



# **FREEWAT**

Free and Open Source Software Tools for Water Resource Management  
EU HORIZON 2020 Project



 **ict4water.eu**

# **Open Workshop ICT tools for innovating Groundwater Management in a changing world**

**September 22<sup>nd</sup> 2017**

**IDAEA. CID - CSIC**

**16 Jordi Girona. 08034 Barcelona**

## **ICT opportunities in a global water market. ERM experiences and vision**



**Andrea Gigliuto (ERM)**

**EIP Water** Online Market Place  
Matchmaking for water Innovation

**MAR Solutions - Managed Aquifer  
Recharge Strategies and Actions  
(AG128)**

**idæa<sup>a</sup>**

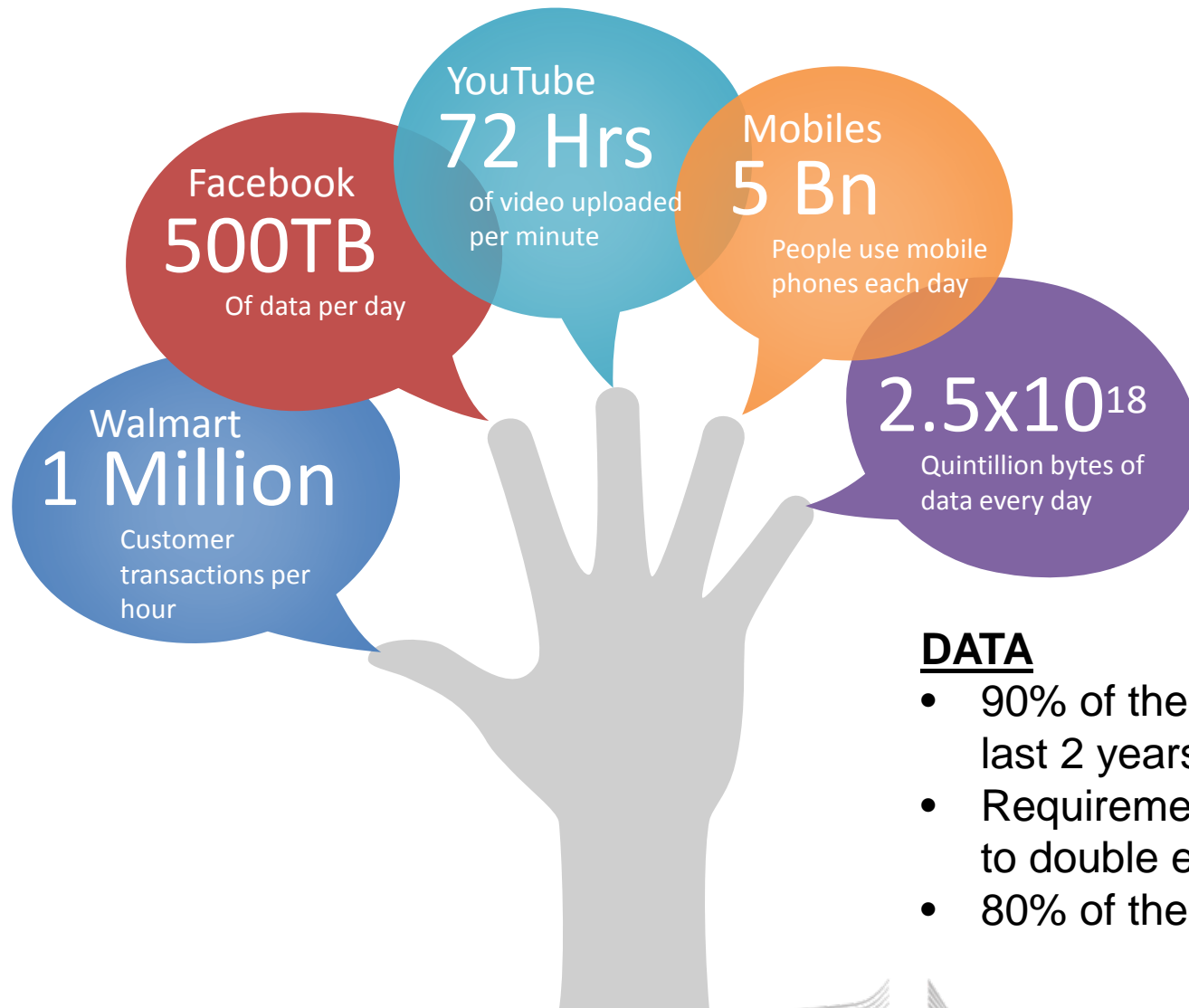


# Agenda

- *Big Data and Unstructured Data*
- *Built in Flexibility*
- *Technology and Data Architecture*
- *Tech and Data Examples*
  - *Data Collection – Using New Technology*
  - *Data Processing & Analysis*
  - *Reporting*
- *ICT and sustainable development goals*

# How Much Data – Big Data

Traditional Relational Database Management Systems (RDBMS) are not able to manage the volume or type of data we generate today:



## DATA

- 90% of the world's data was created in the last 2 years
- Requirement for data storage is expected to double every 2 years
- 80% of the world's data is unstructured



# Managing and Using Unstructured Data

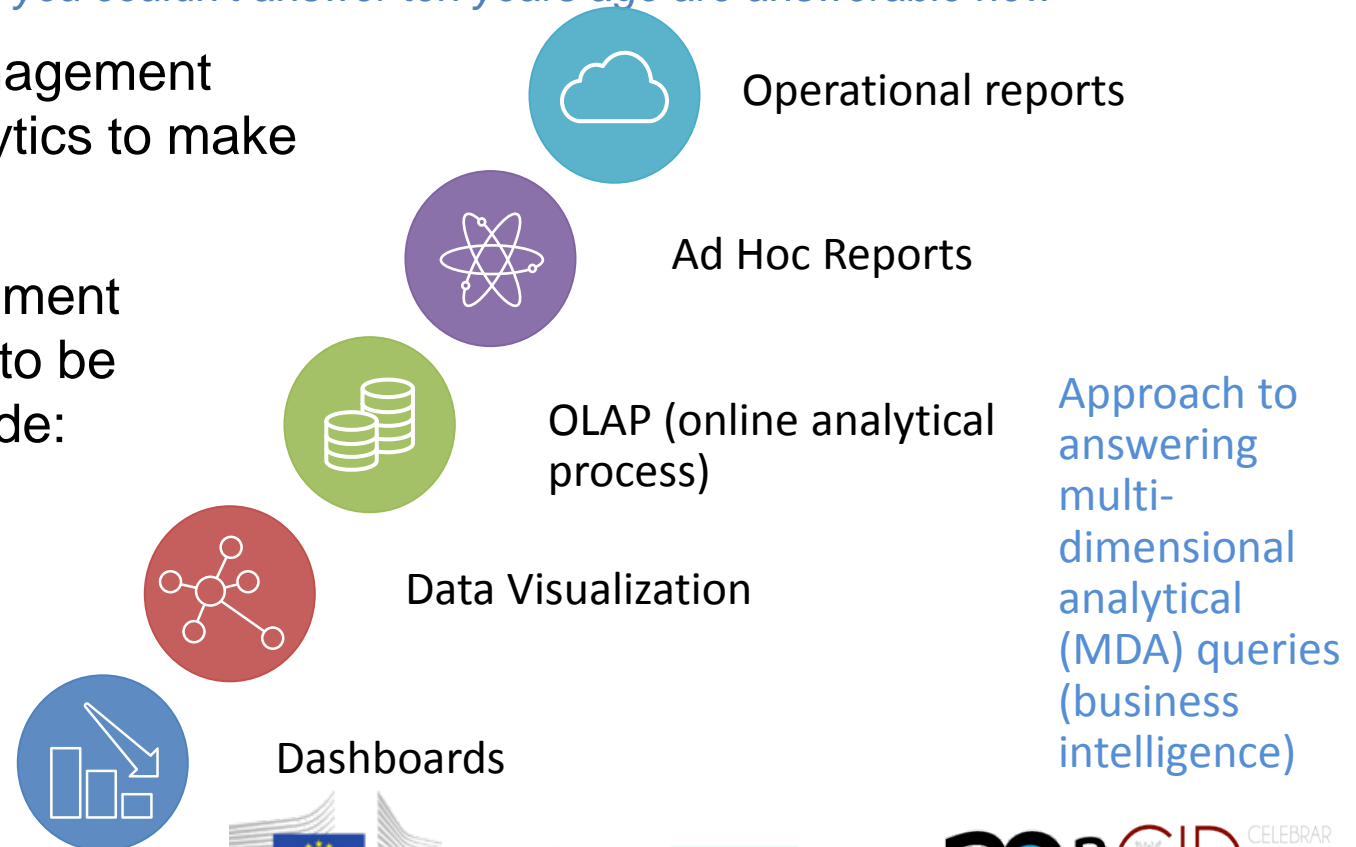
Cloud Computing aids in storage requirements and managing of the data. This cloud based collection of information provides us with the so called 'big data' repository.

