemiology



# Wastewater Intelligence | WBE Responding to COVID-19



## An early warning system for COVID-19 outbreaks

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Kando's WBE solution combines our market-leading wastewater analysis experience with our partners' expertise in, epidemiology, public health, microbiology, and wastewater.

Our end-to-end service detects virus outbreaks and pinpoints infection hotspots in cities, supporting effective public health decision making.

## Our academic partners

We've partnered with leading experts in:

- Public health
- Microbiology
- Epidemiology
- Wastewater



**Prof. Ariel Kushmaro**

Department of Biotechnology  
Engineering  
Ben Gurion University of the  
Negev



**Prof. Eran Friedler**

Head of the Water and  
Environment department,  
Israeli Institute of Technology  
Wastewater Processes & Quality



**Prof. Jacob Moran-Gilad**

Full professor of Clinical Microbiology,  
School of Public Health,  
Faculty of Health Sciences,  
Ben Gurion University of the Negev



**Prof. Nadav Davidovitch**

Director of the School of Public Health,  
Ben Gurion University of the Negev,  
Chair of the Public Health Forum, IMA

# Process



**Planning**

01



**Installation**

02



**Sampling**

03



**Analysis**

04



**Zoom in & Continuous  
Monitoring**

05

# Planning |

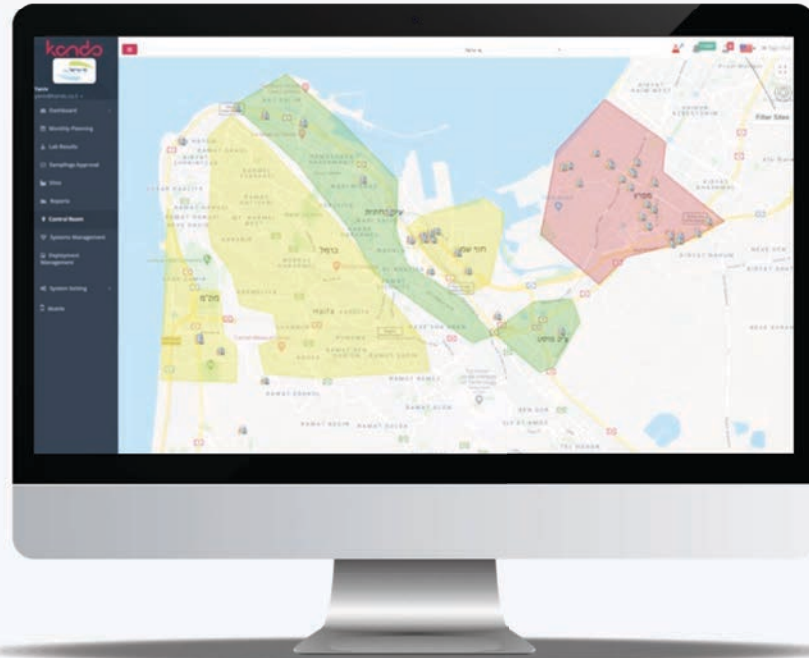
## Defining monitoring areas

Factors Include:

Demographic information

Network information

Wastewater discharge trends



# Installations |

## Automated sampling at optimal locations

How Do We Install?

Network GIS

Upstream population

Manhole physical properties

Network trends analysis.



Data gathering units are deployed at key locations to give maximum visibility.



# Installations |

## IoT data gathering units

Kando's IOT data gathering units are deployed inside client's collection system.

