

# Asset Management of Drainage Facilities Using Advanced Technologies

**Albert T. Yeung, BSc(Eng)(Hon) MS PhD FHKIE  
FICE FASCE RPE(Civ, Env, Gel) CEng PE  
Department of Civil Engineering  
University of Hong Kong  
E-mail: yeungat@hku.hk**



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DSD International Conference 2014

Sustainable Stormwater and  
Wastewater Management

Hosted by:



渠務署  
Drainage Services Department





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For a Better Quality of Life

- Asian Civil Engineering Coordinating Council



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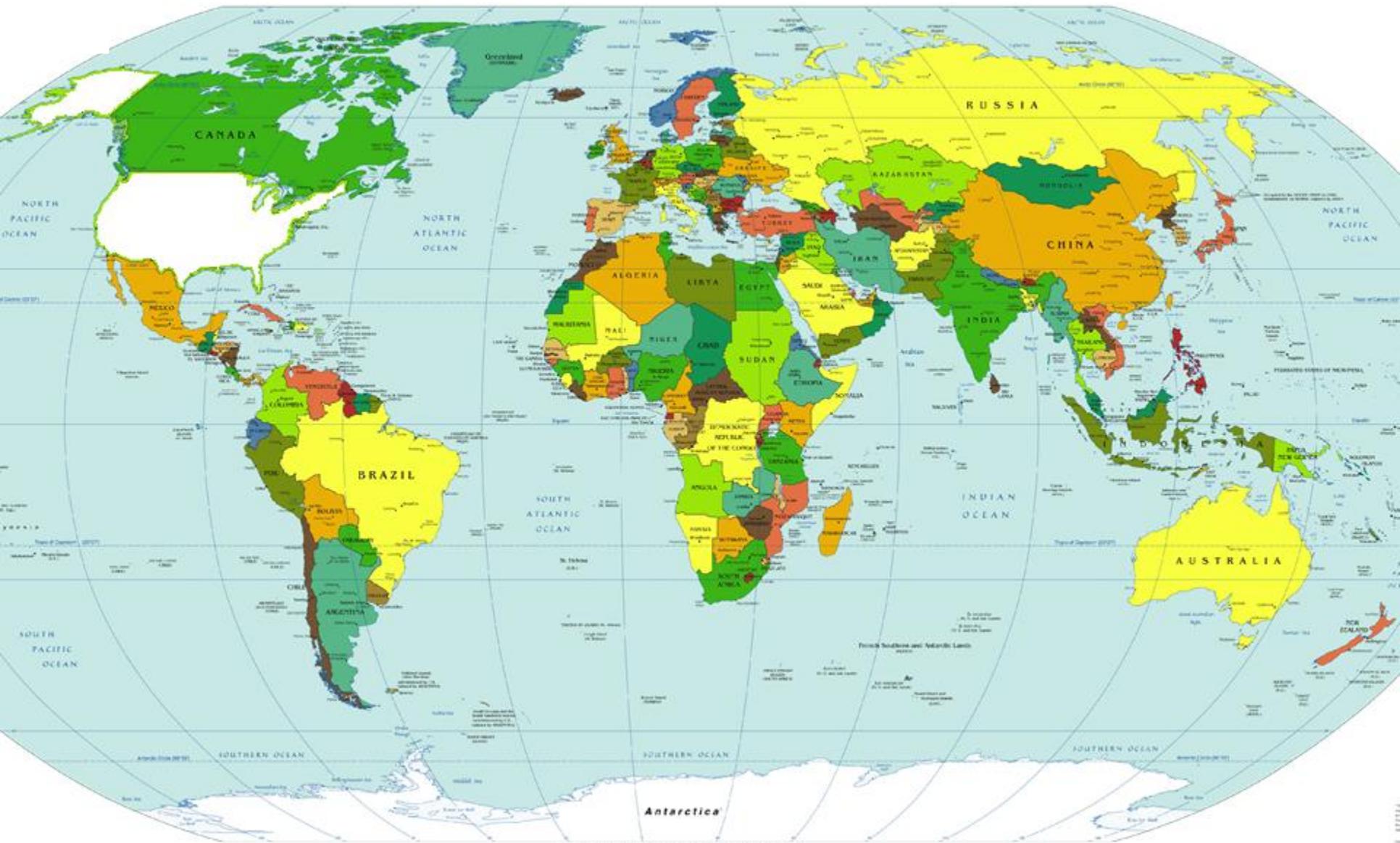
For a Better Quality of Life

- **American Society of Civil Engineers (ASCE)**
- **Chinese Institute of Civil and Hydraulic Engineering (CICHE)**
- **Engineers Australia (EA)**
- **Indonesian Society of Civil and Structural Engineers (HAKI)**
- **Institution of Civil Engineers, India (ICE India)**
- **Institution of Engineers, Bangladesh (IEB)**
- **Institution of Engineers, Pakistan (IEP)**
- **Japan Society of Civil Engineers (JSCE)**
- **Korean Society of Civil Engineers (KSCE)**
- **Mongolian Association of Civil Engineers (MACE)**
- **Philippine Institute of Civil Engineers (PICE)**
- **Vietnam Federation of Civil Engineering Associations (VFCEA)**



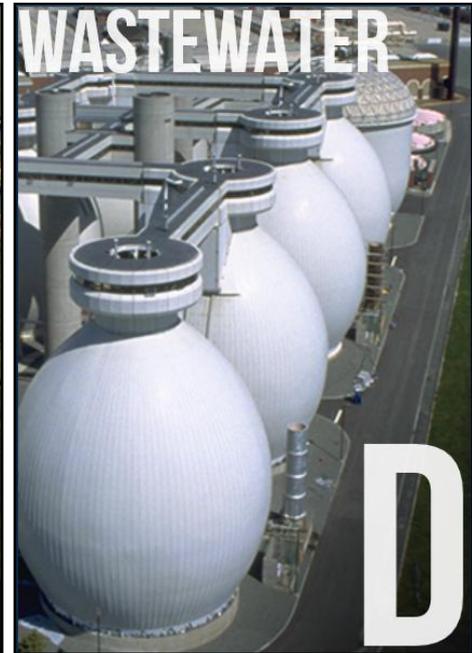
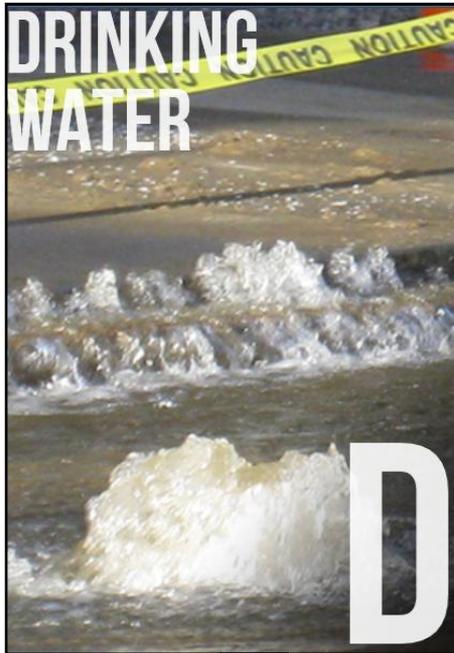
- **Immediate Past Director of Region 10**
- **Chair of Region 10 Assembly**

