

# Data Management and Analytics for Smart Water Systems

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Data | Analytics | Insightful Decisions



- **What we do** – a leading provider of **data management and analytics** solutions for the utilities sector
- **Who we are** – a quality group of engineers, software & algorithm experts with vast water and energy experience
- **Our track record** – more than **100 installations**, world-wide

**Our objective: continue our international growth through strategic partnerships with utilities and service providers**

# The Challenge – Turning Data into Actionable Insights



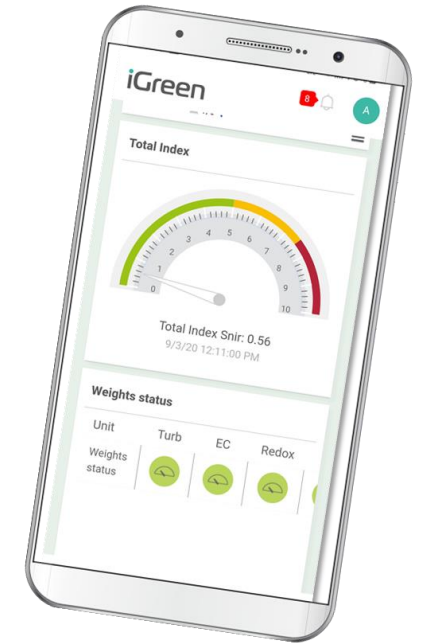
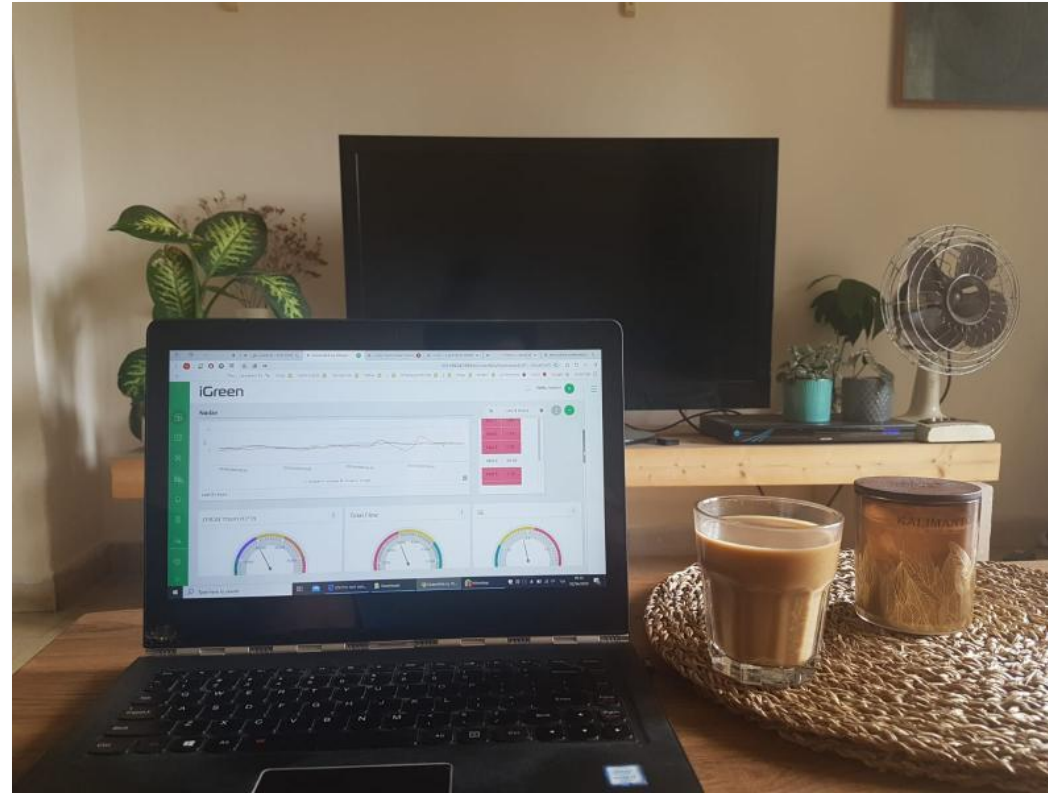
# Anywhere Anytime

Continuity

Comprehensiveness

Convenience

Collaboration



The New Normal – Post COVID-19

# IOSight Responds to the Utility Data Challenge





# Our Clients – Examples



## Water and Wastewater Facilities and Utilities



## Desalination



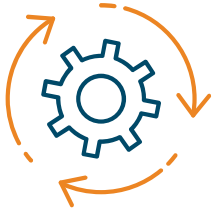
## Watersheds and Environment



# Installations – Water Treatment, Wastewater Treatment and Desalination Plants

Facility	Location	Capacity
Shafdan WWTP	Israel	397,000 m <sup>3</sup> /day
Jerusalem WWTP	Israel	150,000 m <sup>3</sup> /day
Everbright Incineration Leachate WWTP	China	2,500 m <sup>3</sup> /day
Herzliya WWTP	Israel	20,000 m <sup>3</sup> /d
Jardine WPP	Chicago, US	5,300,000 m <sup>3</sup> /day
Sawyer WPP	Chicago, US	2,726,000 m <sup>3</sup> /day
Westlake Filtration Plant	California, US	68,000 m <sup>3</sup> /day
Lahat BWRO Plant	Israel	20,000 m <sup>3</sup> /d
Granot BWRO Plant	Israel	20,000 m <sup>3</sup> /d
Sorek SWRO Plant	Israel	624,000 m <sup>3</sup> /day
Hadera SWRO Plant	Israel	525,000 m <sup>3</sup> /day
Ashkelon SWRO Plant	Israel	396,000 m <sup>3</sup> /day
Ashdod SWRO Plant	Israel	384,000 m <sup>3</sup> /day
Palmachim (ViaMaris) SWRO Plant	Israel	246,000 m <sup>3</sup> /day
Carlsbad SWRO Plant	California, US	204,000 m <sup>3</sup> /day
Santa Barbara SWRO Plant	California, US	11,000 m <sup>3</sup> /day
Larnaca SWRO Plant	Cyprus	54,000 m <sup>3</sup> /day
Limassol SWRO Plant	Cyprus	40,000 m <sup>3</sup> /day

Water Utilities, Watersheds & Environment	Location
The Chicago Department of Water Management	US
Current – Chicago River	US
Mekorot – The Jordan River Watershed	Israel
The Jerusalem Water Utility	Israel
The Ramat Gan Water Utility	Israel
The Haifa Water Utility	Israel
Las Virgenes Municipal Water District	US
The Jordan Valley Water Association	Israel
The Beer Sheva Water Utility	Israel
Igudan – Dan Regional Association for Environmental infrastructure	Israel
The Herzliya Water Utility	Israel
The Kfar Sava Water Utility	Israel
The Rishon Lezion Water Utility	Israel



## Operations and Performance

- **Water quality** monitoring
- **Energy** cost reduction
- **Chemical** consumption reduction
- **Machine performance** monitoring
- Minimization of down time
- Network **optimization**
- **Water loss** detection
- **Data integrity** assurance
- Process optimization
- **Knowledge management**



## Administration and Finance

- Billing & metering
- Chemical inventory management
- Chemicals and energy balances
- Planning vs. execution comparison



## Regulatory Compliance

- Comprehensive regulatory reporting
- Contractual compliance
- Adherence with environmental and public health standards

- **Engineering-driven** development and implementation
- **Vertically integrated – an off-the-shelf end-to-end solution** for data management and analytics
- **Based on vast experience** (over 100 installations)
- **Seasoned team** – engineers, data scientists, software
- **Water-specific software assets** (reports, formulas, analytics)

