



... a business
model
framework that
has stood the
test of PR09...

Strategic Water Asset Planning Solution (SWAPS)

Introduction

The Strategic Water Asset Planning Solution (SWAPS) marks a major step forward in asset lifecycle management in the water industry. SWAPS can simultaneously be an engine to evolve business strategy, a methodology and an information technology tool. It represents a paradigm shift towards risk based asset management. SWAPS is a unique solution that provides a step change in planning by:

- Amalgamating the principles of asset management, risk management and project finance within the framework of regulatory policy and guidance
- Applying asset lifecycle analysis algorithms to the entire asset base (bottom-up) to generate capital maintenance options. Optimising them against business scenarios with varying costs and risk using genetic algorithms.
- Squeezing information out of available data to create robust investment cases justified on cost-benefit down to the most granular level.

SWAPS aligns projects with the company's goals by linking investment to customer and environmental benefits. Tests on real data have revealed the potential of SWAPS to fundamentally change the way assets are invested in.

The Planning Challenge

The Common Framework for Capital Maintenance planning (CMPCF) and regulatory guidance on asset management sets water utility companies a daunting challenge.

As public utilities, they are obliged to invest in a way that conserves the environment and delivers the best service affordable. To optimise its investments, a water company must evaluate the relative benefit to customer service of investing in every option, for each asset. A look at the dimensions of planning gives an idea of the enormity of the task.

- **Assets:** A typical company has about 2 million assets (pipes, pumps etc.) of over 1000 types, with lives ranging from 10 to over 200 years. Spread over 50,000 square miles, a majority of these assets are buried in the ground and difficult to monitor.
- **Failures and consequences:** Any asset can fail in tens of ways, each of which can have several consequences. Some may just disrupt supply or affect quality; others can cause flooding or even pollution. The scale of each consequence varies according to the position of the asset in the network, the number of properties it serves, its proximity to a water course, the topography it's embedded in, the condition of other assets connected to it and tens of other factors.
- **Intervention options:** There can be many options to manage an asset. For example, operational solutions such as frequent maintenance have to be compared with capital options such as replacement and a number of options in between.
- **Planning horizons:** Short term decisions for long lived assets must be optimised within a long term context. What's the point for example, in replacing a pump in a works that is to be rebuilt in a few years due to population growth?

In theory, considering choices to be made on assets, intervention types, the time of intervention and designs, an average water company has to consider and choose from a universe of 100 trillion options.

The Strategic Investment Planning System (SWAPS)

Managing with real data

... SWAPS has the analytical muscle to apply lifecycle risk analysis to every asset ...

A robust planning system used to determine typically £1 billion worth of investment, down to the last £1000 project has to be based on a sound foundation of financial principles, risk management methodologies and robust analytics.

Any number of solutions implemented by water companies across the UK eventually come up against a common obstacle – data. SWAPS recognises that data deficiencies are a part of reality. It uses workarounds not unlike those found on spreadsheets around the business to squeeze information out of data. SWAPS' powerful lifecycle risk analysis algorithms screen out assets with cost-benefit justifications for investment.

A process of consultation with operators and managers adds meat to the investment cases as business as usual. This focuses resources to surgically improve data for the few assets that really need investment, and away from the potentially unaffordable job of collecting 'all data for all assets'. Its business as usual approach means that most of it gets done within the company's resources.

Regulatory compliance

The entire gamut of regulatory guidance is embedded and auditable within SWAPS; be it on cost-benefit, willingness to pay, risk, the CMPCF, carbon footprint etc. A unified risk methodology creates a level playing field for competing projects of all kinds see figure 1 below). Annual plans are nested in five year plans which in turn are a part of long term scenarios (effective up to 40 years or more).

