An expert system for calculating the costs of open spaces over their entire lifecycle

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In architecture, the costs that will be generated by a building or facility and its expected life expectancy are already clear at the planning and installation stage. But what is the situation with open spaces? Here maintenance is considered only cursorily, and renewal and lifecycle not at all. Research has shown that the literature also has little to offer. Considering these facts, the Center for Green Area Management at the Zurich University of Applied Sciences (ZHAW) in Wädenswil has developed a software program to calculate lifecycle costs in collaboration with nateco, green management and the German Database Association GmbH (d.b.g.) as business partners, and with financial support from the Commission for Technology and Innovation (CTI). The expert system supports the following areas:

- Application of lifecycle considerations, as in current facility management practice, to outdoor spaces.
- Optimisation of construction projects with regard to economic, ecological and social sustainability.
- Calculation of lifecycle costs in the context of open space design competitions and new project implementation.
- Creation of maintenance cost documentation and transparency for customers, users of green areas, politicians and administrative offices.
- Planning of conservation measures in existing facilities and early assurance of financing.
- Planning of renovation and renaturation measures at the best possible time.
- Improvement of green space care in general.

Initial situation

The construction of a green space is an intervention with implications for the following 10 to 50 years (or longer). Initial investment costs make up only about 15% of the total lifecycle costs of a facility[1], and the much higher amounts required for maintenance over the coming decades are estimated at the planning stage (Figure 1). All too often new facilities have had to be removed or structurally adjusted because human and financial resources were not available for the necessary maintenance. Alternatively, the overall appearance of the facility no longer fulfilled users' expectations and needs, due to a lack of resources to ensure this.

In our era of holistic, proactive thinking, it is vital to transparently present the costs of caring for green spaces over a future period spanning several years, or, if possible, for their entire life cycle. This is the only way to ensure that the financial impact of the projects can be objectively evaluated at the planning phase. Furthermore, a holistic way of thinking includes not only economic aspects; in times of increasing urbanisation and persistent climate change, both public and private green spaces in urban areas can be expected to make an increasingly vital contribution to a socially and ecologically sustainable environment.

The research project

Together with the business partners mentioned above, researchers at the ZHAW have sought ways to visualise the lifecycle of a green area, together with the various elements it comprises (coverings, planted and seeded areas, trees and shrubs, equipment, etc.), and to calculate the associated maintenance costs. After about two years of research and development, the software GreenCycle® was developed, enabling various calculations for the lifecycle of a facility to be made (see Figure 2).

The project team was supported during the development period by an advisory panel of experts and representatives from cities, Swiss trade associations (BSLA, VSSG, VSS, Jardin Suisse) and private companies. The software is currently being tested in pilot projects in various cities.

Target groups

GreenCycle® is a tool for planning and consulting firms, and for investors in the private and public sectors. These include property management

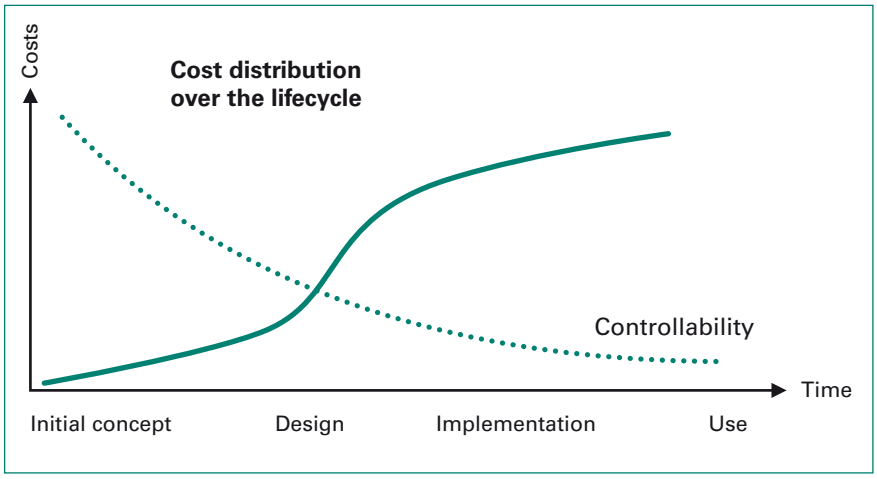

Figure 1: Cost allocation in life cycle2. As the lifecycle of a facility progresses, costs are increasingly difficult to control. The highest expenses are those for maintenance in the years after construction.