# **Sustainability**

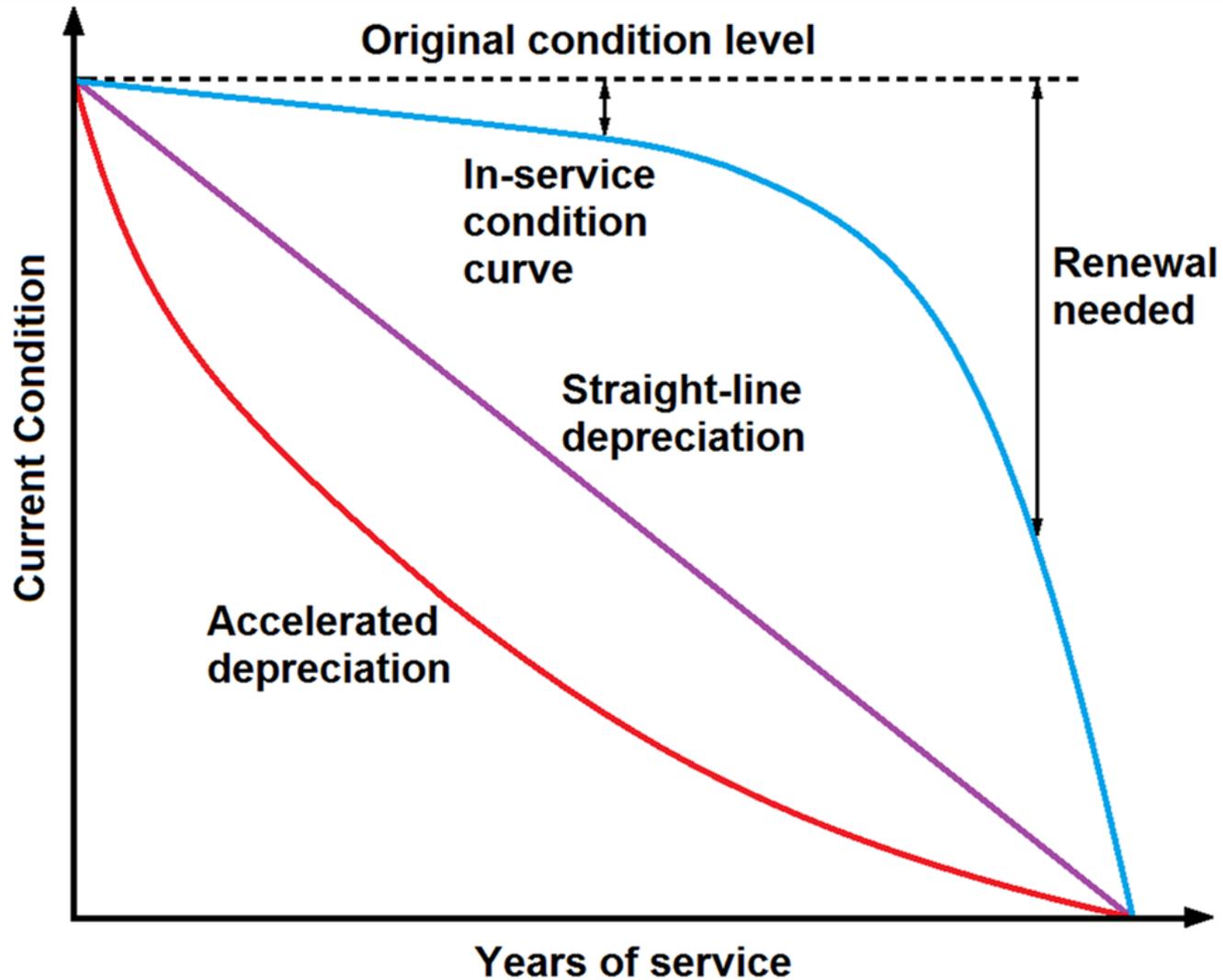


# ASCE Region 10

**2013 REPORT CARD FOR AMERICA'S INFRASTRUCTURE**



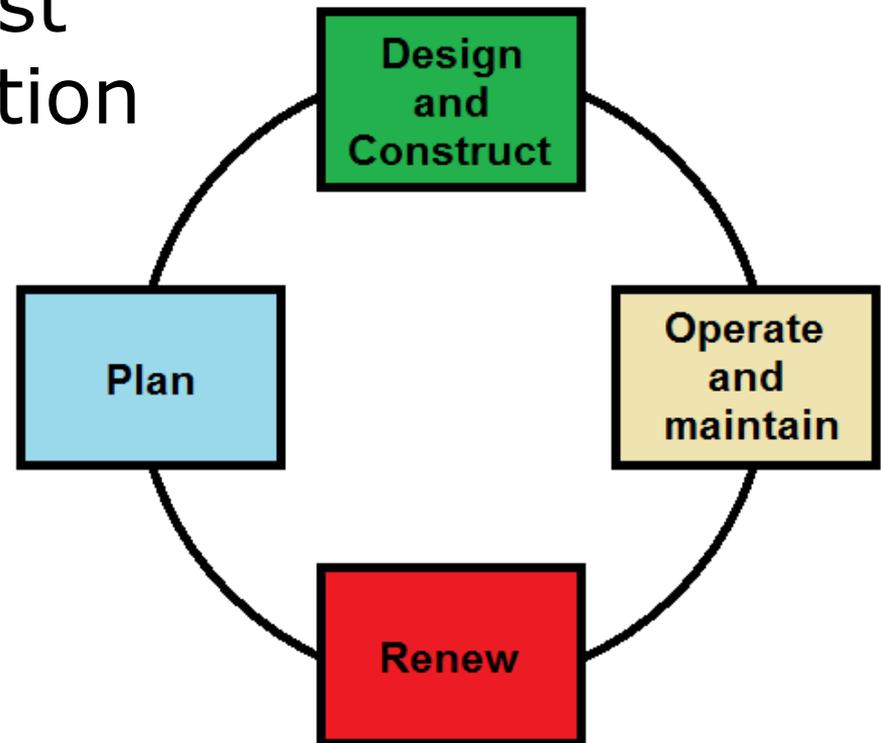
# Infrastructure Condition Curve