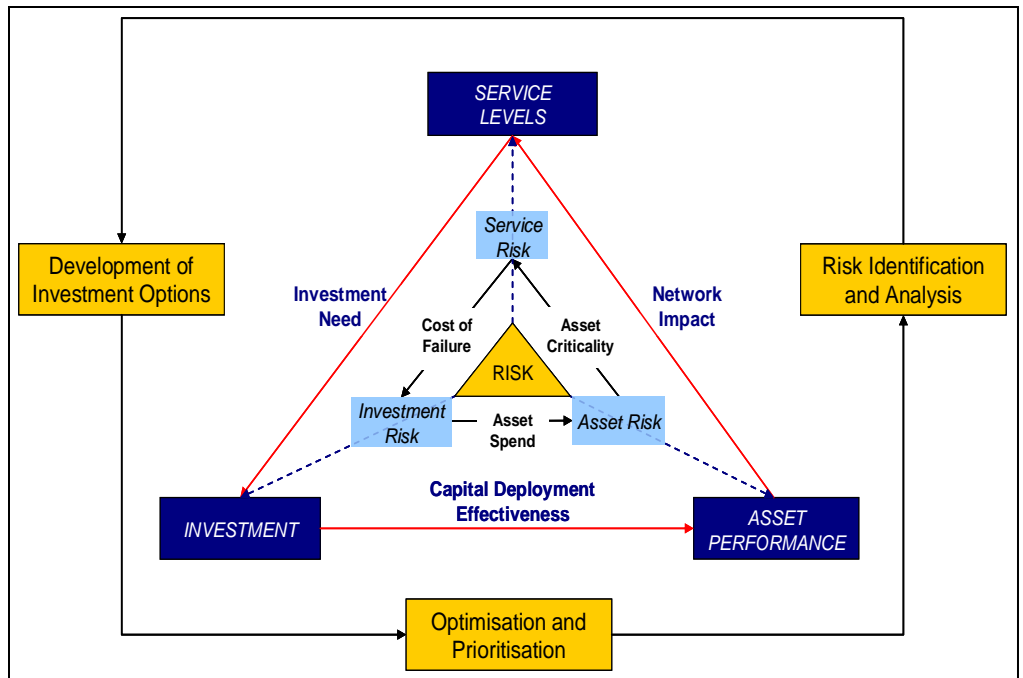


Figure 1: Basic concepts of risk based asset management

The Optimiser

Business scenarios specifying planning horizons, company (or even regional) cost budgets, service levels (risk) can be used to constrain a Genetic Algorithm based investment optimiser to create a plan. Its performance is amongst the best in the world:

- It suggests which projects to implement and when.
- It allows both objectives; cost-benefit and cost effectiveness even serially.
- It can prioritise huge sets of 500,000 projects or more within minutes.
- It recognises projects with different cost profiles and multiple benefits.
- It can distinguish between investment categories such as growth or enhancement.

**... SWAPS
makes industry
leading
planning
affordable...**

Why is SWAPS necessary?

- SWAPS performs the analysis recommended by regulators in their guidance - at the same level of granularity at which investment decisions are made. It does so in near real time as business as usual sourcing its data from wherever it is available.
- SWAPS means an investment plan is always ready. Every investment case is underpinned by robust lifecycle cost analysis. This provides the best trade-off between operational and capital investment options
- It makes the most of data available dynamically integrating unit costs, costs of consequences, deterioration models, maintenance history, condition surveys, telemetry and SCADA data. SWAPS significantly reduces the cost of data improvement by focusing on what's essential.
- SWAPS is completely auditable and is ideally suited to support price reviews
- SWAPS is technology agnostic.

Why is SWAPS unique?

Business alignment

SWAPS aligns with the business by adopting PAS-55 principles. Investment planning in SWAPS is guided by an investment management policy and an investment management strategy developed under the programme. The investment policy and strategy establish are demonstrably linked with a company's corporate goals and strategy. SWAPS has been developed on the back of lean business processes with a view to maximise efficiency.

Theoretical Foundation

Logical discontinuities in otherwise integrated business processes are a major hindrance to collaborative working. A risk measured using a scoring system specific to one part of the business often does not make sense to another trying to find ways to mitigate it. Apart from creating silos within the business, it reduces planning efficiency. However, SWAPS is underpinned by theoretically sound methodologies that foster a common understanding throughout the supply chain. Its unique risk based approach to cost benefit analysis lays the foundation for total optimisation by creating a level playing field for all kinds of competing capital investment needs. The approach is completely devoid of any subjective scoring systems that plague almost every other one of its kind in the industry.

Data management

SWAPS has the analytical muscle to apply complex asset lifecycle risk analysis required by regulation to the entire asset base. SWAPS possesses the innovation to do so using realistic levels of data quality. SWAPS makes industry leading planning affordable.

Outcome and Benefits

Economic Benefits

SWAPS promises to bring enormous efficiencies to the way companies spend public money in the UK.

Environmental Benefits

Water companies in the UK struggle to link investment to environmental outcomes such as pollution and reduction in their carbon footprint. SWAPS has made it possible to target investment towards the objectives set out in the European Environmental and Habitats directives. Money saved through investment efficiency will generate funds to meet ever toughening environmental standards.

Social Benefits

SWAPS transparently funds projects based on their benefits to customers and society (the environment). The benefits are monetised to assess value for money and eventually drive investment. Most importantly, SWAPS identifies risks before they occur rather than directing investment to control them afterwards. This not only lowers the cost of failure substantially, but prevents damage to the environment.

For more information

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