*"The right way to do it is not to start with the technology, but understand what the business is about."*

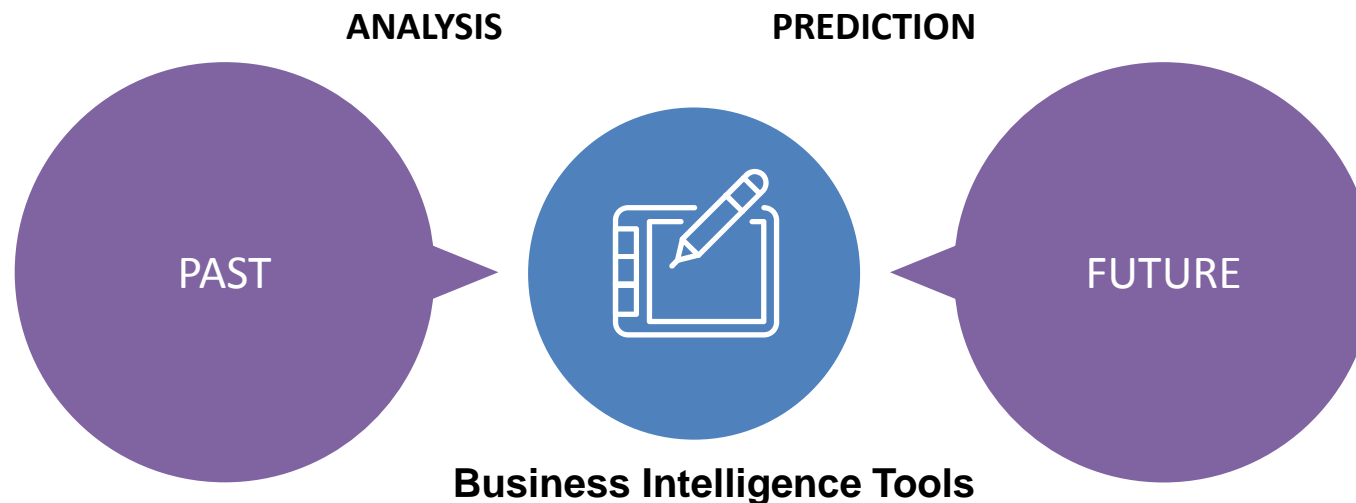
*"You need to have a clear vision. You need to work back from that to the source of the information. But it is also true that questions that you couldn't answer ten years ago are answerable now"*

One aspect for water management and protection is the analytics to make decisions more quickly.

The right storage/management structure allows analytics to be deployed in order to provide:



# Intelligent Business Decision Making



- Business Intelligence (BI) is provided through tools to make more informed decisions.
- By providing these tools it creates an environment where greater insight into data can be made
- Providing opportunities to make quicker and more robust decisions around implementation/execution strategies for water management/remediation.

Product	Time	Price
Stinky Cheese	1:48 PM	\$ 7.79
Jelly Beans	1:45 PM	\$1.17
Gum	1:42 PM	\$8.72
Honey	1:43 PM	\$7.49
Grill	1:44 PM	\$97.86
Beans	1:45 PM	\$1.36
Frozen Dinner	1:46 PM	\$6.65
Steak	1:47 PM	\$17.87
Frozen Dinner	1:48 PM	\$5.87
Jams	1:49 PM	\$41.80
Peanuts	1:58 PM	\$2.61
Jams	1:51 PM	\$43.46
Less Stinky Cheese	1:52 PM	\$8.18
Orange Juice	1:53 PM	\$3.73
Stinky Cheese	1:54 PM	\$6.73
Very Stinky Cheese	1:55 PM	\$7.43
Eggs	1:56 PM	\$1.94
Almonds	1:57 PM	\$4.26
Fish	1:58 PM	\$14.58
Peaches	1:59 PM	\$3.47
Orange Juice	2:00 PM	\$3.61
Frozen Dinner	2:01 PM	\$5.63
Putrid Cheese	2:02 PM	\$6.36
Peanuts	2:03 PM	\$2.64
Beef Jerky	2:04 PM	\$2.38