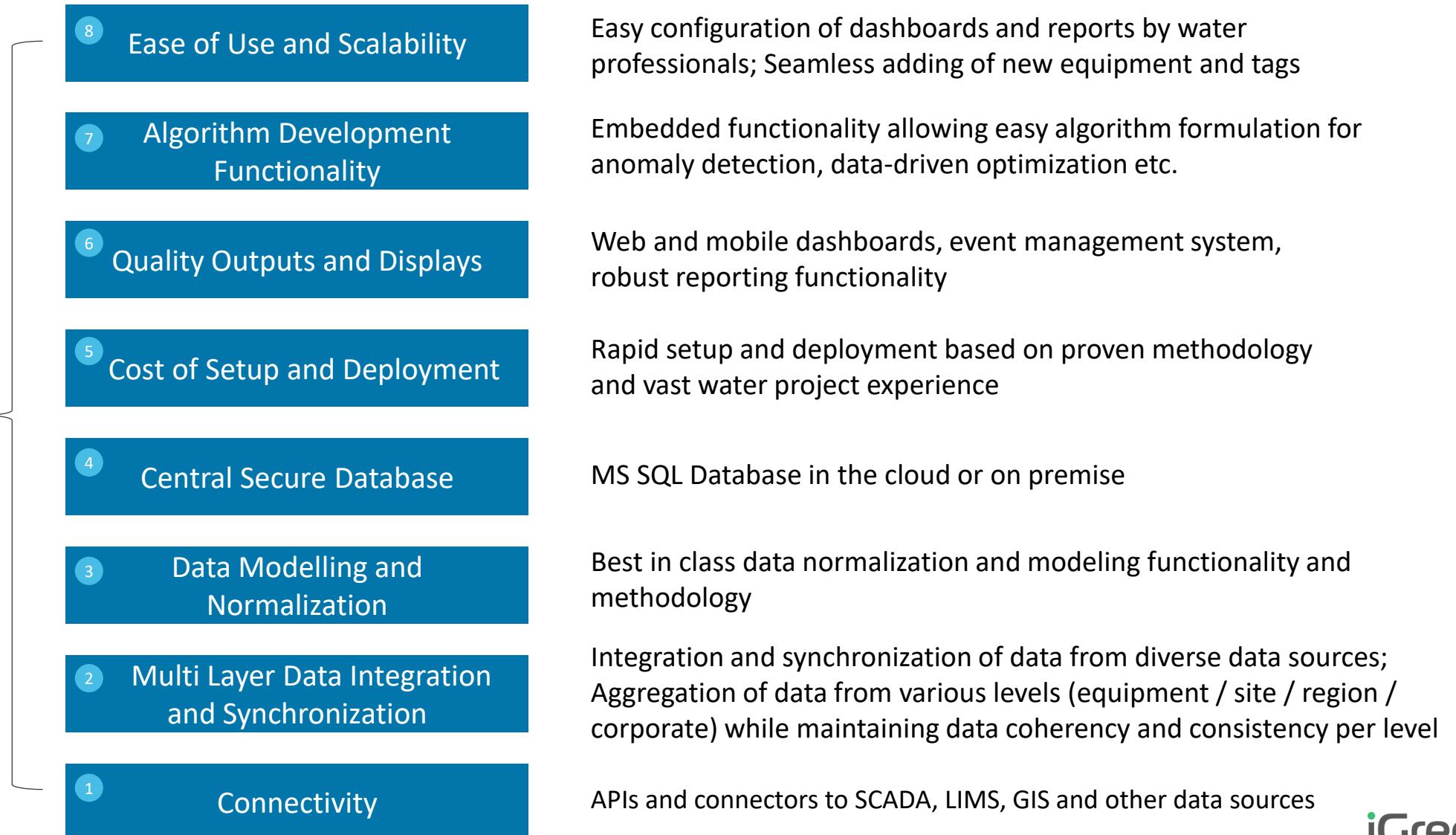
Delivering proven solutions and outcomes

# iGreen is a Best-in-Class Water-Specific Data Management and Analytics Solution

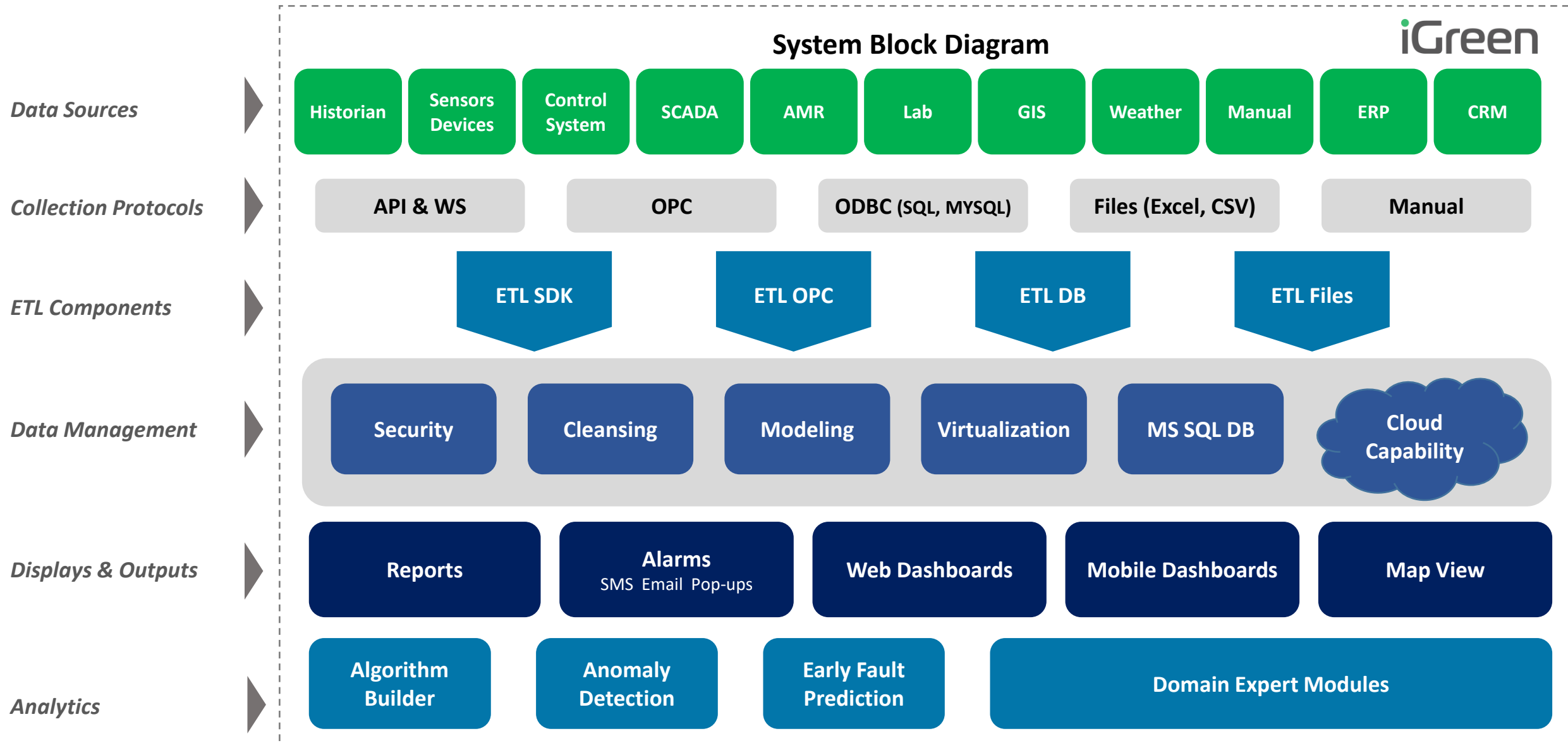


iGreen

Embedded  
Water Domain  
Know-how and  
Assets



iGreen



- Pre-processing using data quality concepts and logic rules
- Pre-processing using time series data analysis
- Adding data logic rules – factoring, deadband, limits, etc.

