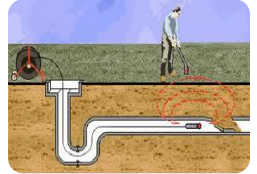


Risk-based renewal planning for asset management of water distribution systems

RRPAM-WDS



Why, How, What

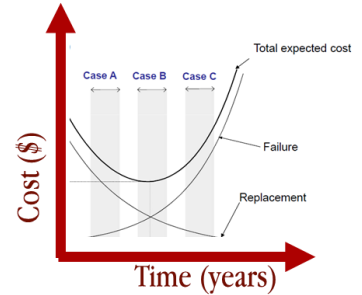
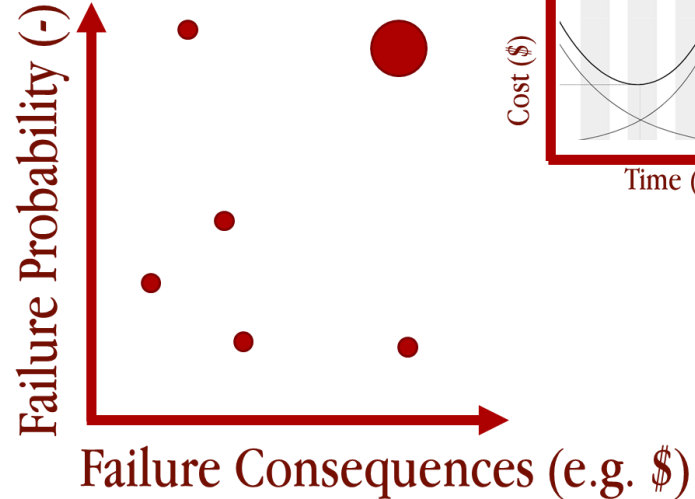
Assela Pathirana





RRPAM-WDS: Why ?

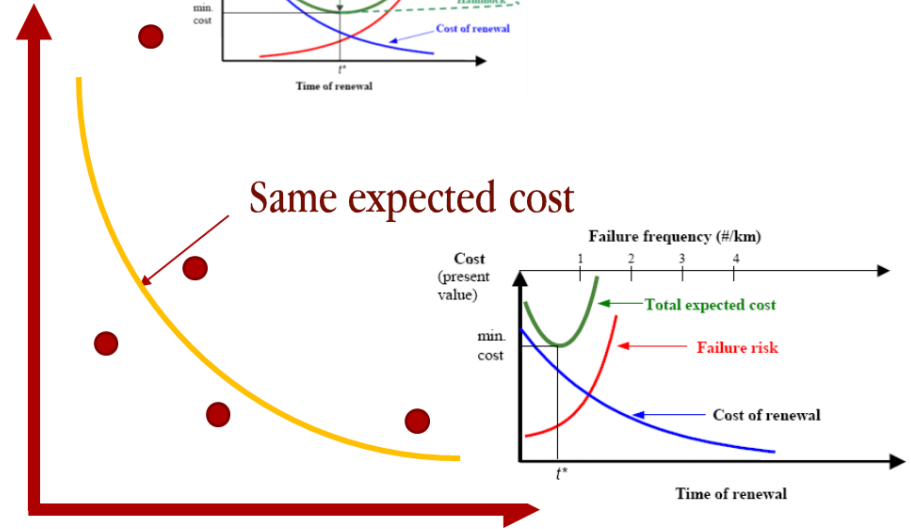
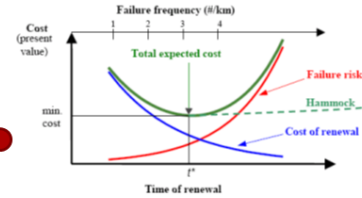
- Risk-based renewal prioritization –heart of infrastructure asset management



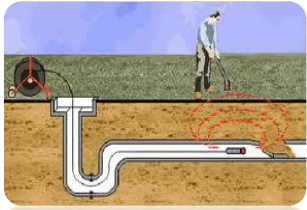


Short-term replacement planning

- Optimal replacement time for infrastructure assets



Failure Consequences (e.g. \$)