# Asset Management

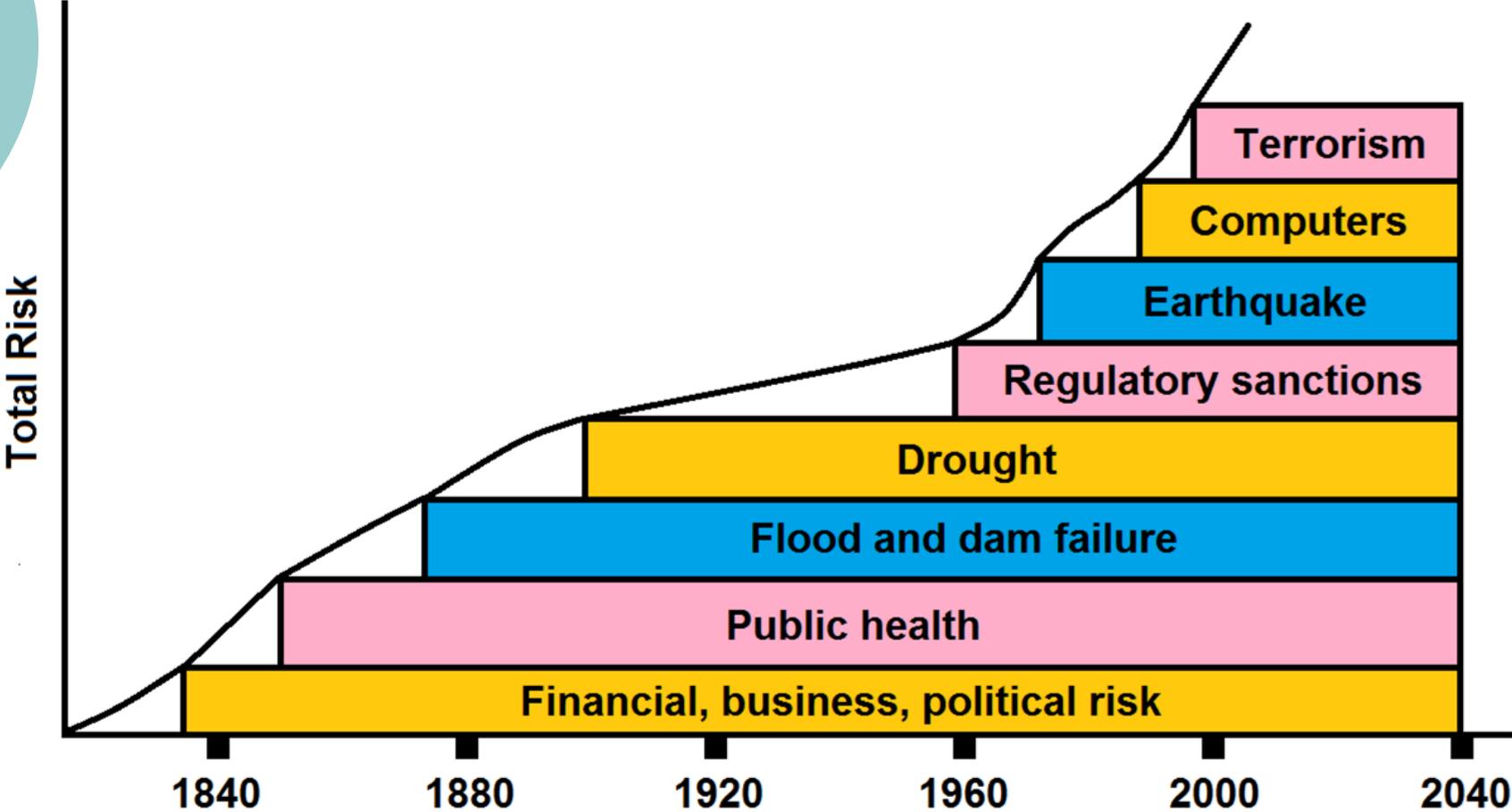
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- To derive the best performance from an asset at the lowest cost from acquisition to disposal

