

science summary



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Assessment and measurement of asset deterioration including whole life costing

Science Summary: SC060078/SR2

The “Assessment and measurement of asset deterioration including whole-life costing” research project aims to improve our understanding of the process of deterioration of common materials and components in flood risk management (FRM) assets and the way that deterioration interacts with asset condition and performance under service conditions.

Understanding and quantifying deterioration rates is important for estimating and planning programmes of maintenance that contribute to an asset’s whole-life costs (WLCs), and for the day-to-day maintenance and renewal intervention activities.

As deterioration processes are closely related to the costs incurred over the life of assets, whole-life costing is another goal of the research. The main link between deterioration processes and WLCs is the relationship between periodic investments in managing the asset (maintenance, refurbishments) and the resulting performance of the asset, which includes the effect of reducing the deterioration.

The project was conceived as being likely to require three phases:

- Phase 1 delivers the project scoping together with some interim deliverables. It includes the detailed assessment and collation of existing data and initiation of theories to tackle the process of developing deterioration curves and basics for whole life costing. A practical guide with typical deterioration curves for flood defence assets is also produced. Phase 1 also identifies and drafts out the scope of work suggested for the following phases.
- Phase 2 commences the implementation of the programme set down in Phase 1 and could include setting up the monitoring framework and potentially the carrying out of baseline surveys at monitoring or pilot sites. This phase could be progressed by a combination of Environment Agency Science (R & D) funds and funds from local Environment Agency areas and coast

protection authorities in which assets will be monitored.

- Phase 3 could mainly comprise of ongoing monitoring of Environment Agency or local authority assets at pilot sites and be largely funded outside the Environment Agency science programme.

This report presents the results achieved in Phase 1 of the project.

The research project collected available knowledge from Environment Agency areas, from both Asset System Management and Operations Delivery, and from a variety of maritime local authorities. The collated information provides evidence of the rate of asset deterioration at the individual asset level and at a system level (for example, systems of groynes). Availability of information about costs has also been identified from interviews.

The understanding of deterioration processes has been improved by the use of data collated both during the interviews and from the literature review, identifying the relevant failure mechanisms and key variables for a number of assets.

The project has produced the “Guidance on determining asset deterioration and the use of condition grade deterioration curves”. This practical guide details the deterioration curves and how to use them to quantify the residual life of different types of assets. Vertical walls, embankments, culverts, dunes and shingle beaches are covered. These curves will be useful for guiding Environment Agency areas and local authorities in preparation of asset management plans. Changes in the dominant deterioration processes at different times in composite assets imply the use of limiting values of deterioration curves. Examples of how this should be considered are provided in the guide.

The project has also identified ongoing developments in state of the art science related to whole life costing, which confirm the strong interrelationship with the asset deterioration element. The project has concluded that methods and tools for flood defence asset whole life costing can be developed in the next stage: the general concepts from asset management science can be applied, and examples from other fields of asset management can be used. This will require translation to the specific concepts and language of flood defence asset management. The project has found that there are various highly relevant ongoing developments in the Environment Agency's asset systems management (such as System Asset Management Plans [SAMPs] and Asset Management IT [AMIT] tools), where some of these specific concepts are being developed. Hence, any work on whole life costing needs to be fully embedded in those developments

The project has identified the main goals and activities for Phase 2. These include activities related to deterioration, whole life costing and the setting-up of a long-term monitoring programme to facilitate the gathering of information on asset deterioration and the cost-effectiveness of different maintenance strategies. Monitoring activities (which should carry on beyond the end of Phase 2) would provide the required evidence base on deterioration and its relation to maintenance approaches. Phase 2 of the project would include measurement and understanding of component-level deterioration processes allowing more reliable and site specific deterioration and fragility curves to be created. It also could provide a vehicle within ongoing projects such as Performance-based Asset Management System (PAMS) for understanding the impact on flood risk of adopting various maintenance scenarios. Activities related to whole life costing methods and tools in Phase 2 would support flood defence asset management in the short, medium and long term.

This summary relates to information from Science Project SC060078, reported in detail in the following output(s):

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Project manager: Stefan Laeger/Tim Hopkins

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