- Creating tags based on engineering expressions
- Adding sanity tests to the incoming values
- Structuring the data to an engineering product tree
- Algorithm builder and rule-based engine per tag

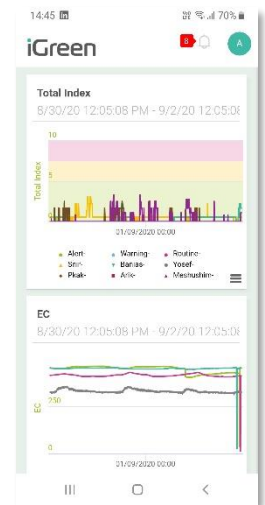
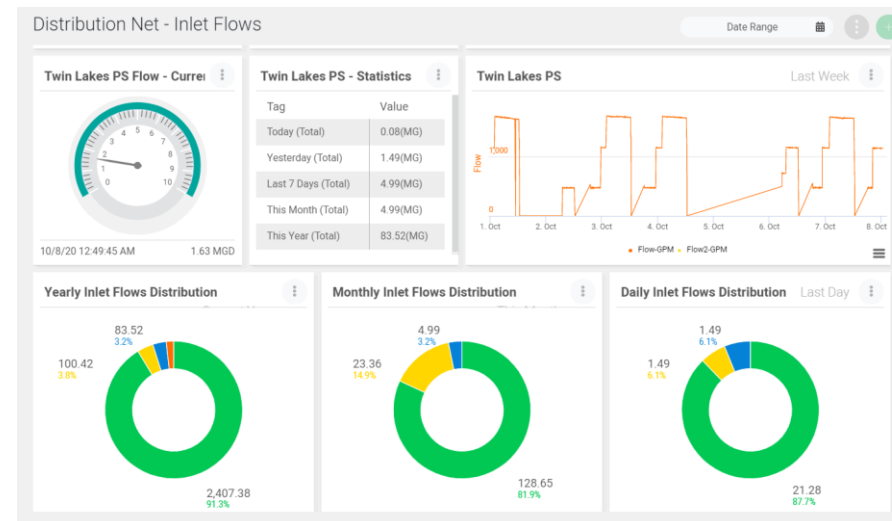
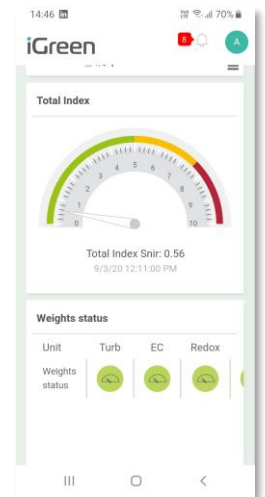
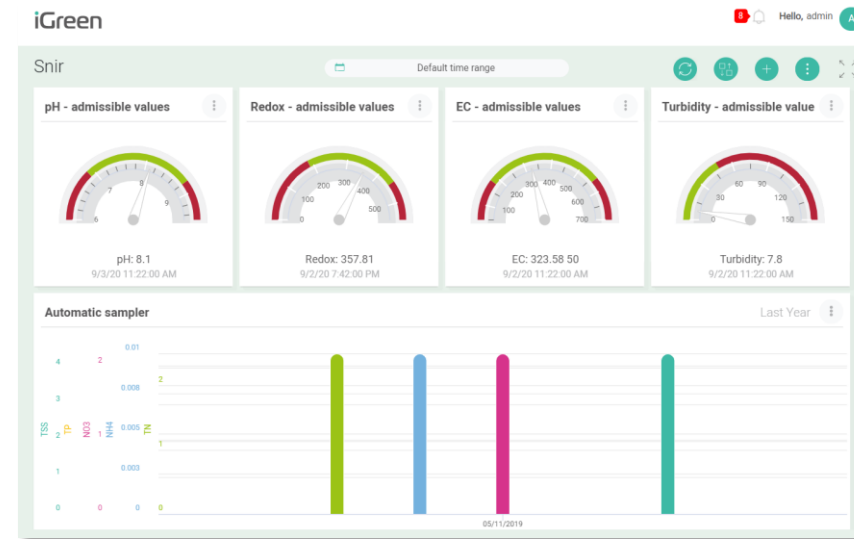
The screenshot displays the 'Data View' interface of the iGreen system. It features a hierarchical tree structure of data points, organized into columns. The leftmost column lists high-level categories, and subsequent columns show more granular details, with arrows indicating data flow or relationships between different levels of the hierarchy. The tree structure is as follows:

- Test Unit
- Lab
- Lab 2020
- Off Shore
- Intake
  - On Shore
  - Pretreatment
    - RO North (A)
      - SWRO North
        - Pumps North
          - HP line 1
          - HP line 2
          - HP line 3
          - HP line 4
        - FI-E2L02-01-AI01
        - PI-E2L91-01-AI01
        - Total HP flow
      - Banks North
      - BWRO North
    - RO South (B)
      - SWRO North
        - Pumps North
          - HP line 1
          - HPF pump1
        - FI-E2P01-01-AI01
        - FQ-E2P01-01-AI02
        - HPF 1 - Amper
        - HPF 1 - DP
        - HPF 1 - KW
- Intake common
- Intake Pumps
  - Intake pump1
    - FI-B0P01-01-AI01
    - FQ-B0P01-01-AI02
    - Intake pump 1 - efficiency
    - Intake pump 1 - pump DE TT
    - Intake pump 1 - pump NE TT
    - Intake pump 1 - VFD mode

- Brine Pit
- Neutralization tank
- NT blended permeate
- Product water
- ALKM
- B
- BFD
- CA
- CCPP
- CL
- DO
- EC
- ECFD
- HARM

# Web and Mobile Dashboards

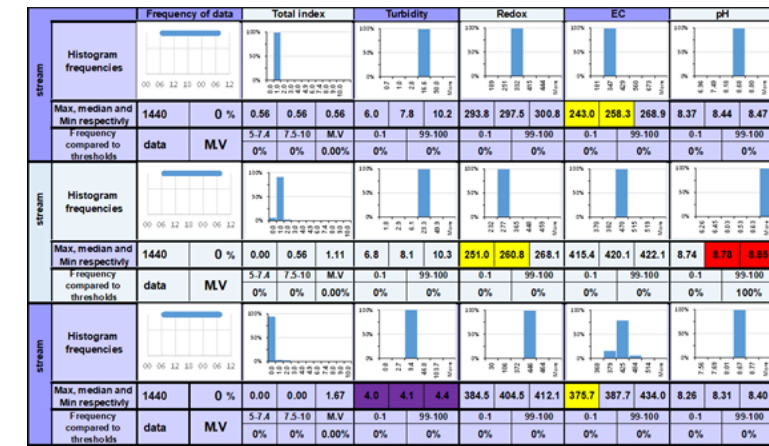
- Mobile and web Interfaces
- Variety of visual widgets
- User-friendly dashboard creation





IOSight

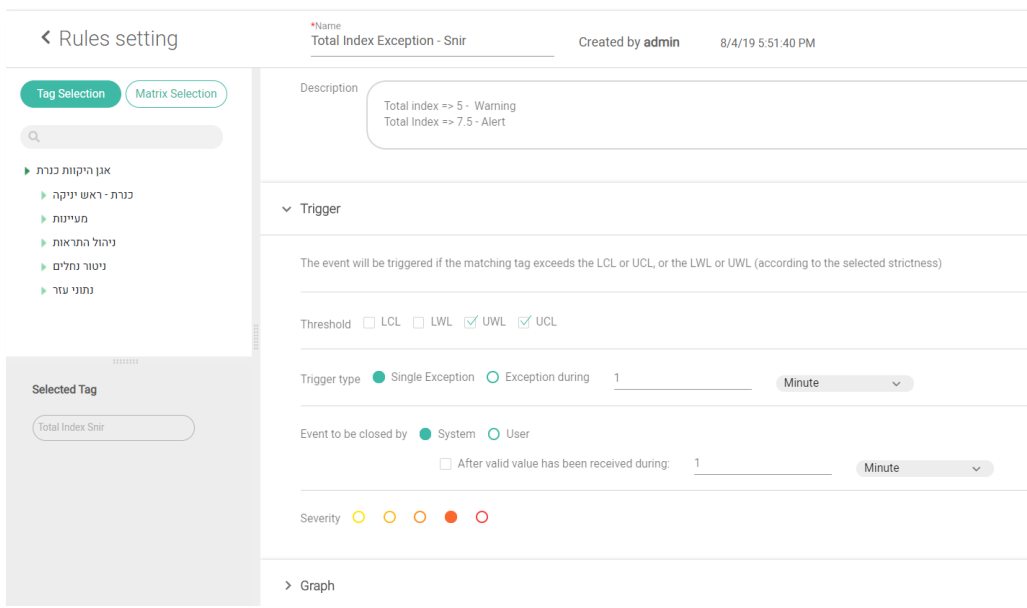
- [illegible]



# Rules-Based Event Management System

- Rule-based event management
- Alerts can be sent by email or SMS
- GIS interface

## Rules Engine



The Rules Engine configuration interface shows a rule named "Total Index Exception - Snir" created by admin on 8/4/19 5:51:40 PM. The description is "Total index => 5 - Warning" and "Total Index => 7.5 - Alert". The trigger is configured with a threshold of UWL and UCL, and a trigger type of Single Exception. The event will be triggered if the matching tag exceeds the LCL or UCL, or the LWL or UWL (according to the selected strictness). The trigger type is Single Exception, and the event will be closed by System. The severity is set to Yellow.