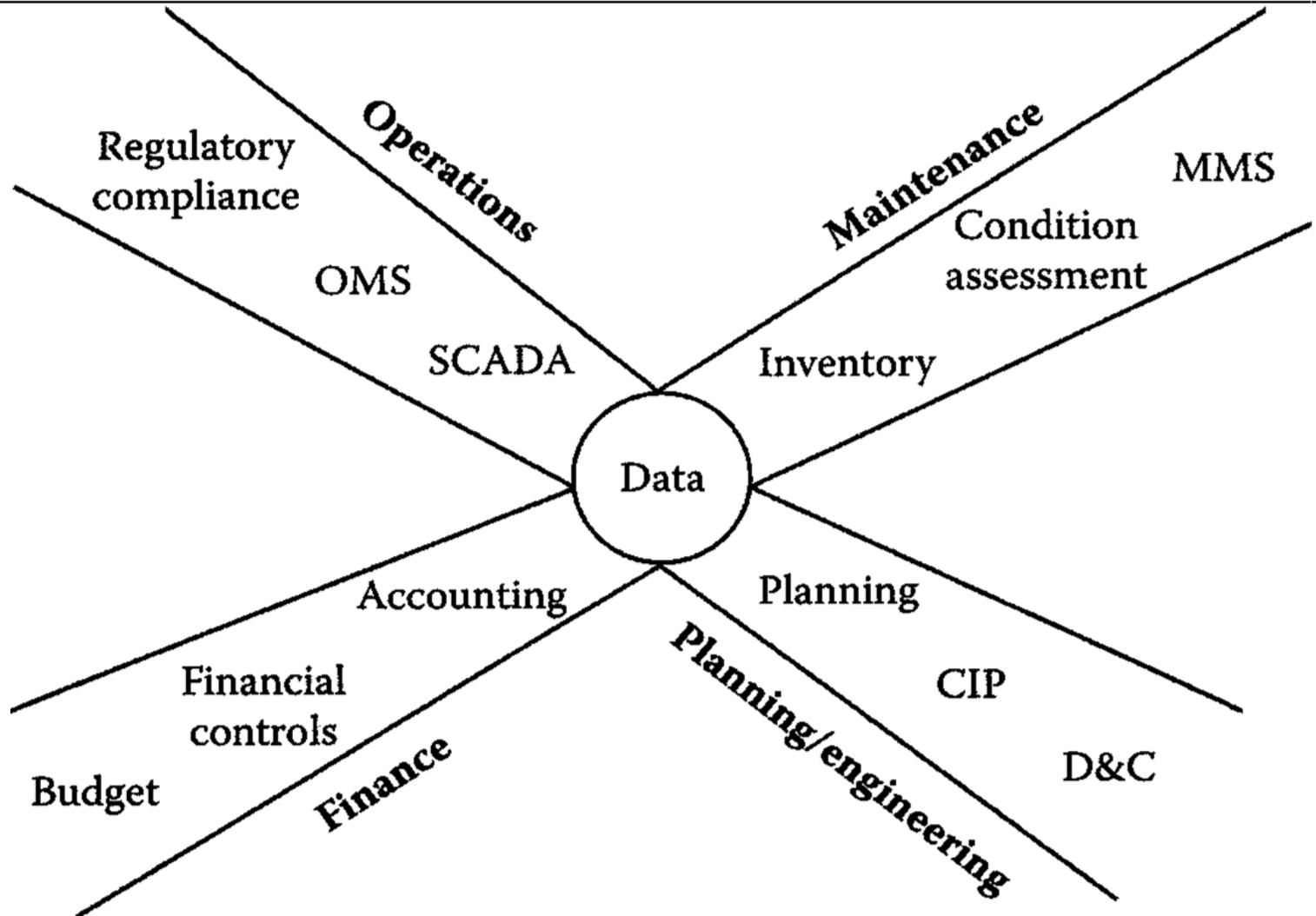




# Risk to Water Utilities



# Data-centered Approach





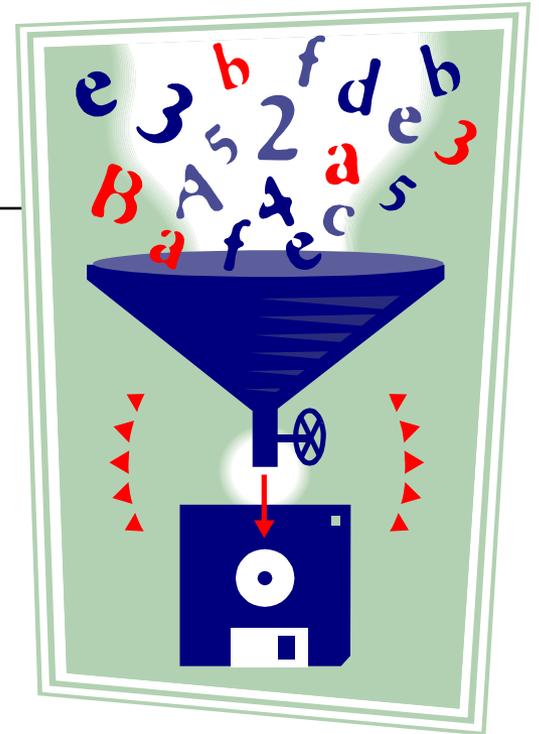
# Data Management

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- Accuracy
- Strategic & representative locations
- Up-to-date
- Inter-active
- Accountability
- Sustainability

# Why uses IT?

- Accuracy
- Objective
- Efficiency
- Consistency
- Free of human errors
- Prevention of loss of data
- Compliance
- Convenience





# **Uses of IT in Asset Management**

- Automatic and continuous collection of data
- Effective management of data
- Quality control and assurance of data
- Pro-active control of indoor air quality

# Gas Management (CO & CO<sub>2</sub> )

- Compliance of statutory requirements: sensing methods, automatic and continuous
- Integrated CO & CO<sub>2</sub> sensors
- Real-time collection of data
- Real-time wireless transmission of data
- Web-based and real-time processing and recording of data
- Prevention of tempering of data
- Real-time publication of data