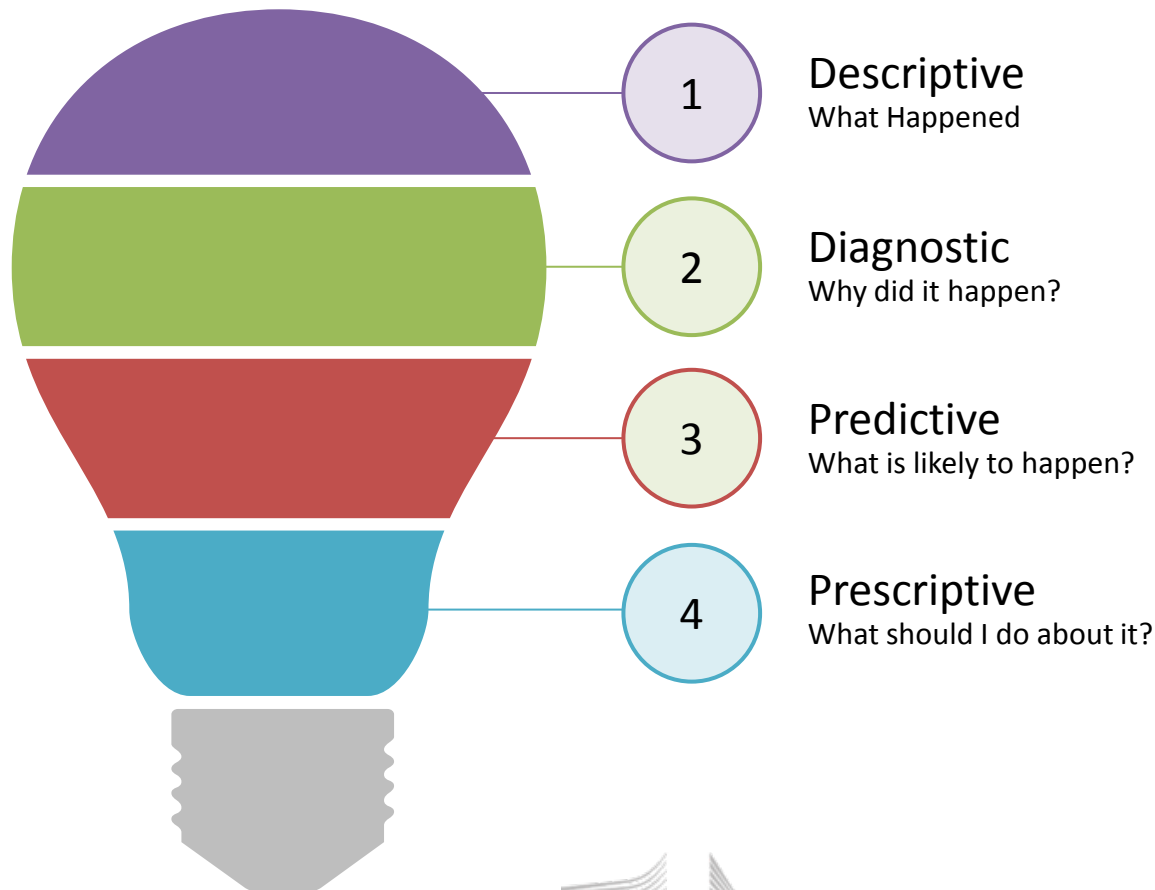


# An Evolution in Approach

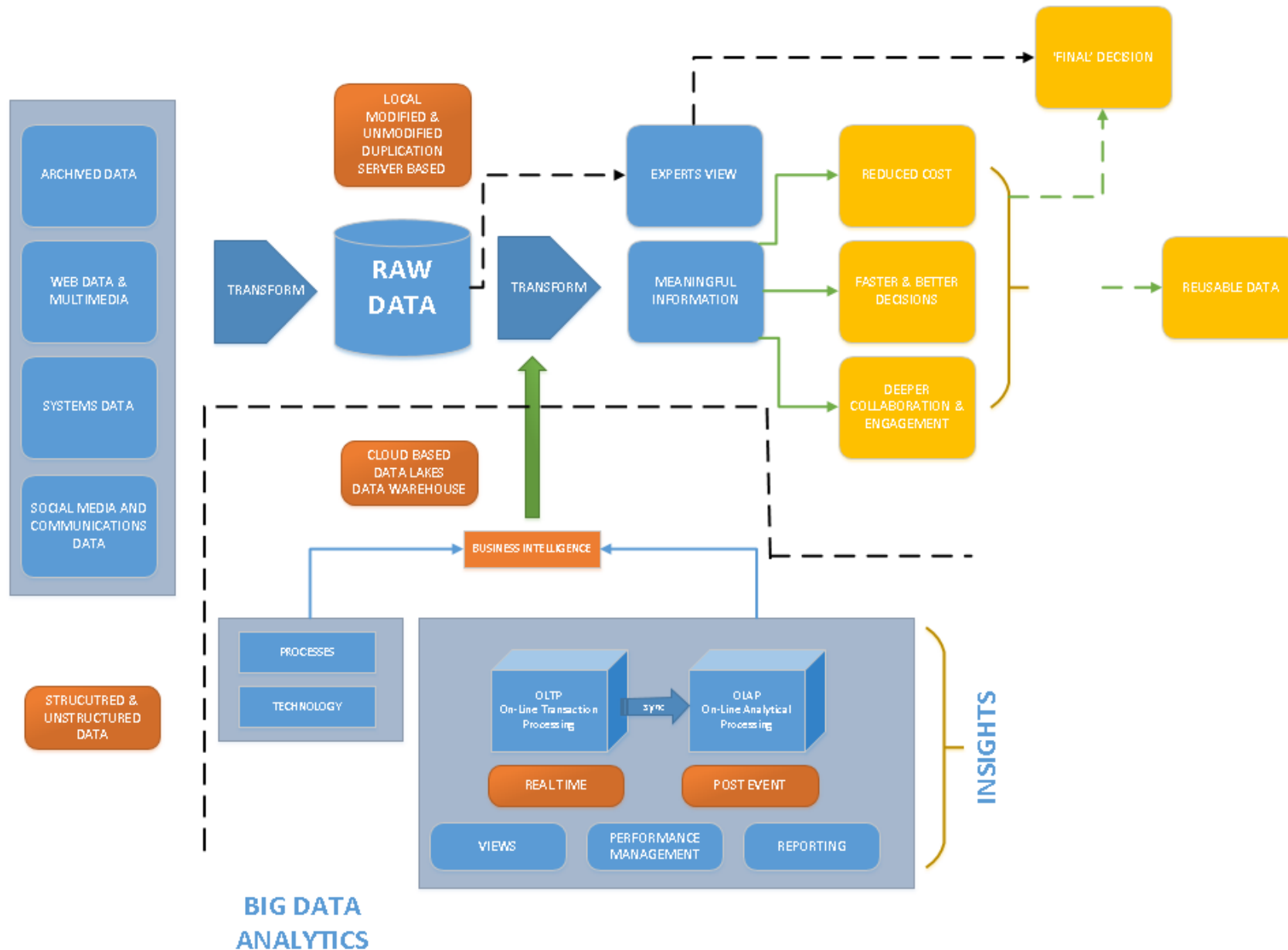
Business Needs and Available Technology changes with time.

Objectives need to be defined which can deliver a certain amount of value within a predefined period.