Challenge

(example: Water Distribution network)

- Deterioration modelling
- Consequence (inc. hydraulics)
- Net Present Value

$$C_M^T = \int_0^T L \cdot C_b \cdot N(t_0) e^{A(t+tg)} e^{-rt} dt$$

C_b = cost of a single break repair (\$/km)
 L = length of pipe (km)
 T = year of pipe replacement

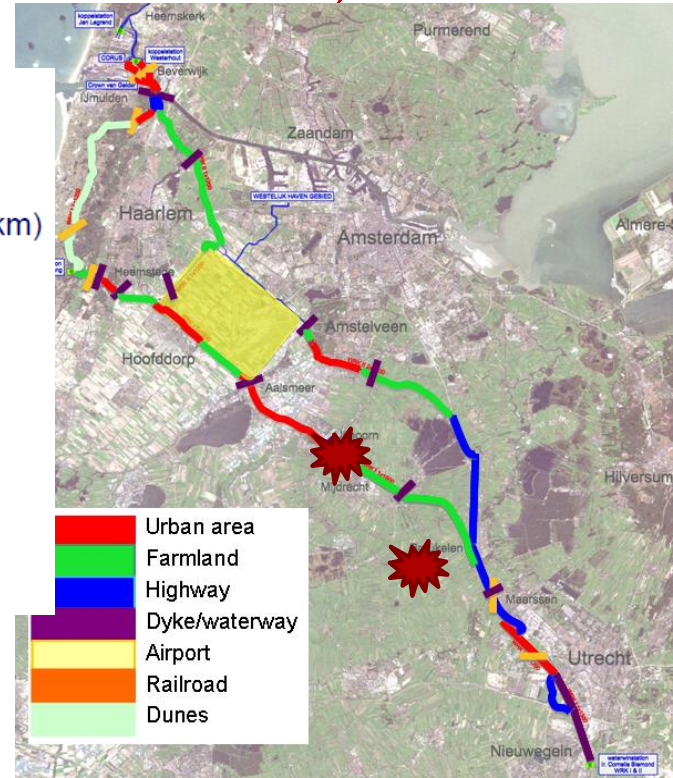
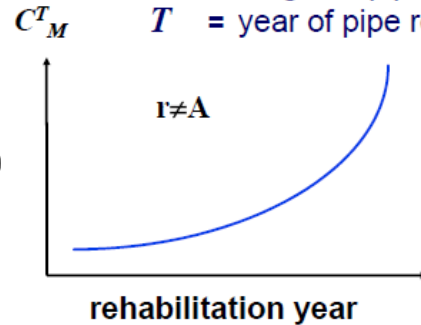


Image: Left: Yehuda Kleiner, Right: Waternet, NL



Challenge in Training room

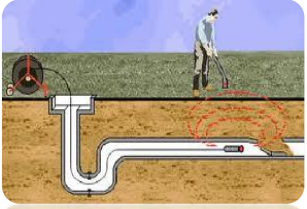
- Time-consuming calculations
- Non-engineers find difficult





How (to address this challenge)?

- Envision an easy to use, desktop software tool that (once data is provided) will do all the difficult calculations for the user
- That was the concept of RRPAM-WDS



What? (RRPAM-WDS)

- Input:

- Water distribution network

- Several parameters (e.g. aging/deterioration constants, interest rate, etc.)