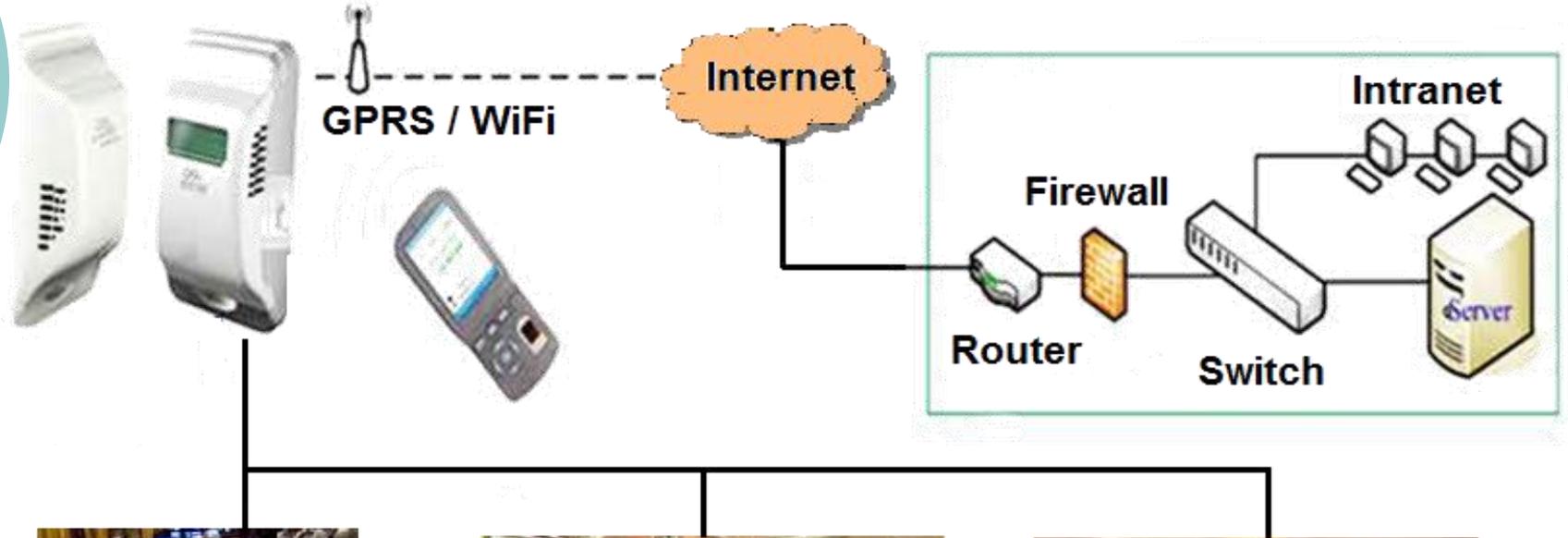
# Collection of Data

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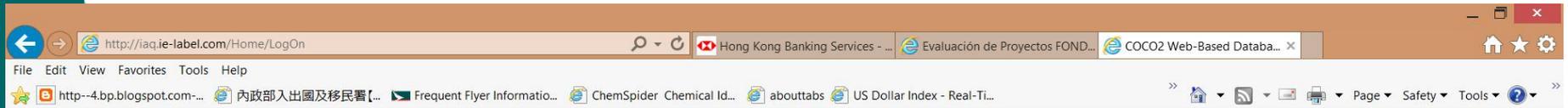
- Integrated sensor for CO and CO<sub>2</sub>
- Sensor is powered by battery
- *In-situ* calibration is not necessary
- Sensors for different types of gases, TVOC, PM<sub>10</sub>, PM<sub>2.5</sub> and other chemicals available
- Data transmission by SIM card

# Transmission of Data

CO & CO<sub>2</sub> Sensor



# Data on the Web



## Real-time Gas Monitoring System

The interface for the Real-time Gas Monitoring System. It features a large brown background with a stylized logo of three people. On the right side, there is a white "USER LOGIN" form with two input fields for "User ID:" and "Password:", and two buttons labeled "Login" and "Back". Below the login form is a small image of a gas monitoring station with a sign that says "不准吸煙" (No Smoking) and "Risk Factor No. 000000".



# Data on the Web

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**CO concentration**

**CO<sub>2</sub> concentration**

**Date and time**

**Sensor ID**

# Data on the Web

## Monitoring Graphical [Realtime Data](#)





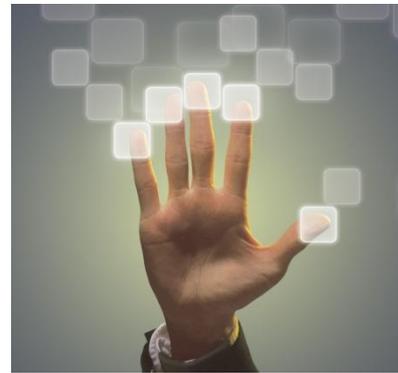
# Data Management (CO & CO<sub>2</sub>)

- SMS and e-mail warnings of exceedance of limits
- Interactions with ventilation control system for necessary corrective actions

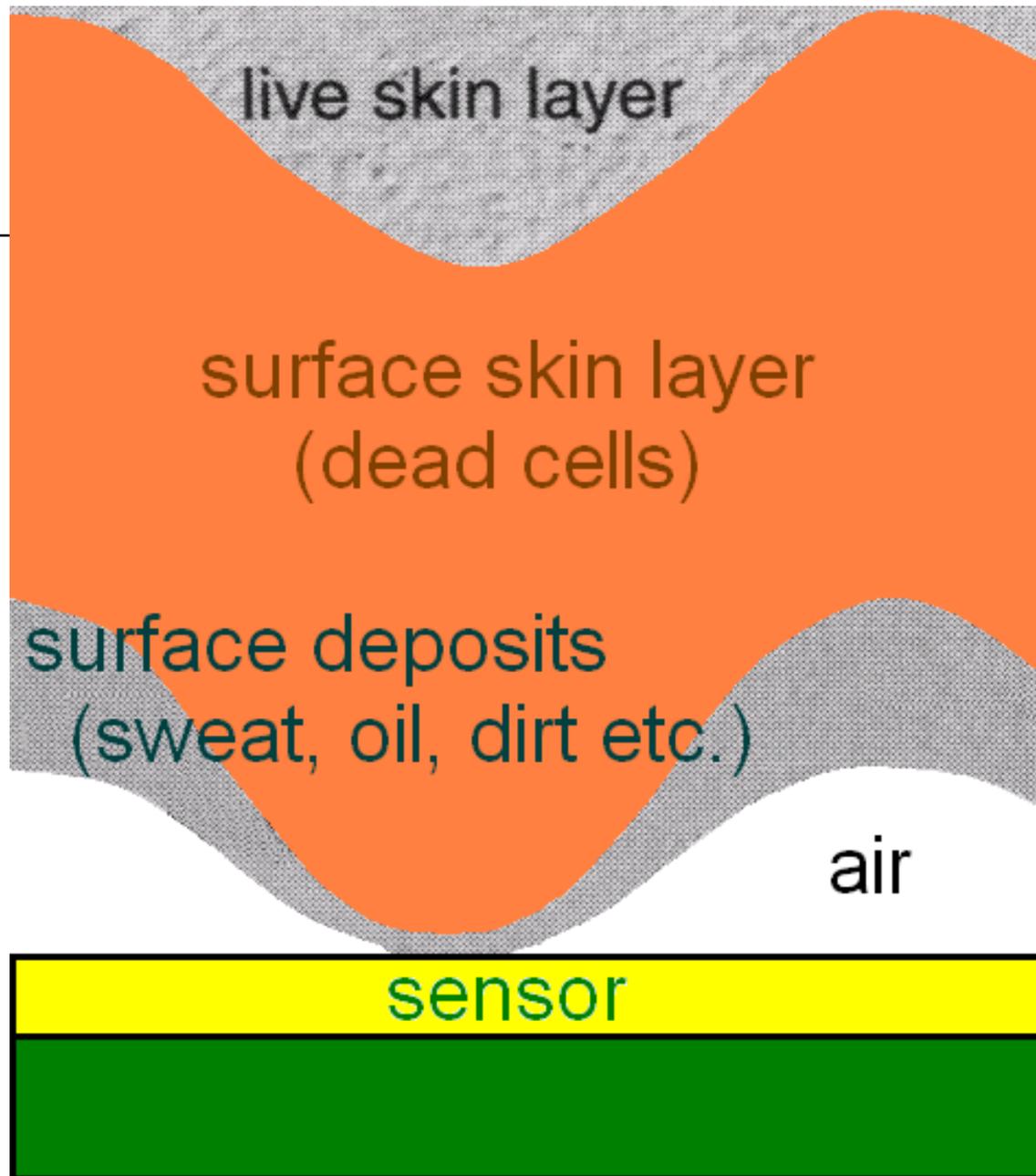
# Mobile Biometric Authentication System