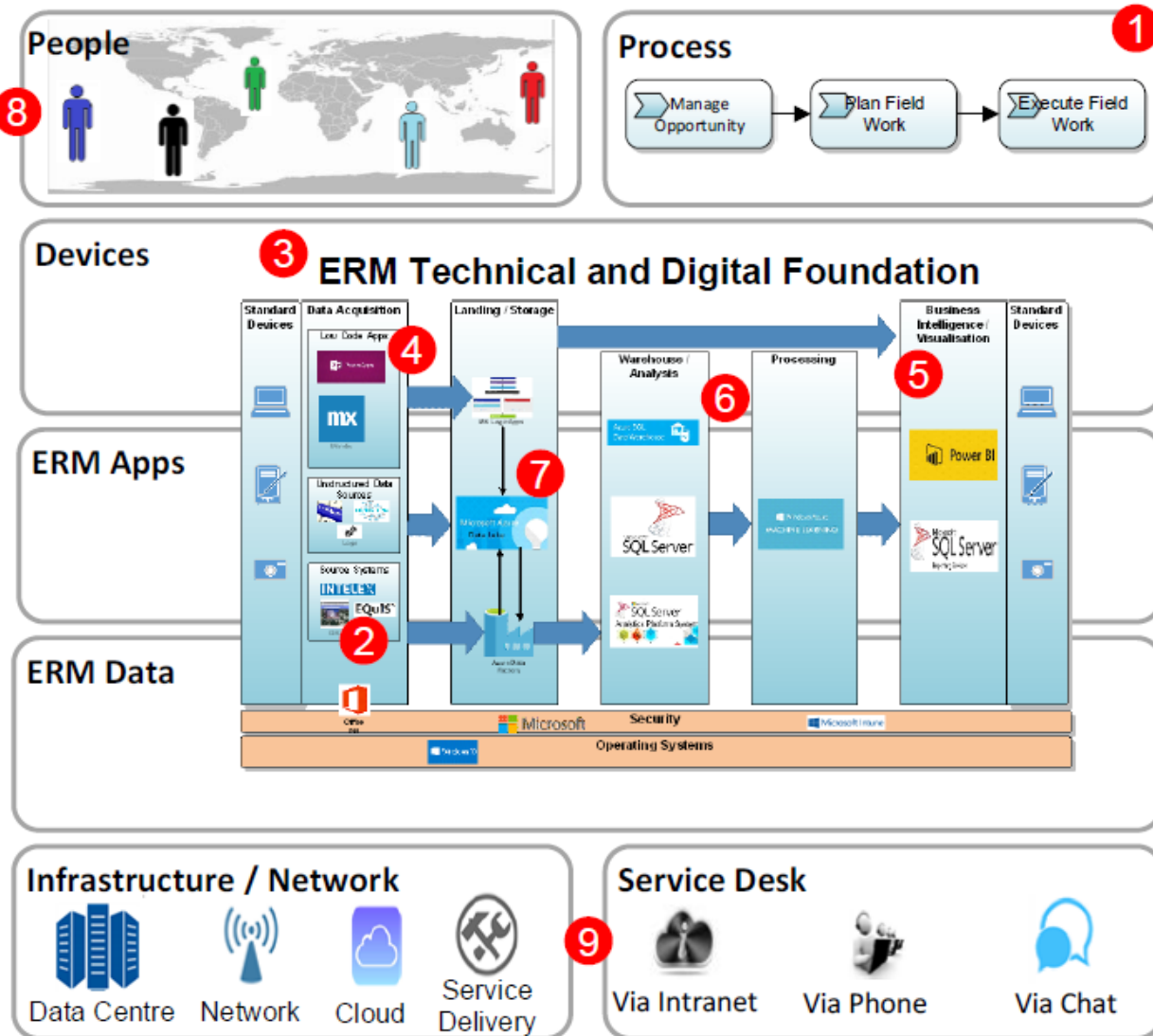
The approach should be scalable and changeable and should service the following specific data analysis requirements:



# Technology Needs and Architecture



# ERM's Technology Enablement Journey



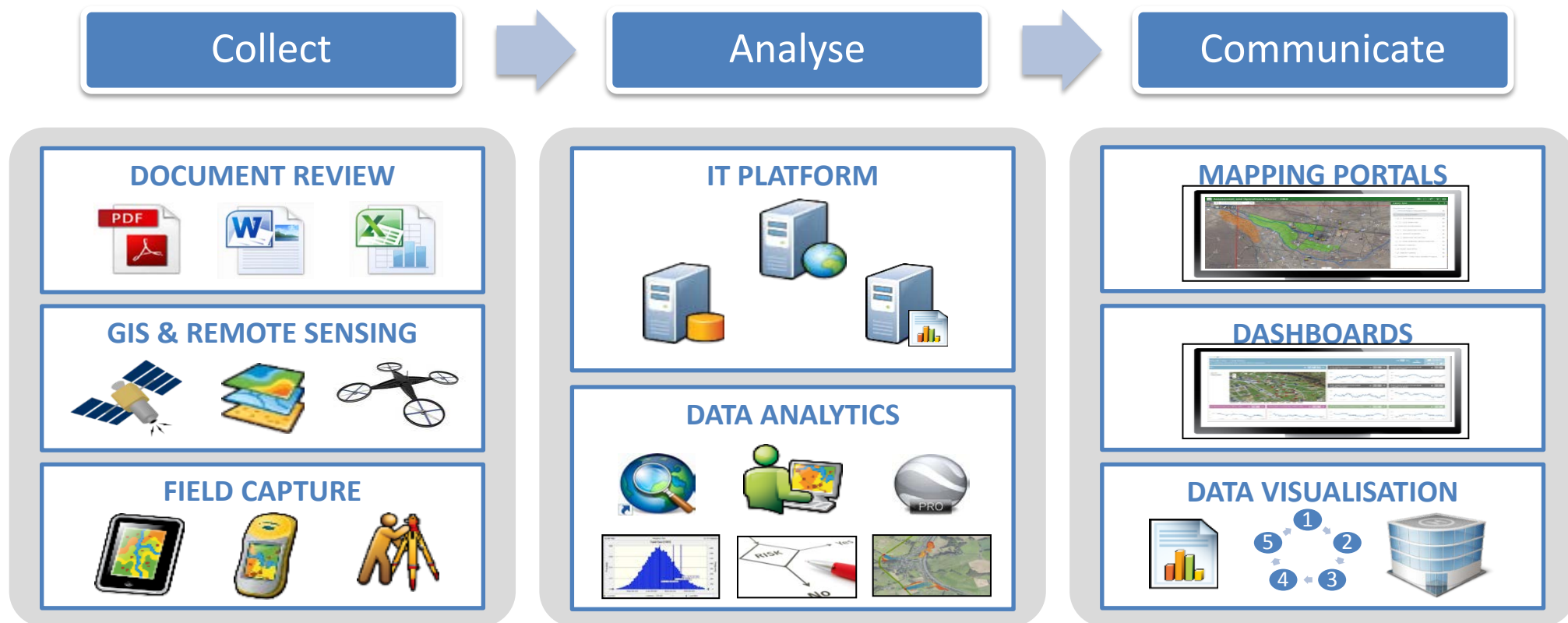
- 1 Connected & Defined Processes
- 2 Consistent use/uptake of available technology (e.g. EQuIS / GIS / Digital Foundation)
- 3 Consistent global approach across systems / tools
- 4 Tech enabled field data collection
- 5 Consistent and contemporary reporting approach using innovative approaches
- 6 No manual transcription or checking of data
- 7 Leverage and generate value from data
- 8 Improve and integrate field worker well being and motivation
- 9 Leverage consistent external support in remote areas (e.g. Flexforce)



# A Complete Process (Integrated Data Management)

New developments are not just about picking the nicest looking software but enabling business processes to share information, expand analysis and provide much greater value. It requires thought and commitment to get a process appropriate for the objective but the rewards can be significant in terms of time and cost saving.

