ATU Decision Support System
DSS: a computer-based information system that supports business or organizational decision-making activities.

ATU DSS: an interactive software tool that supports asset management decisions by *integrating and reasoning with* diverse information sources about different assets and their relationships.
DSS – What it is NOT!

• It is not a tool to tell expert asset managers how to do their job!

• Asset managers are experts in their fields and have a variety of existing systems to help with asset management.

• What they are not experts on is the effects of their actions on other assets, soil, roads etc.
E.g.: *Decisions on Buried Assets*

- Change operational parameters
- Add new buried assets
- Replacement
- Emergency repairs
- Abandon
- Wait and monitor
- Diagnostics (more surveys)
- Combine with other works (road, buried assets)
- ...

- An asset manager will know what they WANT TO DO in the context of their own assets
- This may not necessarily be the best course of action in terms of the global asset ecosystem
Potential Users of the DSS

However – The purpose of our RESEARCH is to demonstrate integrated management of an asset ecosystem (Road, buried assets, soil, etc.) is beneficial.
Main Components of the ATU DSS

Knowledge Base: ontology and datasets

User Interface

Deterioration Models

Cost Models
A water utility company notices a minor leak in a pipe. This is not an urgent case (not a burst) and a decision has to be taken **whether to dig a hole** to fix the pipe.

The utility company has appropriate data about the assets it deals with but does not have data about **other related assets** that may affect the condition of the water pipe or can be affected by the pipe deterioration.

The ATU DSS aims to provide asset managers with an **integrated view** of the local asset ecosystem.
Illustrative Scenario: *Leaking Water Pipe*

What knowledge and data must be in the DSS to support such a scenario?

- **Deterioration Models**
- **ATU DSS**
- **KB**
- **Cost Models**

**Will roads or other assets be affected by your planned action? Examine and assess other assets nearby.**

**Evaluate the cost of your planned action regarding its social, environmental and economic impacts.**

What knowledge and data must be in the DSS to support such a scenario?
DSS = Ontology + Data + Reasoning

An ontology defines a *common vocabulary* for people who need to share information in a domain.

It includes *machine-interpretable definitions* of important concepts in a domain and relations among them.

An ontology can be used to perform *multi-step reasoning* to evaluate outcomes of actions and suggest courses of action.

[Data] Leaky water pipe
⇒ [Causes] Soil changes
⇒ [Results in] Loss of support for road surface and nearby assets
⇒ [Results in] Reduced lifetime of road surface and nearby assets
⇒ [Can be modelled by] Method X
⇒ [Which requires] data Y and Z
The ATU DSS ontology defines the *main concepts* describing

- buried assets (e.g. pipes)
- soil
- land cover (e.g. pavement)
- the environment and human activity
- Methods for deterioration modelling, cost modelling and sensing/data acquisition.
- as well as their relationships.
Why this approach?

• Isn’t this just common sense?

• Can’t we just do this with guidelines?

• Why do we need a computer system?

A: Complexity! …
• A diagram representing (part of, simplified) relationships between soil and pipes

• This is only ONE SMALL PART of the entire knowledge base
Main Content of the Ontology

Knowledge & Knowledge Acquisition techniques

Environment

Land Cover

Soil

Buried Asset

Human Activity

Interact or influence each other directly
Ongoing Work and Future Plans

- We have started with water/soil interactions
- We will add other concepts (road, other utilities) incrementally
- Working towards: Implementation of a prototype of an ATU DSS user interface.
- Working towards: Evaluating the ontology and the prototype DSS system in the “leaky water pipe - to dig or not to dig” scenario (moving onto other scenarios).
- Involvement of end users and domain experts is crucial!

Thank you!