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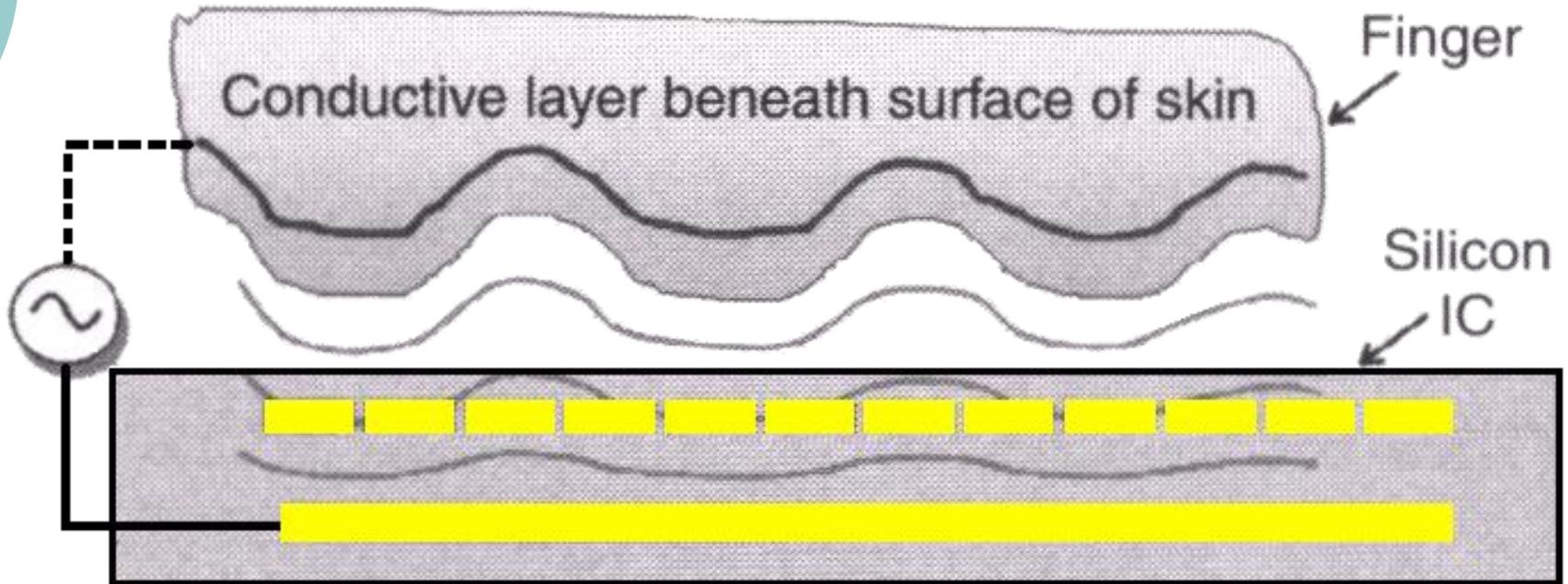
- RFID contactless card reader
- Radio-frequency fingerprint sensor
- GPS
- 3G / WiFi



# Human Skin Structure



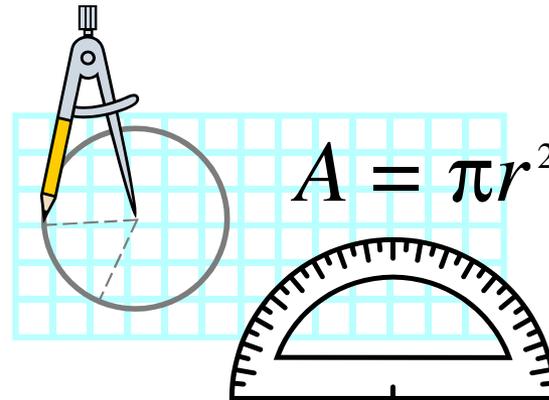
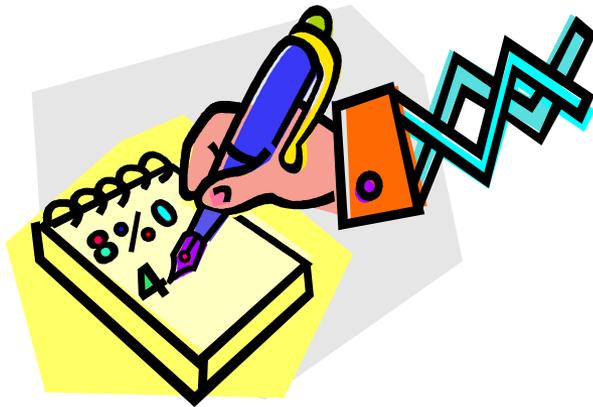
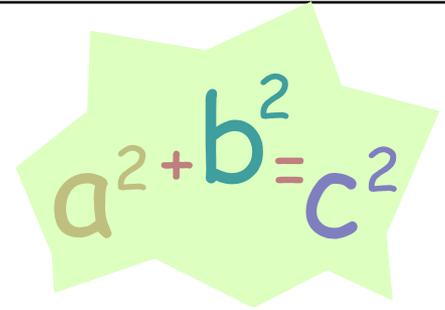
# RF Sensing Technology