Not Rigid but Applications focussed on enabling centralised storage and extraction/manipulation of data:



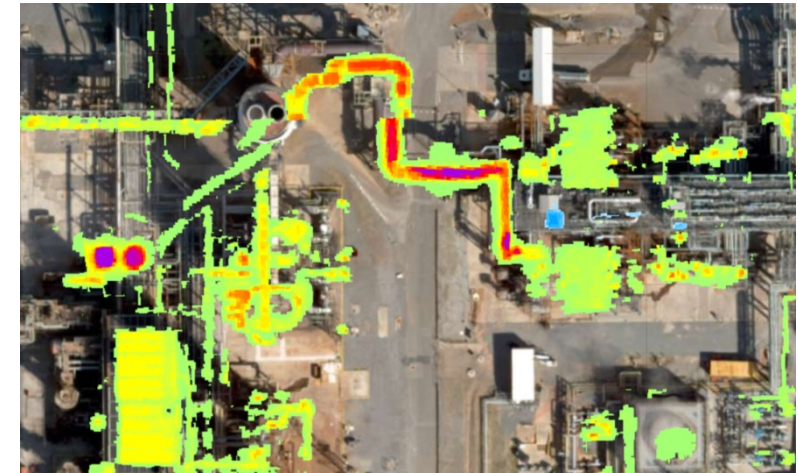
# Technology & Data Management

## Illustrations of Evolution in Approach



# Drone Technology

- Drone2Map by ESRI
- Numerous other applications to transfer and analyse the data.
- Note: Drone data is large and processing through cloud services is often the most efficient. Output files can be 10's – 100's GB in size



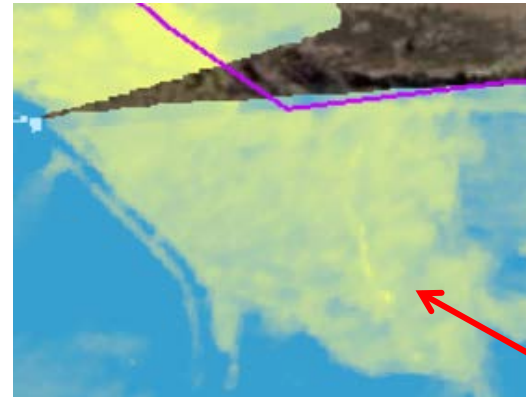
Master Map



Aerial Image



Thermal

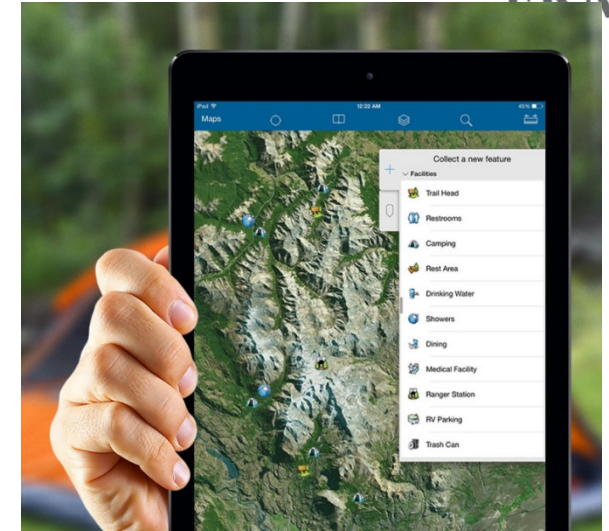


Springs  
and  
stream

# Field data collection and real-time follow-up



- Use a mobile phone and a GIS app to collect data during the field activities;
- Create a field follow-up portal for the Client with dashboards to summarize field results in real-time;
- An additional map portal was created so the project manager could make analyzes over the data and plan the next-day activities.



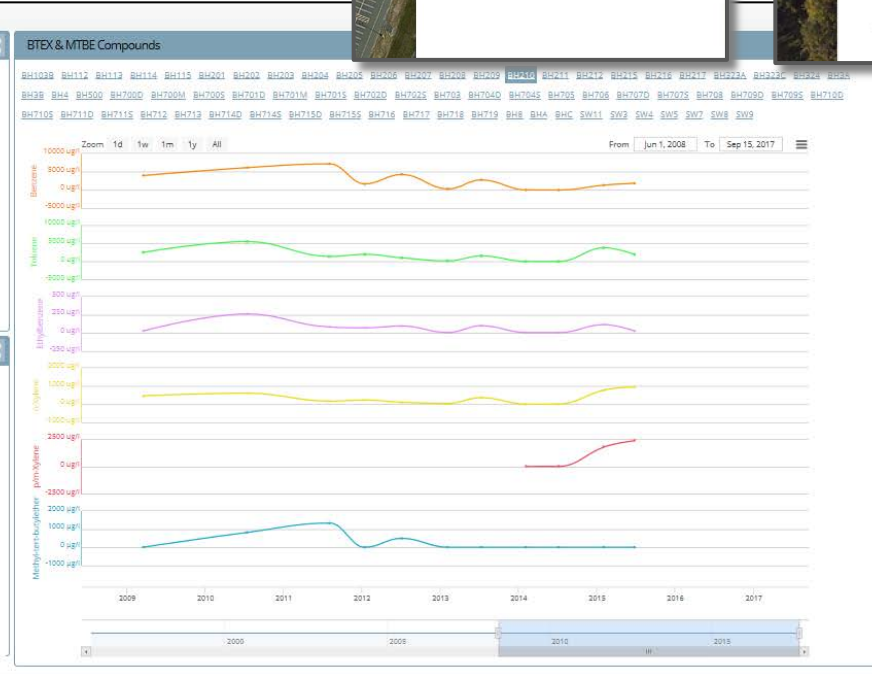
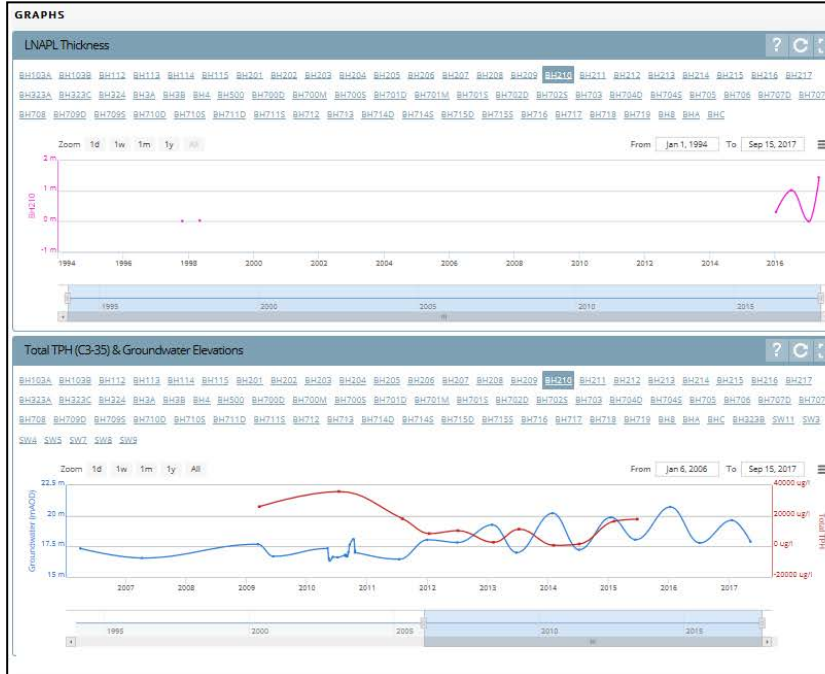
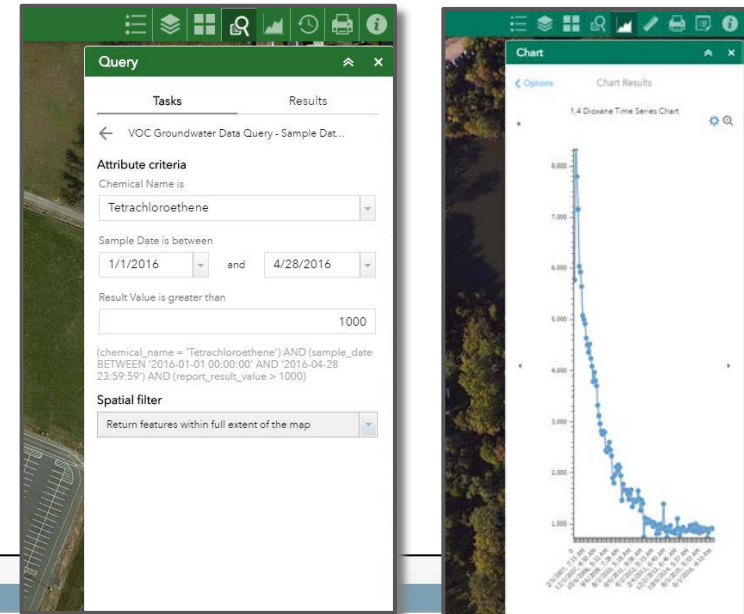
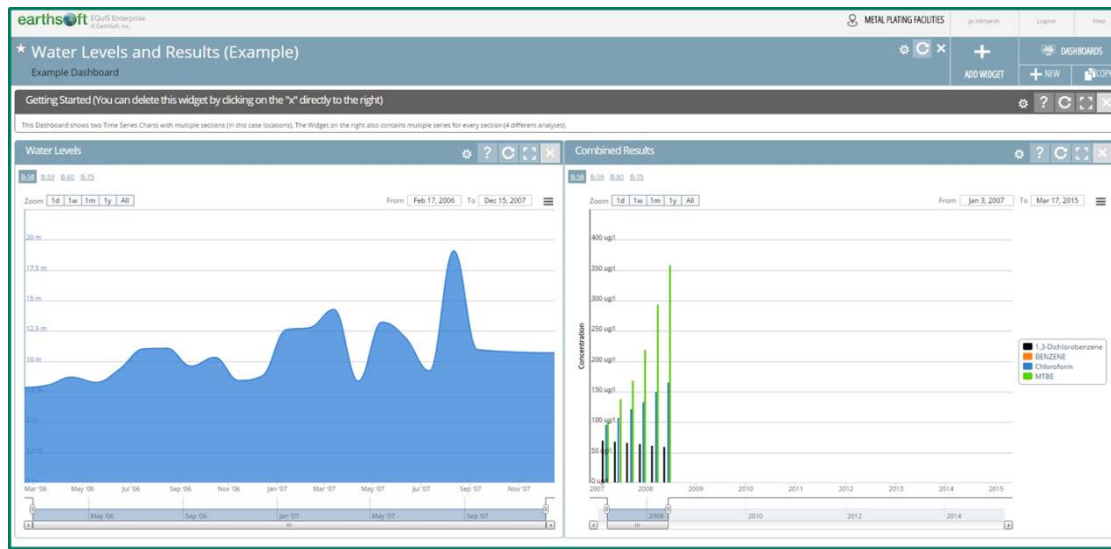
## – Benefits and Value