**Rules setting**

\*Name: Total Index Exception - Snir  
Created by: admin  
8/4/19 5:51:40 PM

Description: Total index => 5 - Warning  
Total Index => 7.5 - Alert

Trigger

The event will be triggered if the matching tag exceeds the LCL or UCL, or the LWL or UWL (according to the selected strictness)

Threshold: ☐ LCL ☐ LWL ☒ UWL ☒ UCL

Trigger type: ☒ Single Exception ☐ Exception during 1 Minute

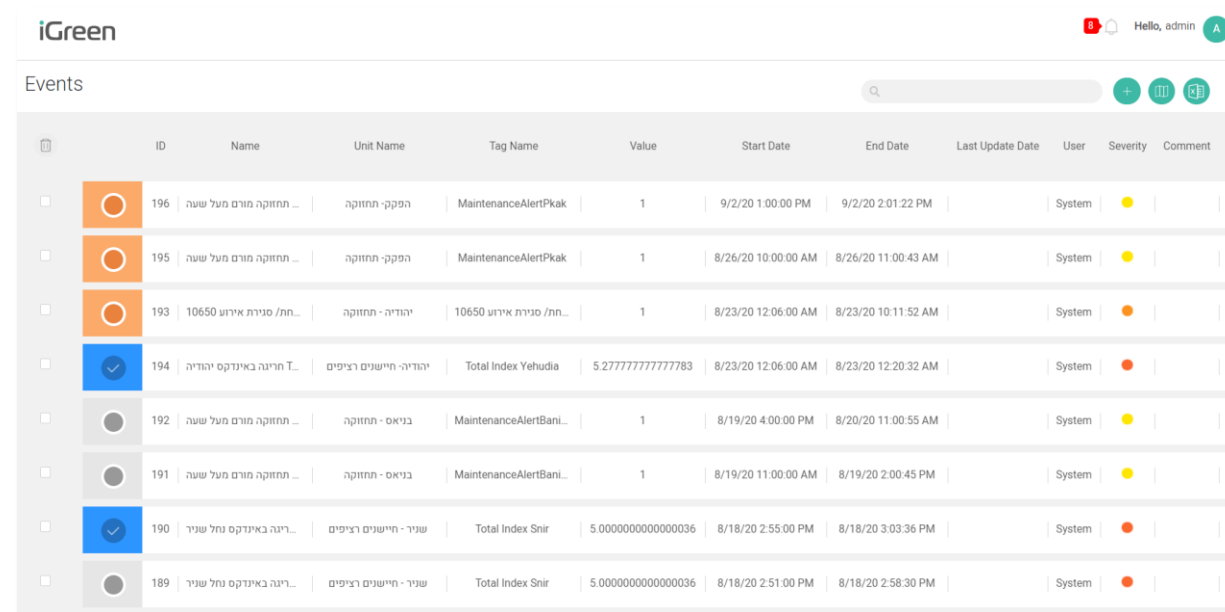
Event to be closed by: ☒ System ☐ User

☐ After valid value has been received during: 1 Minute

Severity: ● ● ● ● ●

> Graph

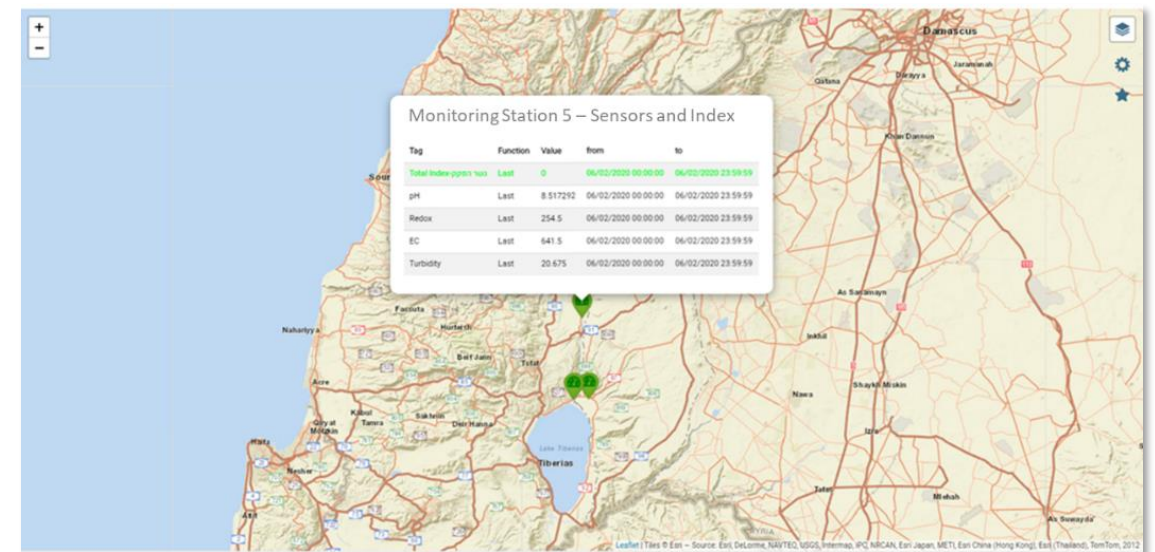
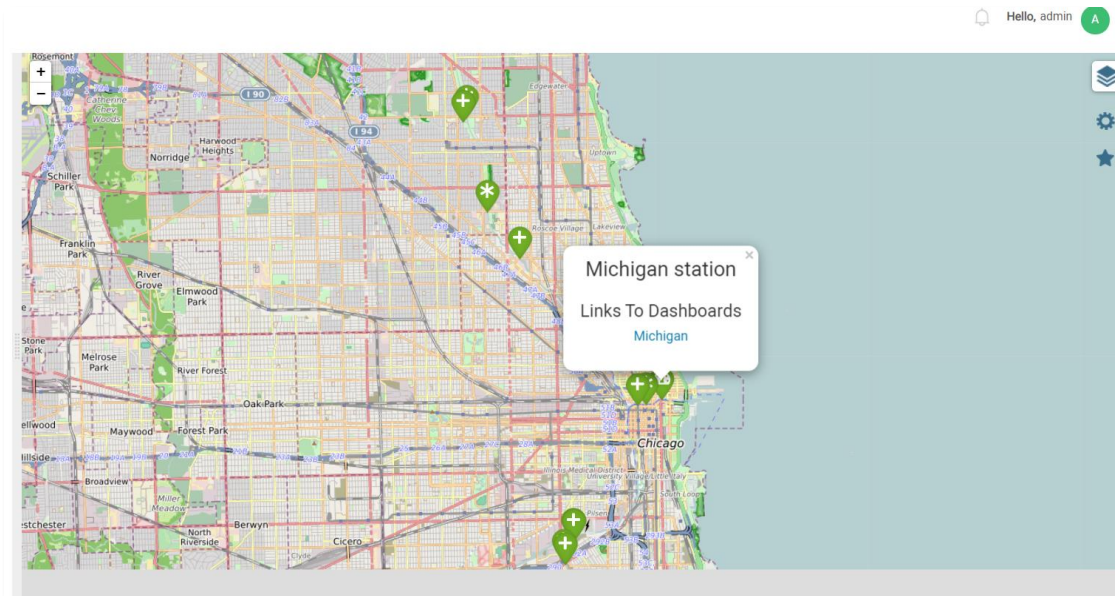
## Event Management Screen



The Event Management Screen displays a list of events with columns for ID, Name, Unit Name, Tag Name, Value, Start Date, End Date, Last Update Date, User, Severity, and Comment. The events are sorted by ID in descending order.