### 1. Quality and flow sensors



### 2. Data logger



### 3. Automatic sampler



# Sampling| Protocol

## Composite sampling

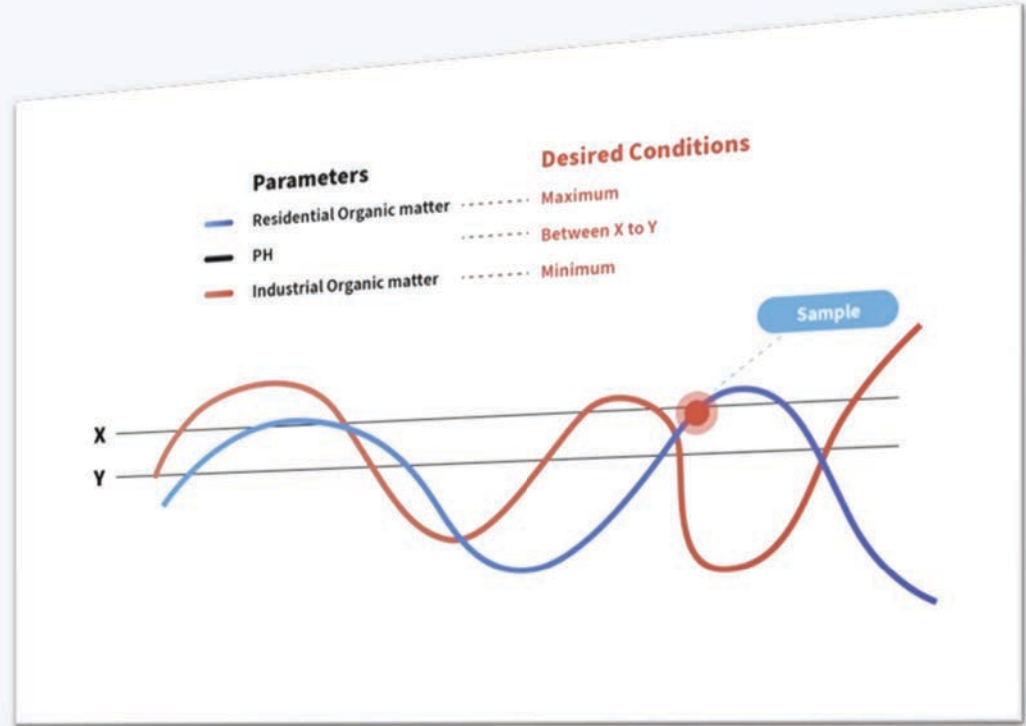
### Wastewater flow

Monitoring wastewater flow is essential for calculating the 'Normalized Viral Load' (NVL).

### Wastewater quality

Pollution and increased rainfall can distort NVL measurements.

Kando's solution only takes samples when conditions are right.



# Results and Zoom-in |

## Upstream focus

**It takes just 48 hours**

to provide targeted analysis of infected areas.

1. Deploy 'Zoom-in' units
2. Collect samples
3. Analyze samples
4. Deliver outbreak report



# Zoom-in | Results

## Kando Provides Infection Profiling for:

Whole Districts

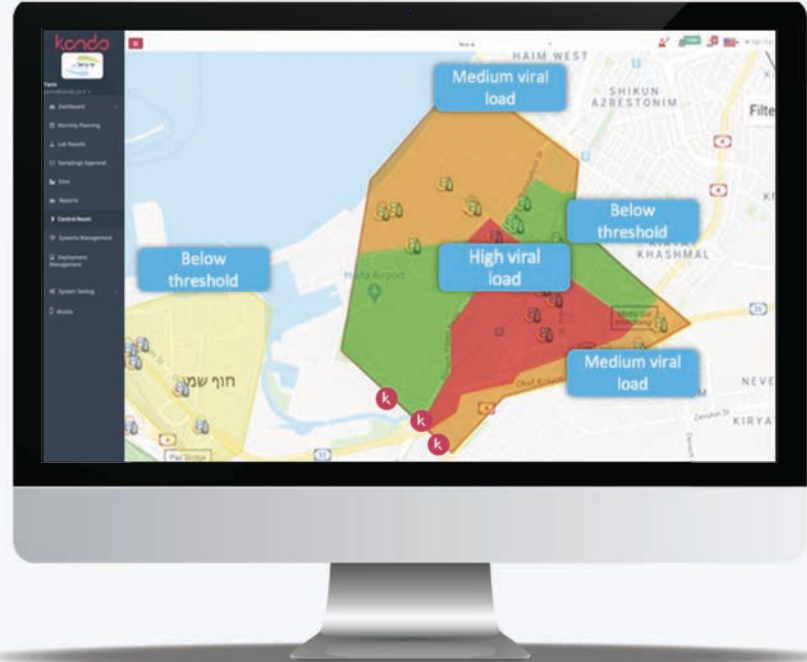
City Blocks

Individual Single  
Streets

Single Facilities

Residential Homes

Hospitals  
Prisons  
Military bases  
University campuses



# Ashkelon | Proof of Concept Pilot

## Ashkelon basic information:

Population: 145,000

Area: 18.4 Square Miles

Location: Southern Israel, Mediterranean coast

Zones: 16

## The ideal location:

No known COVID-19 cases in the community.

The city's 200 known cases were contained in a single controlled location (a quarantine hotel).



## Ashkelon Project Goals

Establish if Kando's technology can pinpoint virus hotspots.