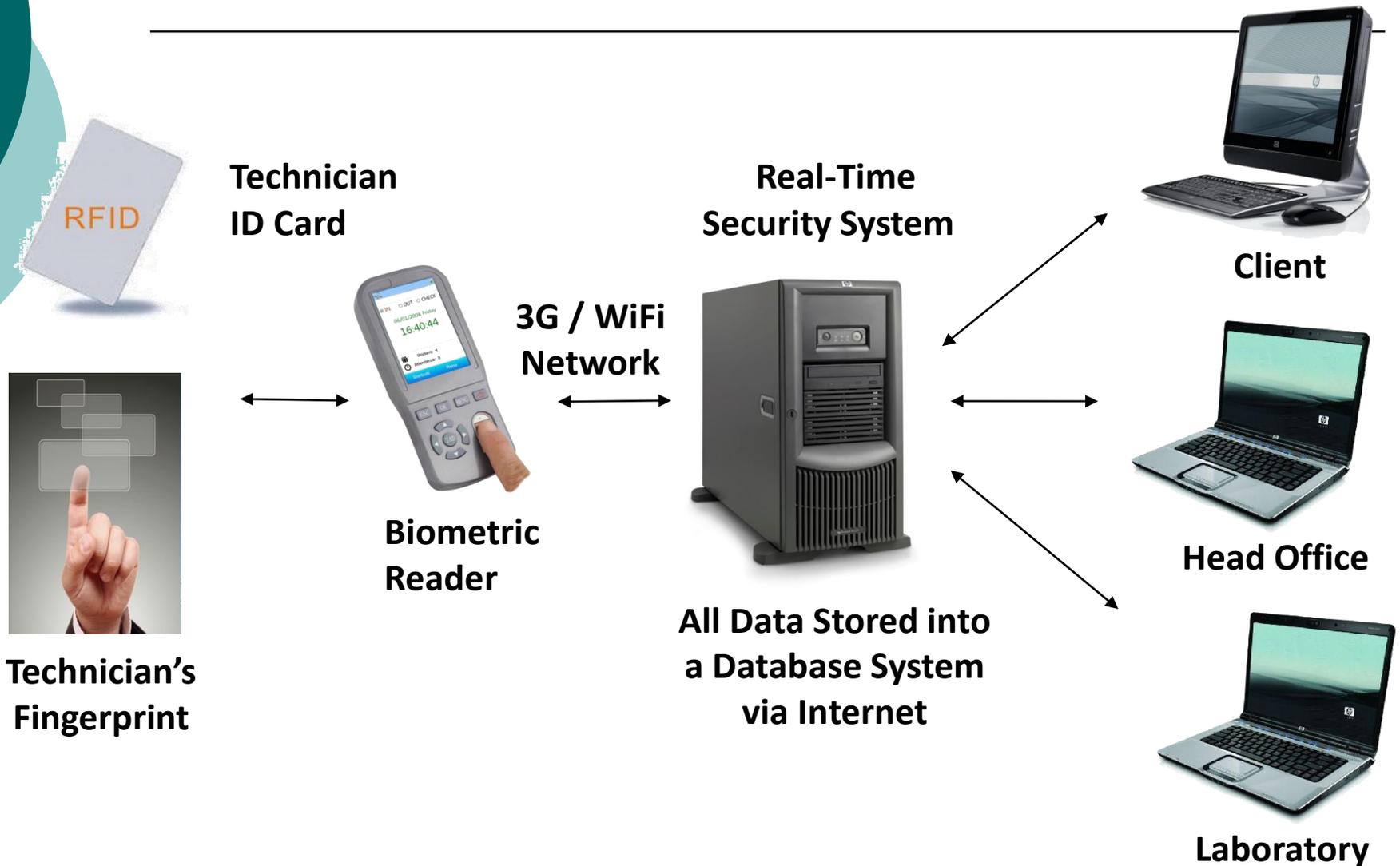
# Privacy Protection

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- The enrolled fingerprint is transformed into a biometric template by a proprietary algorithm



# Real-time Security System





# Example Uses in Asset Management

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- Recording of field samples
  - When? Where? Who? What?
- Chain of custody
- Laboratory testing
- Checking and recording of laboratory results
- Inspection records
- Maintenance records

# Ground Subsidence



# Ground Subsidence

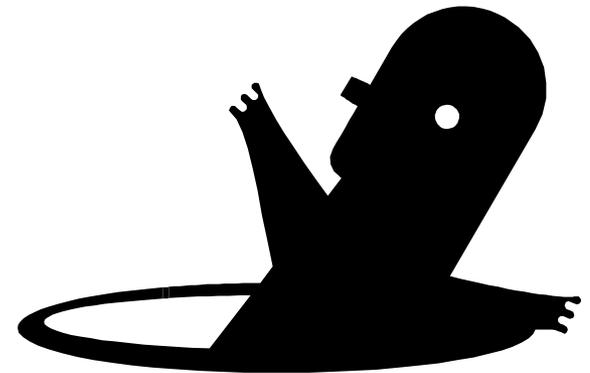
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- April 24, 2007
- Li Yuen Street East, near the junction of the street with Queen's Road Central, Hong Kong
- Sudden collapse
- 4 m wide, 8 m long and 4 m deep hole
- Five stalls, selling clothes, watches, hosiery and jade; and 4 persons collapsed into the hole