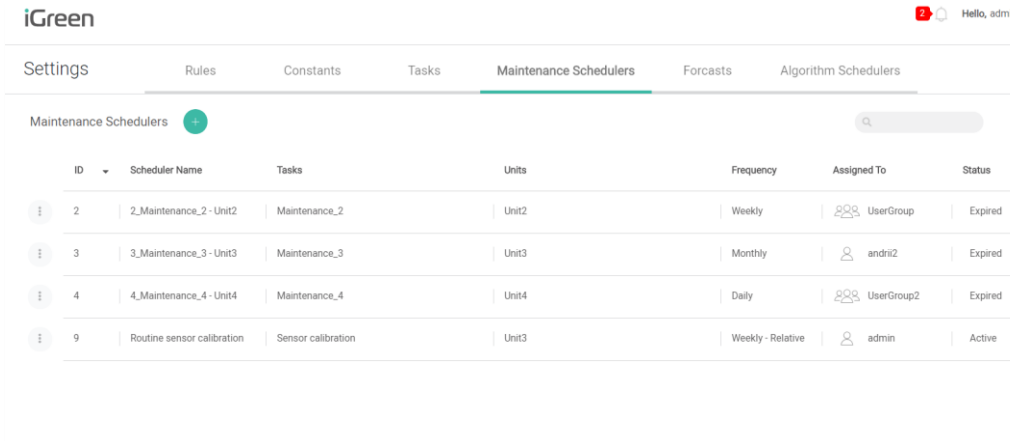
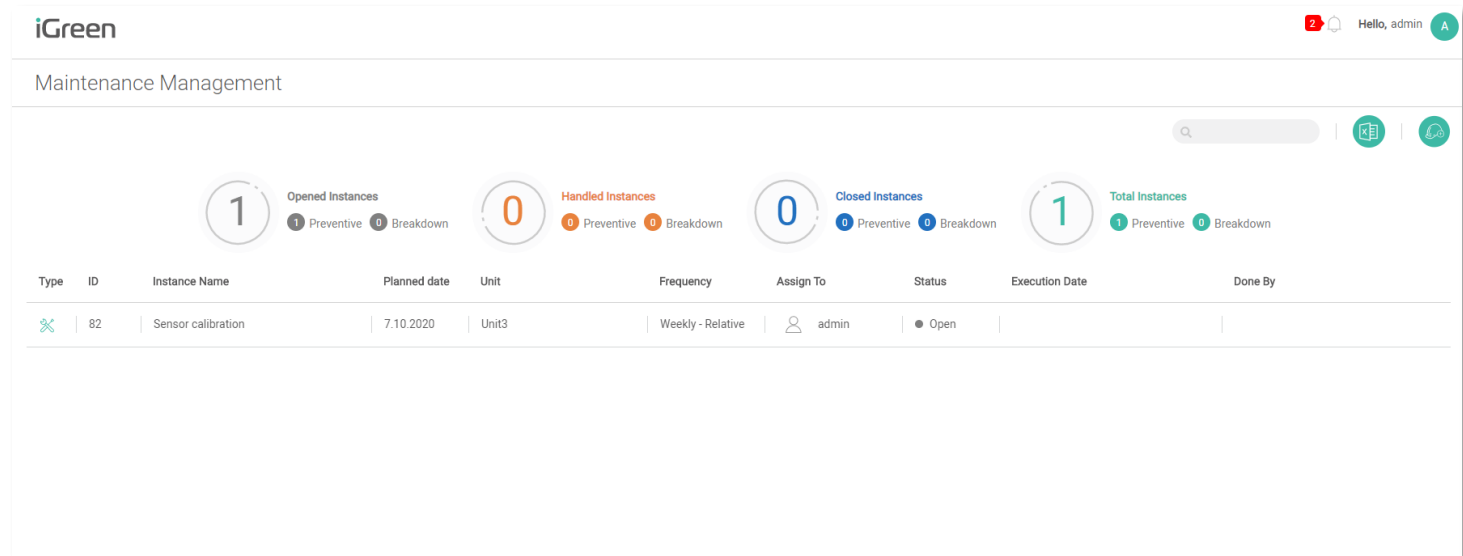
ID	Name	Unit Name	Tag Name	Value	Start Date	End Date	Last Update Date	User	Severity	Comment
196	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	9/2/20 1:00:00 PM	9/2/20 2:01:22 PM		System	Yellow	
195	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	8/26/20 10:00:00 AM	8/26/20 11:00:43 AM		System	Yellow	
193	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	8/23/20 12:06:00 AM	8/23/20 10:11:52 AM		System	Orange	
194	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	8/23/20 12:06:00 AM	8/23/20 12:20:32 AM		System	Red	
192	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	8/19/20 4:00:00 PM	8/20/20 11:00:55 AM		System	Yellow	
191	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	8/19/20 11:00:00 AM	8/19/20 2:00:45 PM		System	Yellow	
190	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	8/18/20 2:55:00 PM	8/18/20 3:03:36 PM		System	Red	
189	תחזוקה מורם מעל שעה	הפקה - תחזוקה	MaintenanceAlertPkak	1	8/18/20 2:51:00 PM	8/18/20 2:58:30 PM		System	Red	

- Visually display real-time situation (e.g., water quality) across locations
- Link to dashboards and event management



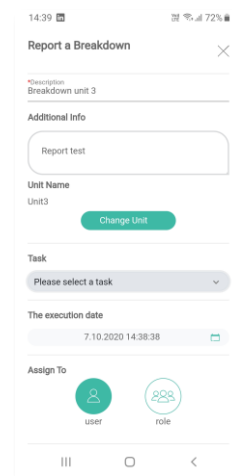
# Maintenance management

- Web and mobile interfaces for tracking and managing preventative and corrective maintenance tasks
- Easy, efficient and effective evaluation of asset condition
- Equipment maintenance scheduling processes

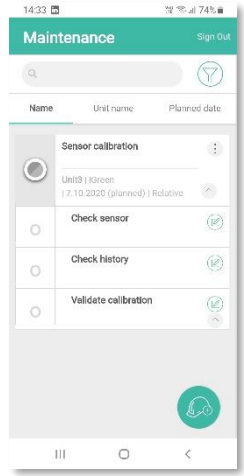


The screenshot shows the iGreen Maintenance Schedulers settings page. It features a table with columns: ID, Scheduler Name, Tasks, Units, Frequency, Assigned To, and Status. The table lists four schedulers: 2\_Maintenance\_2 - Unit2, 3\_Maintenance\_3 - Unit3, 4\_Maintenance\_4 - Unit4, and Routine sensor calibration. The Routine sensor calibration scheduler is currently active.

ID	Scheduler Name	Tasks	Units	Frequency	Assigned To	Status
2	2_Maintenance_2 - Unit2	Maintenance_2	Unit2	Weekly	UserGroup	Expired
3	3_Maintenance_3 - Unit3	Maintenance_3	Unit3	Monthly	andri2	Expired
4	4_Maintenance_4 - Unit4	Maintenance_4	Unit4	Daily	UserGroup2	Expired
9	Routine sensor calibration	Sensor calibration	Unit3	Weekly - Relative	admin	Active



The screenshot shows the 'Report a Breakdown' screen in the iGreen mobile app. It includes a text input field for 'Report test', a 'Change Unit' button, a 'Unit Name' dropdown menu, a 'Task' dropdown menu, a 'The execution date' field, and an 'Assign To' section with 'user' and 'role' options.



The screenshot shows the 'Maintenance' screen in the iGreen mobile app. It displays a list of maintenance tasks: 'Sensor calibration', 'Check sensor', 'Check history', and 'Validate calibration'. Each task has a corresponding status icon (e.g., a green checkmark for 'Check sensor').