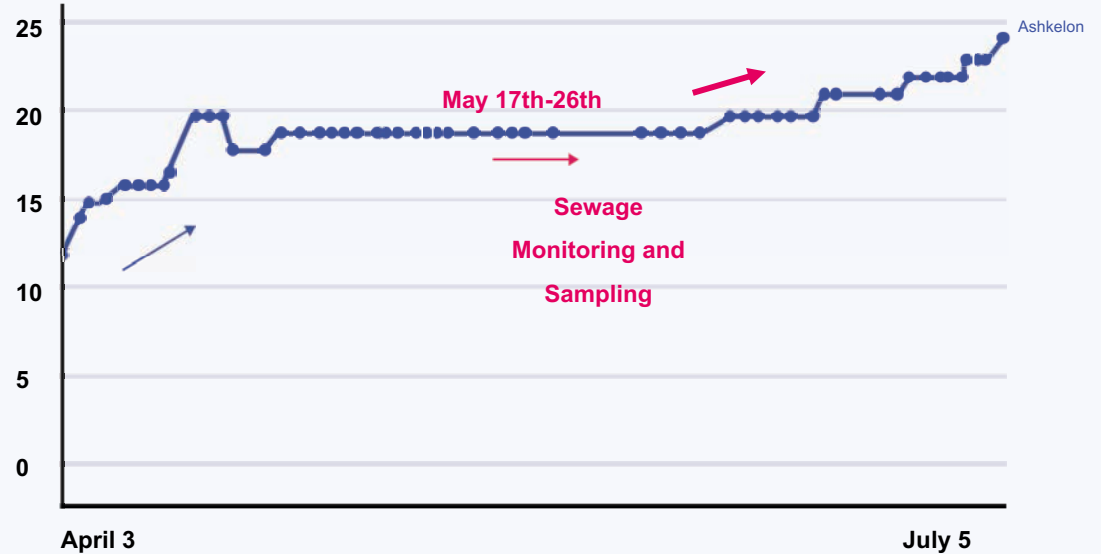
Improve our understanding Normalized Viral Load (NVL) patterns in wastewater.

Model the outbreak profile in the surveyed area.



# Proof of concept | Early detection in Ashkelon

Confirmed patients  
per 10,000 people  
(Ashkelon)



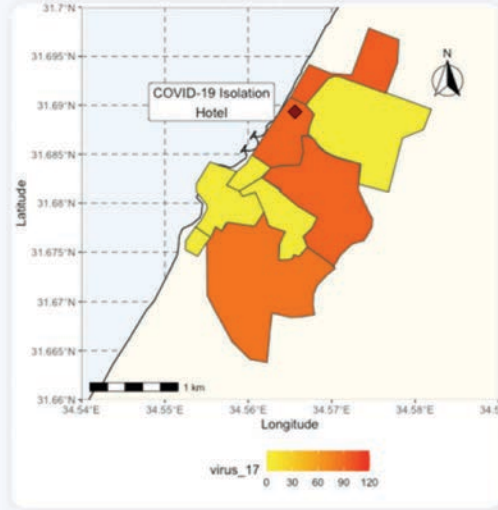
Dates March - July

# Preliminary results | Early warning

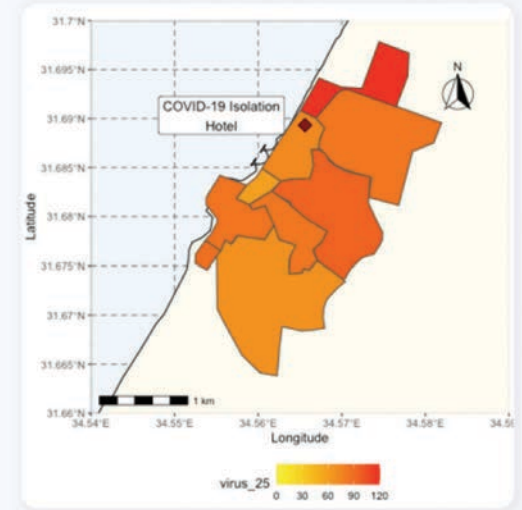
Preliminary Results Pilot Deployment Area



Week 1: May 17th



Week 2: May 26th



# Nationwide Israel COVID-19 Monitoring Project | Live



## Early Warning System for COVID-19 Outbreaks

**Israel: 8.5 million population**

**Tel Aviv: 435,855 population**

Towns more than **20,000 people will be monitored twice a week**. This is a procedure that takes about **24 hours**, from taking the sample until receiving the results.

This project has made the **Ministry of Health and the State of Israel into a world leader in coping with COVID-19**, by using a national network to identify the virus in wastewater and protect the health of the public, while applying and installing technology that does not disrupt the normal daily routine of the population.



# Solution

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Insights from sewage networks



Detect



Track



Impact



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**Looking forward  
to Connecting  
with you**

kando.eco