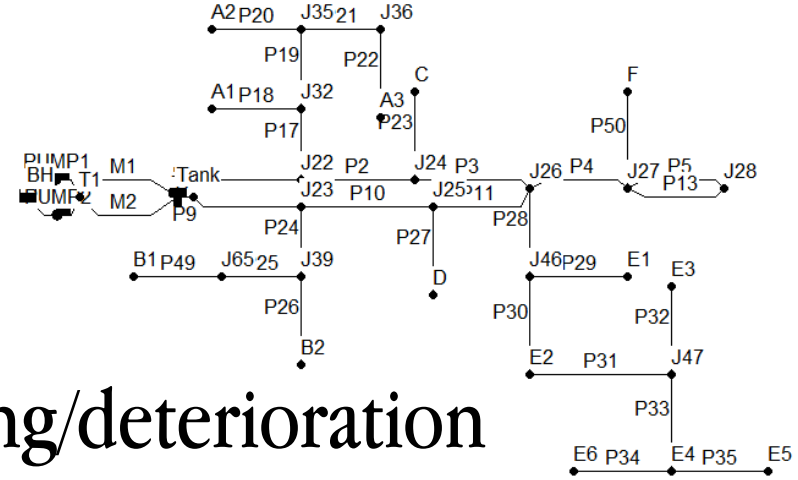


Image: A water distribution system hydraulic model for a rural water supply system in Kenya.



RRPAM-WDS – What?

RRPAMWDS

File View Help

Project Data

Parameters common to all assets

Project:

Epanet file of this project:

Units

Length:

Diameter:

Direct cost total system down

(x1000 €)

Relative size in risk matrix

Discount rate (%)

Time Horizon (years)

Whole life cost

Cost (€)

Time(years)

Network Map

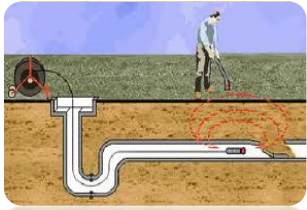
Asset Data

Property Group

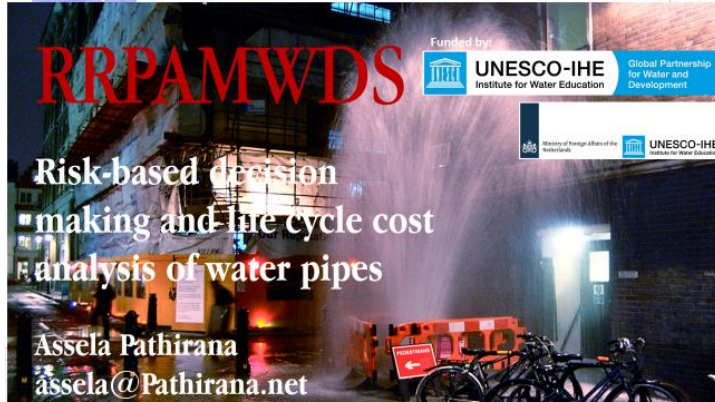
Assign to se

Assigned Groups

The screenshot displays the RRPAMWDS software interface. On the left is a 'Project Data' panel with various input fields and sliders. In the center is a 'Whole life cost' window with a graph showing 'Cost (€)' on the y-axis (0 to 1,000) and 'Time(years)' on the x-axis (0 to 1,000). A green circle highlights the origin (0,0) on the graph. To the right is a 'Network Map' window with a similar empty graph. Below these are 'Asset Data' and 'Assigned Groups' panels.



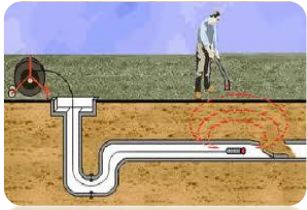
RRPAM-WDS - Technical



- Open source (GNU GPL v3)
- Python 3.x/2.7 compatible
- GUI with PyQt4
- guiQWT graphical support
- Cross platform (Windows, Linux, OS-X,..)
- Source available at github, download: <https://github.com/asselapathirana/RRPam-WDS/releases/latest>
- Fully documented online (<https://rrpam-wds.readthedocs.io>)
- Fully tested code with 92% Test coverage!
- Continuous integration with travis-ci/appveyor

Overview

| | |
|---------|--|
| docs | docs unknown version |
| tests | build error build passing requirements up-to-date coverage 92% |
| package | pypi v0.1.0 downloads 0/month wheel no python 2.7, 3.3, 3.4, 3.5 implementation cpython, pypy |



RRPAM-WDS – for the user

- Now it is possible to do Risk-based analysis of water networks rapidly
- Cuts the time required to do calculation workshops in teaching
- Increases the quality of learning