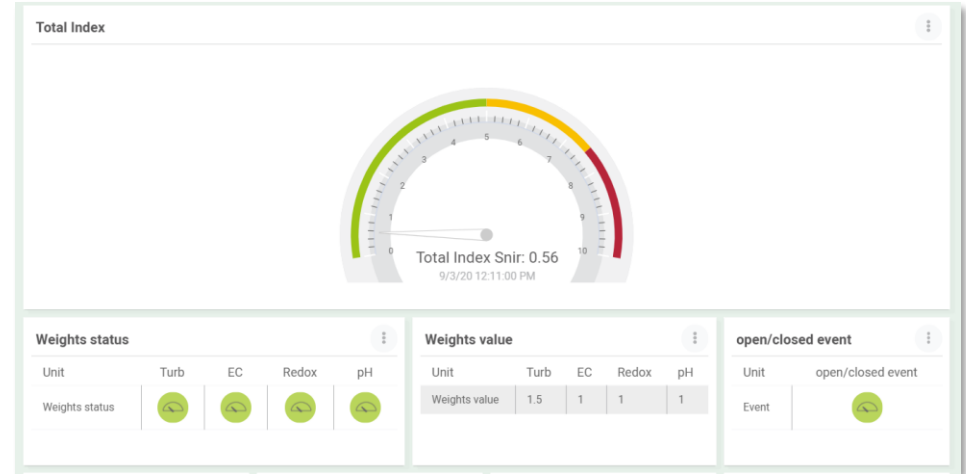
# Anomaly Detection and Early Fault Prediction

iShed



## Water Quality Monitoring in Rivers and Watersheds

- Contamination / anomaly detection
- Downstream propagation
- Elimination of 95% of false alerts

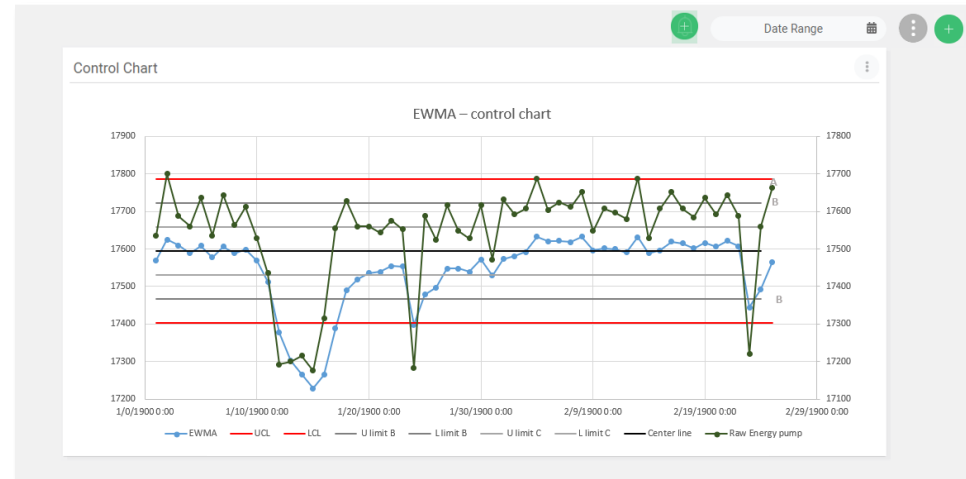


iDetect



## Early Fault Detection Engine

- Machine failure
- Quality exceptions
- Flow and pressure anomalies





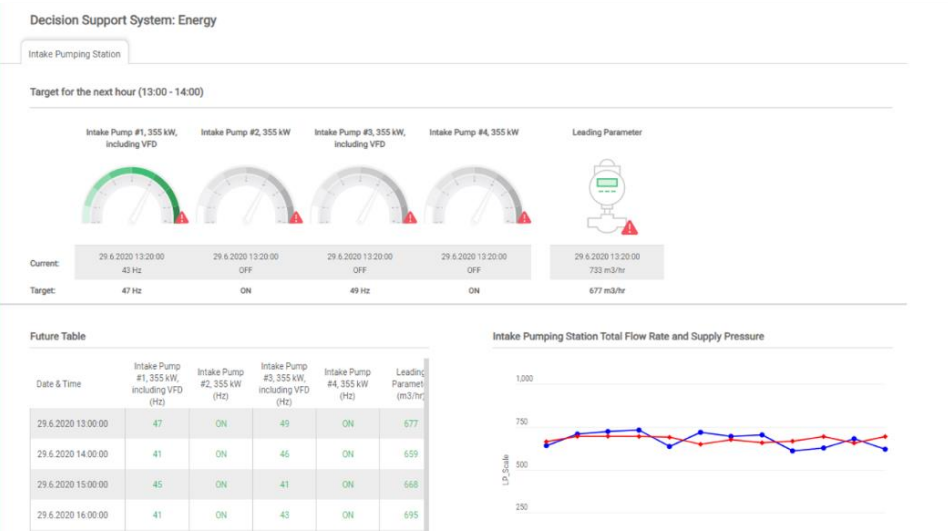
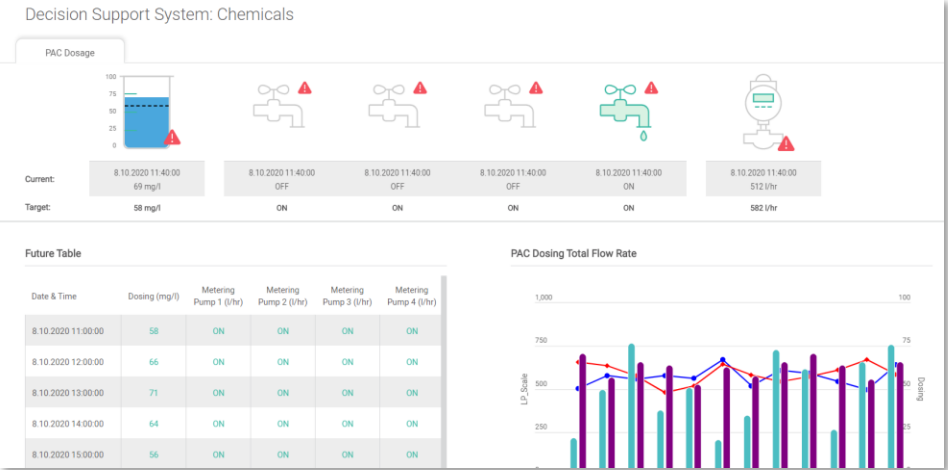
## Optimization for WTPs and WWTPs

- Energy consumption of pumps/blowers
- Chemical dosing
- Up to 10% cost savings



## Water Supply System Optimization

- Real-time network operations optimization
- Optimization of energy costs



iNet



## NRW in District Metered Areas (DMAs)

- Online water balances based on MNF
- Water-loss decision-support system
- Detecting anomalies and potential bursts

Configuration Algorithms

Select Unit  
MNF  
Display tags per matrix

Select Algorithm  
Var\_on\_Working\_Pump  
OldDailyLeak  
Daily\_Gardening  
Hourly\_Supply  
Min\_Hourly\_Supply  
HourMNF  
PressureWeightedAvg  
DailySupply  
Daily\_Calcs  
AveragePressure

CalculateDailyLeakage

CalculateDailyLeakage

Input variables

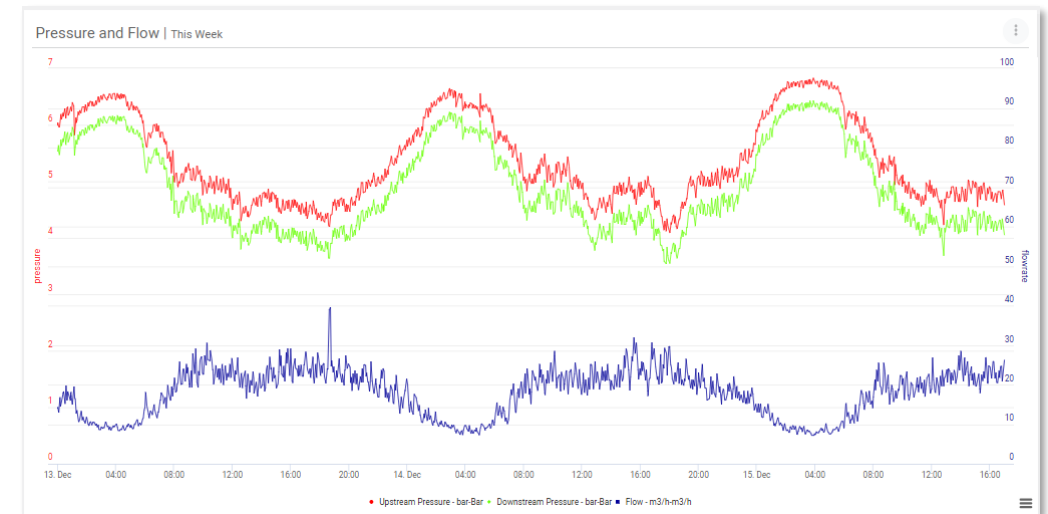
pressureatMNF	Type: Interval	Source Type: Matrix	Source: MNF0_Pressure	Matrix Depth: 1
ReferenceTime	Type: Date	Source: take schedule ref time	Source: Ref Time	
TimeObject	Type: TimeRange	Value: Time Object Value		