- Unique Data Repository
- Accessible 24/7 hours
- Shared within organization
- Interactive tool
- Data collected digitally straight from the field
- Work online or offline
- Improved decision making process
- Faster results
- No need for specific training

“Centralized GIS platform to extract and analyze data, support discussions and make better decisions”



# Solutions – Analysis – EQuIS Dashboards

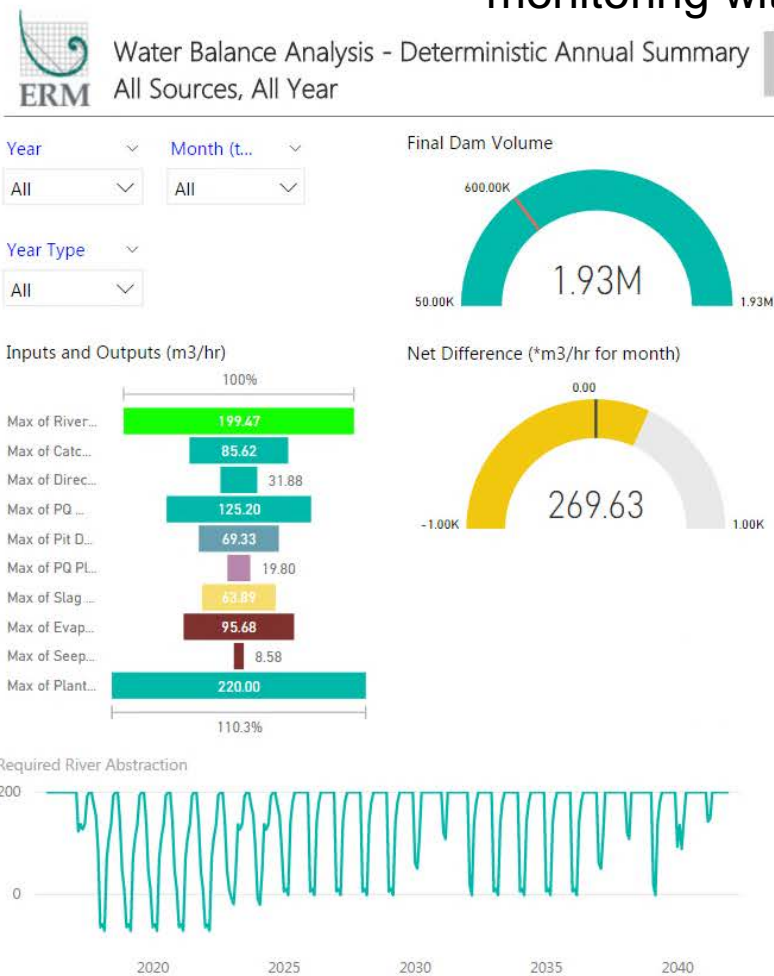


# Solutions – Business Intelligence

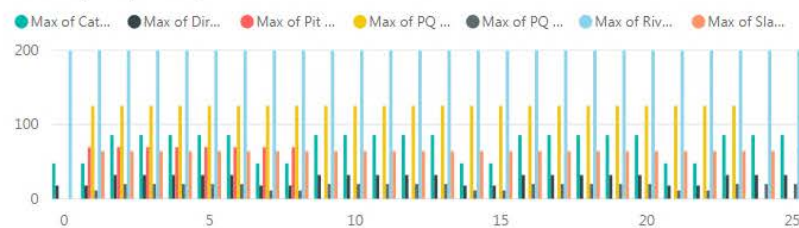
Microsoft Power BI

ESRI Insights

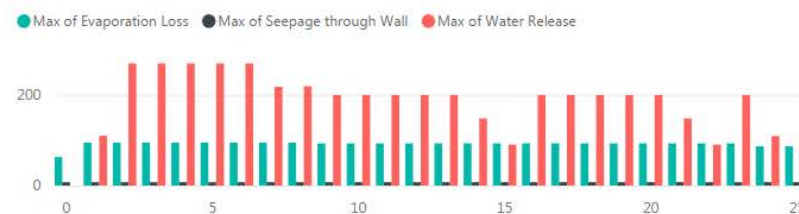
Both provide rapid means of managing and simplifying complex data and supplementing this with complementary information (e.g. meteo data versus mass recovery). They both provide opportunity for real-time monitoring with alerts and 'real' automated business insights.