# Danger of Underground Voids

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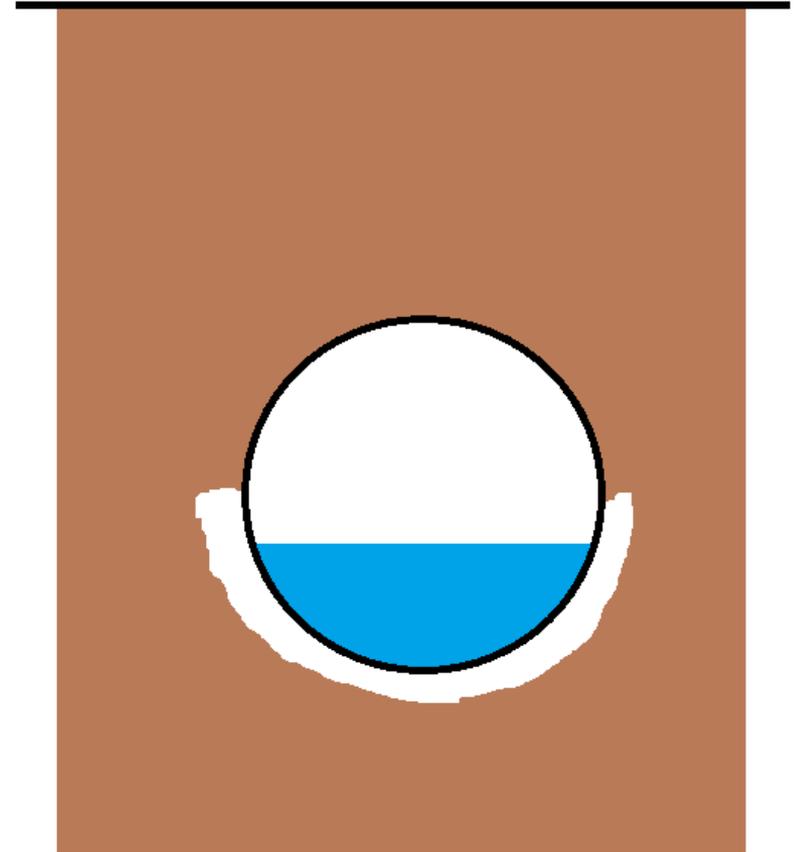
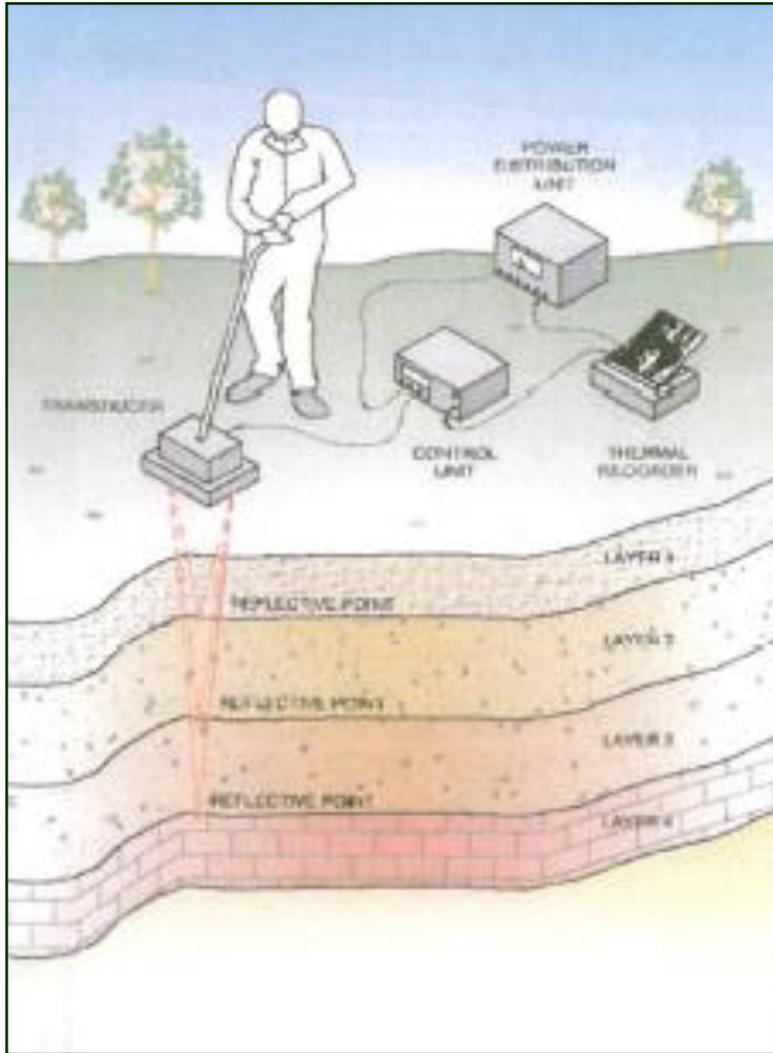
- The incident alerts engineers and the general public alike the potential danger of the existence of undetected underground voids



# Water-carrying Utilities

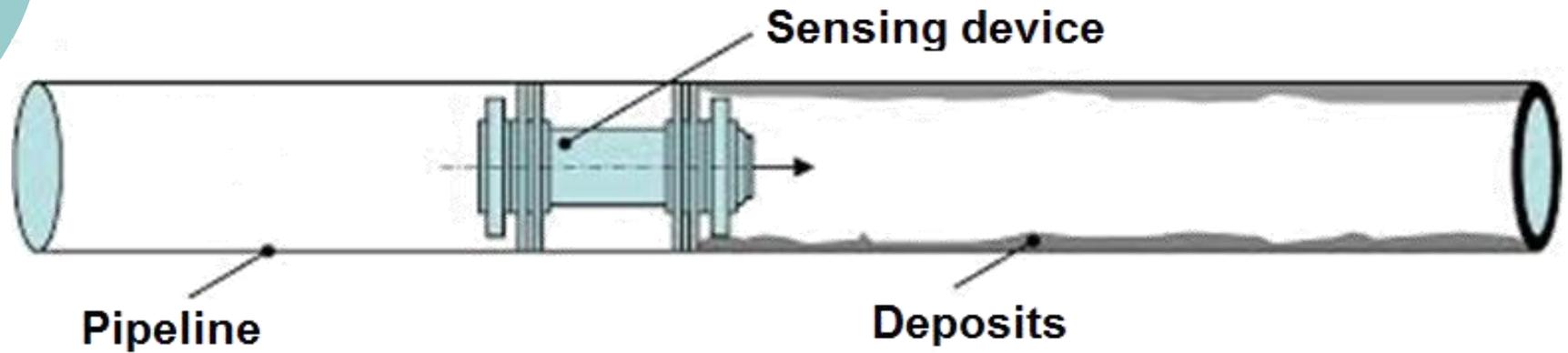
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- Leakage of water from these water-carrying utilities may create underground voids by soil erosion
- If undetected, these underground voids can increase in size progressively, leading to
  - Maintenance issues
  - Difficulties during installation of new pipes
  - Sudden collapse of ground surface
- Unfortunately, these underground voids would probably be undetected until accidents occur



# In-line Sensing Device

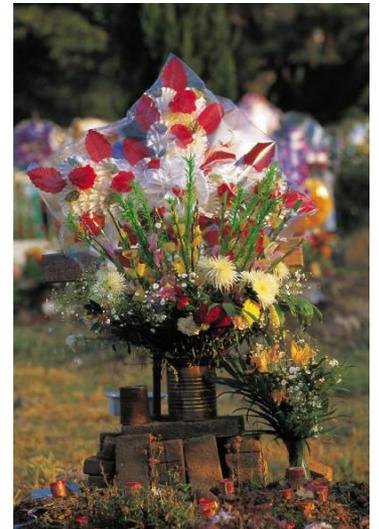
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**He lived without compromising, served his chosen profession to the best of his abilities, and died without having anything to regret.**



**Karl Terzaghi  
(October 25, 1963)**





*Aieue*

For a Better Quality of Life

**7<sup>th</sup> CECAR**

**ASCE**  
AMERICAN SOCIETY OF CIVIL ENGINEERS

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**Honolulu, Hawaii, 2016**





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**Thank you!**