Output variables

OutputPresMNF	Target Type: None	Saving time: take schedule ref time	Ca
OutputLeakage	Target Type: None	Saving time: take schedule ref time	Ca
DailyLeakage	Target Type: Matrix	Target: MNF_DailyLeakage	Matrix Depth: 1 Saving time: take schedule ref time Ca

Variables

Variable Name	Variable Description	Declaration	Tag Id	Tag Name	Path
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iGreen

# Case Studies

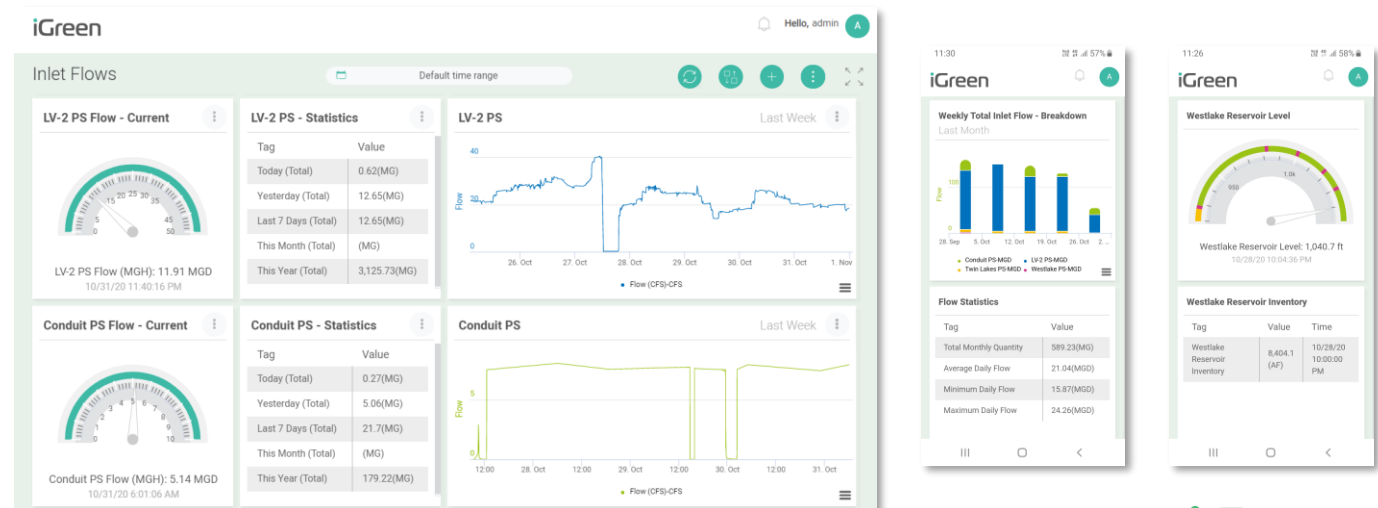


# Las Virgenes Municipal Water District, California, US



- COVID-19 “new-born”; Launched in March, go-live in June
- 100% remote project management and execution
- Reservoir, filtration plant, distribution network
- Establishing the data foundation
- Monitoring and management insights
- Web and mobile dashboards
- Management and regulatory reports
- Flows, water levels, quality, energy, chemicals

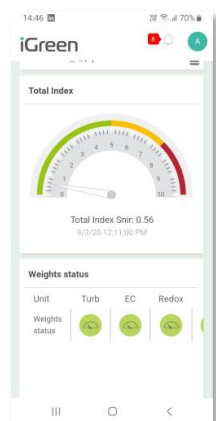
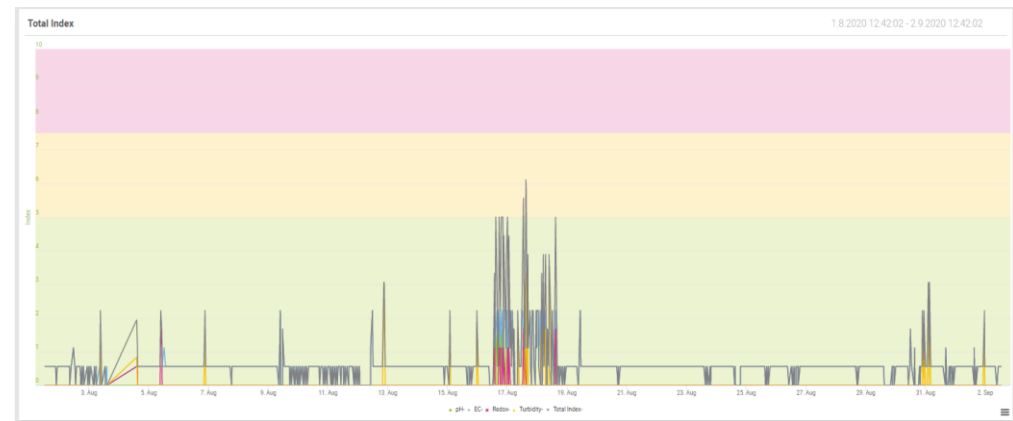
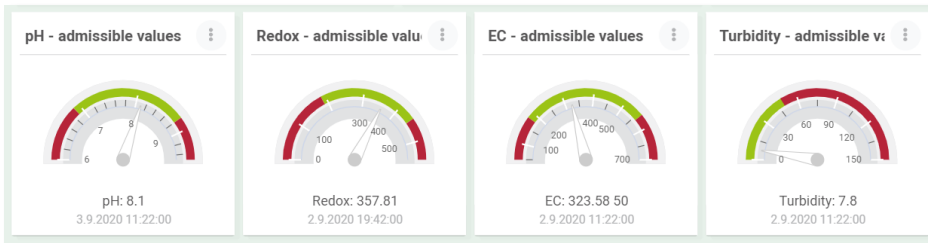
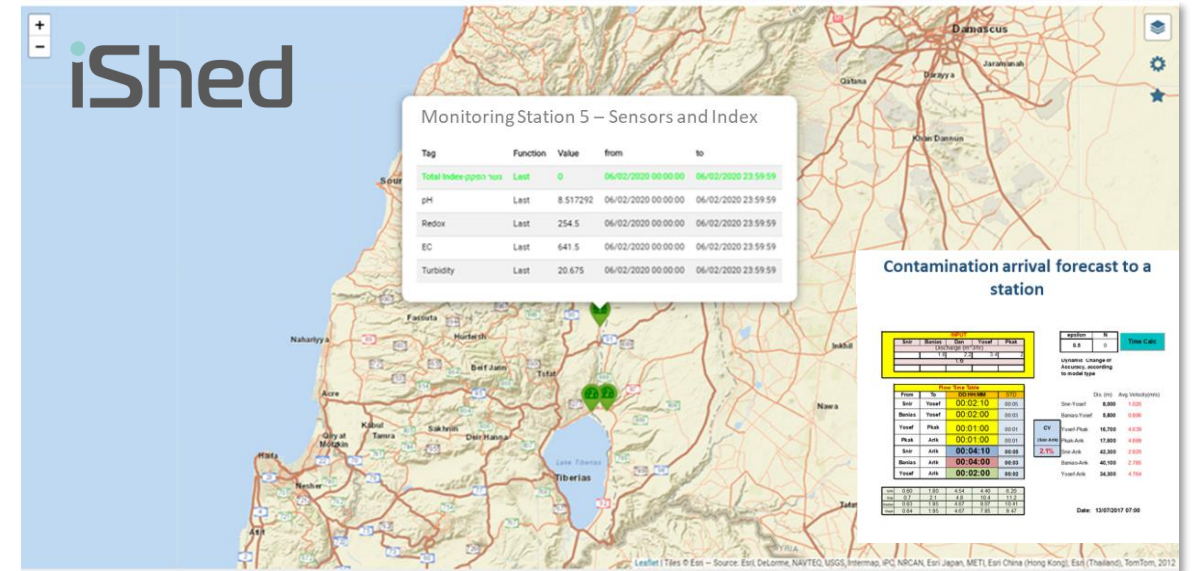
iGreen



iGreen

# Jordan River / Sea of Galilee Watershed, Israel

- Operational since 2017
- Efficient, comprehensive “Nerve Center”
- 500% productivity improvement
- Algorithm-based anomaly detection
- Elimination of 95% of false alerts
- Propagation calculations
- Event management and alerts
- Web and mobile dashboards