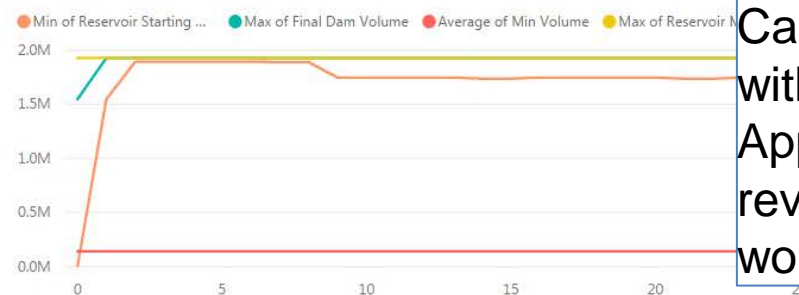
LoM Inputs (m3/hr)



LoM Outputs (m3/hr)

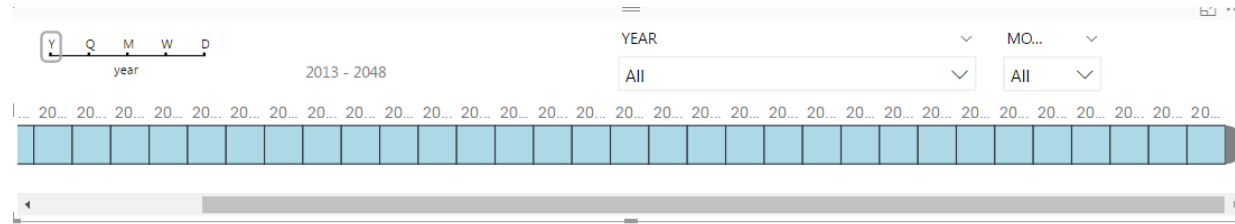


Start and Final Volumes (m3) by Year



Can be easily configured with Data Collection Apps for real-time review and approval of work.

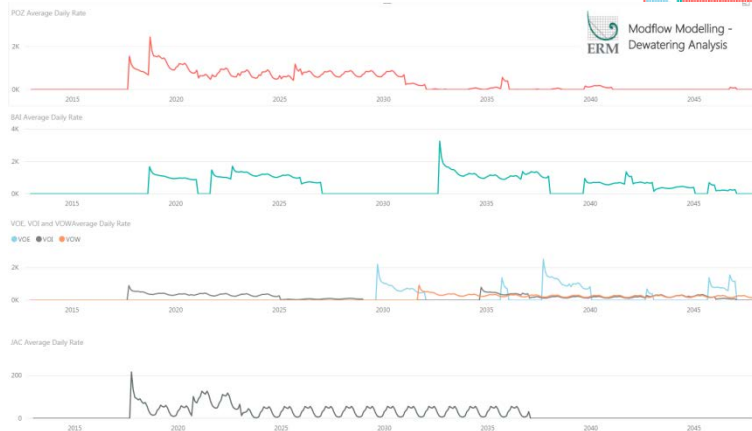
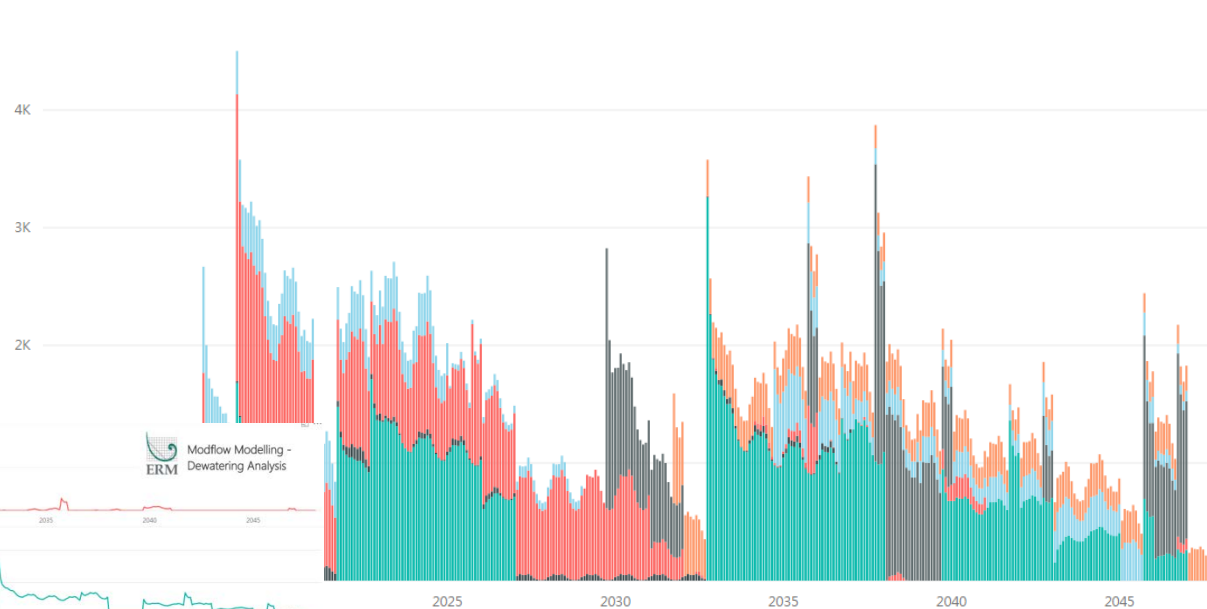
# Solutions – Business Intelligence



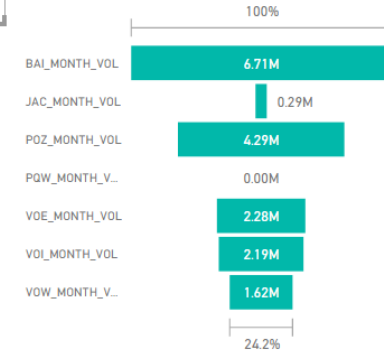
Daily Pit Dewatering Rates per Pit (Summarised by Month)