- Web dashboards and reports for the **Chicago Department of Water Management**
- Integration and management of data collected from 3 SCADA systems
- Jardine and Sawyer Water Purification Plants and the water supply system



# H2Now Chicago – Real-time water quality monitoring

## Goals

- **Obtain real-time information** about the microbial quality of the Chicago River
- **Communicate** these data to the public
- **Educate** the public
- **Gain insights** into how the river water quality responds to changing conditions and events, such as CSOs

## Status

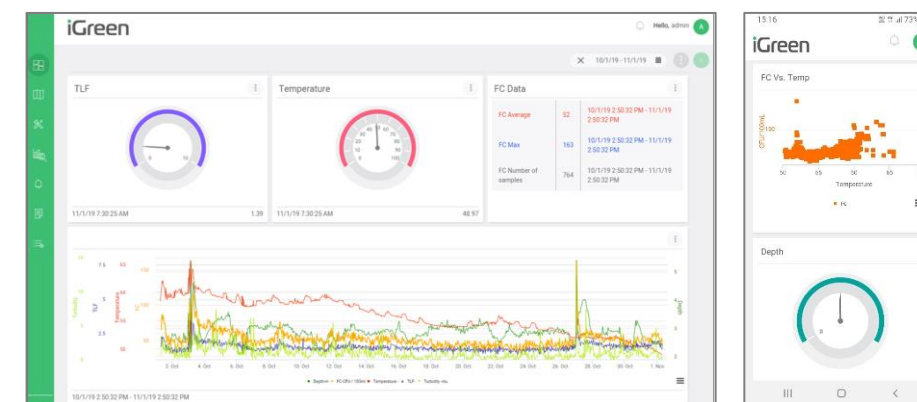
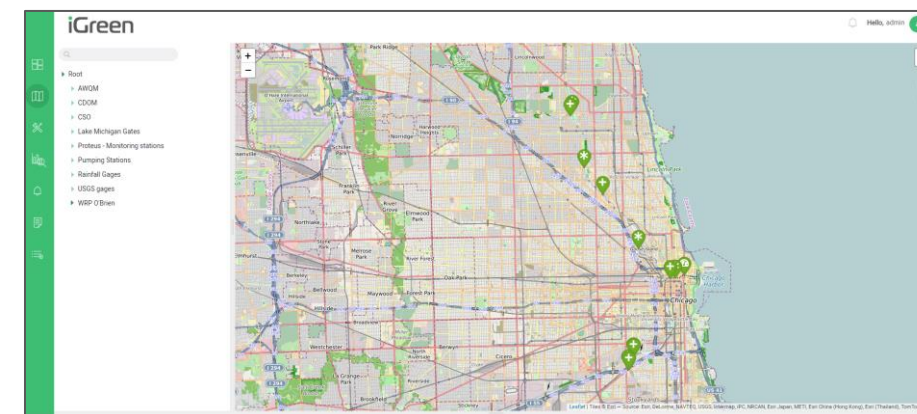
- **iGreen** installed and working
- **iShed** underway

## Data Sources

- ▶ AWQM
- ▶ CDOM
- ▶ CSO
- ▶ Lake Michigan Gates
- ▶ Proteus - Monitoring stations
- ▶ Pumping Stations
- ▶ Rainfall Gages
- ▶ USGS gages
- ▶ WRP O'Brien

*Current*

**H2NOW**  
CHICAGO  
WATERWAY MONITORING



**iGreen**

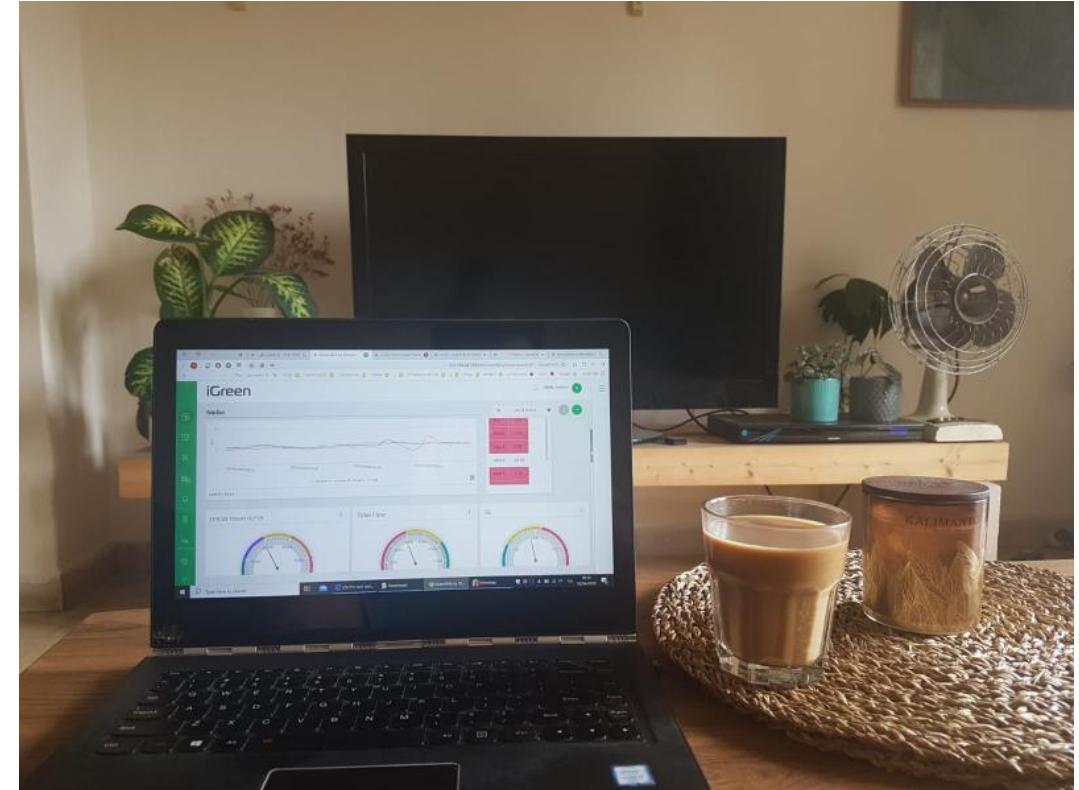
# Shafdan WWTP

- The **largest wastewater treatment plant in Israel**
- Treats approximately **145 million cubic meters of wastewater per year**
- **iGreen** – the center of operations, and the main DSS
- Data collected from SCADA and Lab (over 4,000 tags)
- **Outputs** – engineering and regulatory reports, online web dashboards
- During **COVID-19**
  - remote access, and ability to monitor the facility's performance
  - numerous daily reports and web dashboards
  - new cyber security component – Waterfall data diode enables **mobile phone access**



# Palmachim Desalination Plant, Israel

- One of the major desalination facilities in Israel
- Produces approximately 90 million cubic meters of water per year
- During COVID-19 period
  - iGreen ensures complete business continuity
  - Remote access by plant engineers and managers
  - More frequent report distribution



## Control center for monitoring multiple SWRO facilities

- Israel produces 80% of its drinking water from sea water desalination and is considered a world leader in the field.
- With 5 huge facilities built on BOT, the government arm for designing, inspecting and collecting the desalinated water is utilizing iGreen to keep a close watch on plant operations while assuring both water volumes and water quality.



# Thank You

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