● BAI ● JAC ● POZ ● PQW ● VOE ● VOI ● VOW

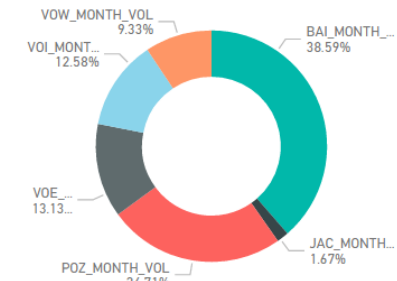
5K



Cumulative Dewatering Volumes

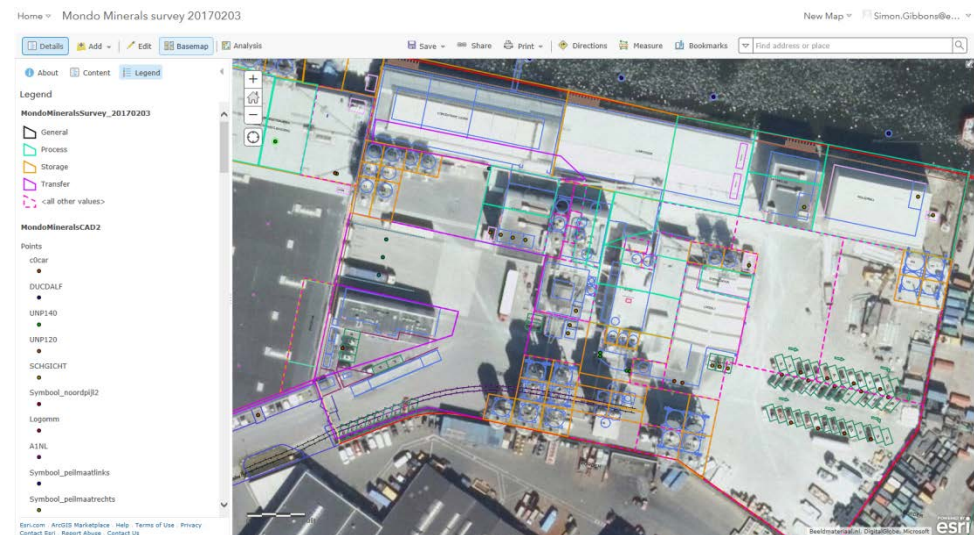
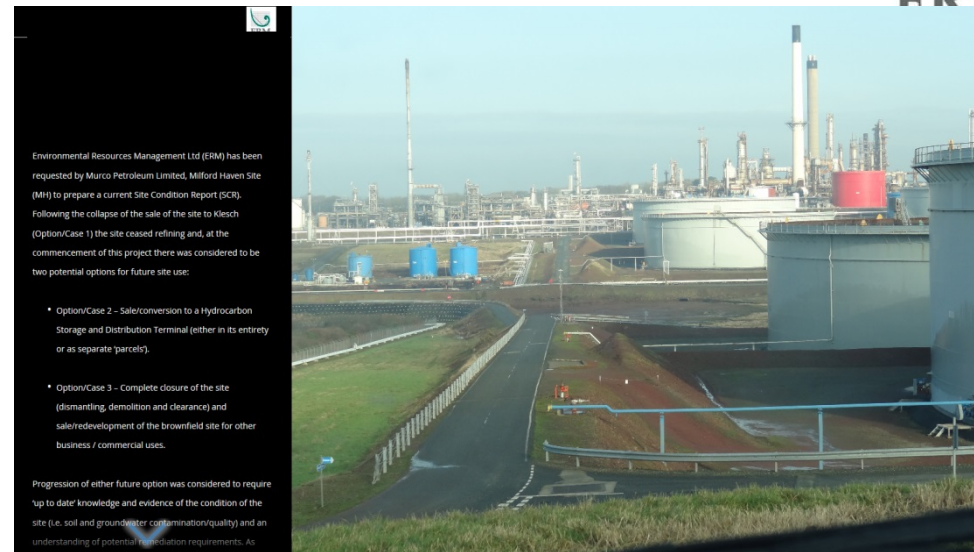
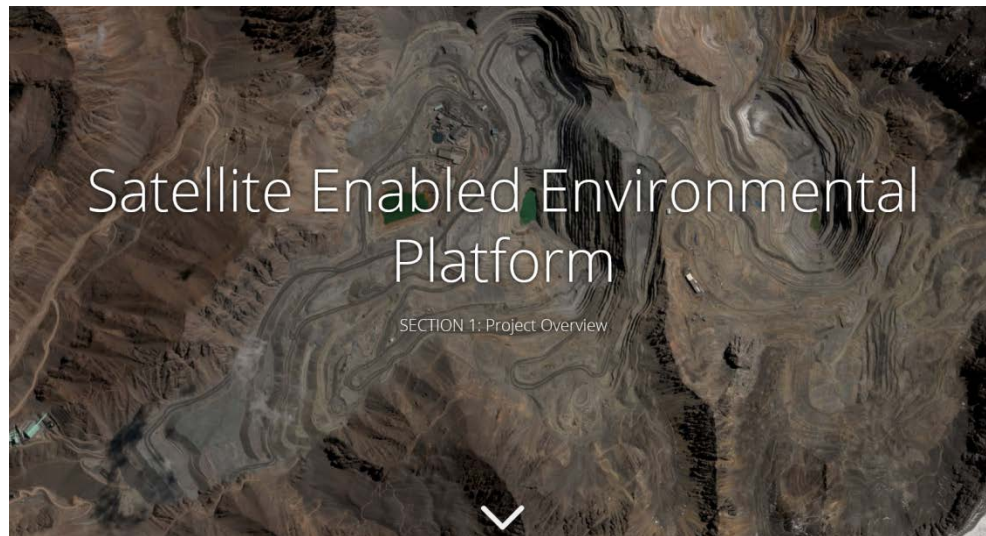


Proportion Dewatering by Pit








# Solutions – Reporting – Story Maps





# ICT AND SUSTAINABLE DEVELOPMENT GOALS

SDG	SDG FOCUS AREAS AND TARGETS* WHICH BENEFIT MOST FROM DIGITAL SOLUTIONS	MOST POWERFUL DIGITAL SOLUTION(S)	DIGITAL'S POSITIVE IMPACT WITH ILLUSTRATIVE DATA POINT
<b>6</b> CLEAN WATER AND SANITATION 	<ul style="list-style-type: none"> <li>• Achieve universal and equitable access to drinking water (6.1)</li> <li>• Improve water quality (6.3)</li> <li>• Increase water-use efficiency (6.4)</li> <li>• Implement integrated water resources management at all levels (6.5)</li> <li>• By 2020, protect and restore water-related ecosystems (6.6)</li> </ul>	<b>SMART WATER MANAGEMENT</b> for example, smart pipes, smart levees, smart meters, soil sensors, remote irrigation management systems, rain water harvesting systems, consumption control apps, e-billing	» Improves water use efficiency and helps increasing access to water  <b>Up to 15 per cent water consumption reduction<sup>71</sup></b>
<b>14</b> LIFE BELOW WATER 	<ul style="list-style-type: none"> <li>• Reduce marine pollution from land-based activities (14.1)</li> <li>• Minimize and address the impacts of ocean acidification (14.3)</li> <li>• Provide access of small-scale fishers to markets (14.b)</li> </ul>	<b>SMART CONSERVATION</b> for example, advanced mapping and data analytics, sub-marine, coastal and inland smart sensors, drones, real-time satellite imaging, smart monitoring, real-time weather forecasting	» Improves protection of oceans and water quality  <b>32 per cent of the world's coastal areas could already benefit from smart conservation solutions<sup>76</sup></b>
<b>15</b> LIFE ON LAND 	<ul style="list-style-type: none"> <li>• Ensure the conservation and sustainable use of freshwater ecosystems (15.1)</li> <li>• Combat desertification and land degradation (15.3)</li> <li>• Promote the implementation of sustainable management of all types of forests (15.2)</li> <li>• Ensure the conservation of mountain ecosystems, including their biodiversity (15.4)</li> </ul>	<b>SMART AGRICULTURE</b> for example, optimized farm management and automated irrigation systems; precision agriculture, incl. M2M / IoT, soil sensors and satellites and integrated real-time weather information, traceability and tracking systems  <b>SMART CONSERVATION</b> for example, advanced mapping and data analytics, sub-marine, coastal and inland smart sensors, drones, real-time satellite imaging, smart monitoring, real-time weather forecasting	» Improves protection of nature reserves on land and resource-use efficiency  <b>251 trillion liters of water saved in 2030, from smart agriculture<sup>77</sup></b>

Source: Accenture. #System Transformation. How digital solutions will drive progress towards the sustainable development goals



**Thanks for attention**