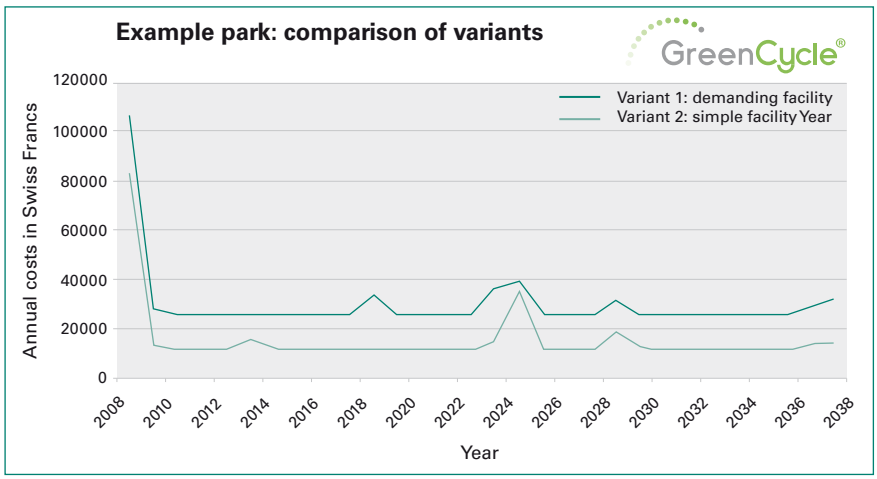

Figure 2: Example of a model covering 30 years for a park built in 2008, consisting of different types of surface coverings, green areas, trees and shrubs, and elements of equipment. Variant 1 allows for intensive design and maintenance; Variant 2 is a simpler version requiring less care. The high costs in 2008 are due to the construction of the facility. In subsequent years partial renovations must be allowed for in both variants.

companies, town planning offices and cooperatives, as well as landscape architects and general planners. These all have an interest in a sustainable and secure long-term investment. In addition, GreenCycle® can be used by cities and communities to assess and optimise the maintenance of green spaces.

Applications

The project partners have now been using GreenCycle® for over six months in their consulting practice. The applications are already very diverse:

- A landscape architect needed to show the investor that a new project would entail lower maintenance costs than the existing arrangement. By comparing current with future maintenance costs, a savings potential of 20 percent was demonstrated.
- The costs of green space maintenance in various municipalities were reviewed using GreenCycle®. The communities wanted to verify the plausibility and efficiency of work done. It was shown that the expenses were generally justified. There were also pointers on how priorities in green space maintenance should be selected in future and where renovation is unavoidable.
- GreenCycle® is already used in different communities and landscape gardening companies to define standards for the maintenance of green spaces. This offers the advantage, especially in larger companies, that quality can be uniformly guaranteed and customers can be assured of this.
- During a tendering procedure for green space maintenance, the data submitted by the bidders were reviewed and evaluated. The main focus was on the detection of obvious dumping prices, which were associated with an excessive risk to the client.

GreenCycle® is growing

There is considerable interest in GreenCycle®. The first programs have been sold and are in use. In Switzerland, the Association of Swiss City Garden Departments (VSSG) has set itself the goal of optimising the data from GreenCycle® for its own purposes as part of the project "Open Green Space Costs" In 2010 and 2011, the work of maintenance teams in many green spaces throughout Switzerland is being surveyed in detail. This data will be used as the basis for a "VSSG data collection" in GreenCycle®. This should enable standards to be set for all cities, which can then be enforced collaboratively.

It was crucial for the project team that the data models can be used flexibly in GreenCycle®, which allows the basic data to be continually optimised. To achieve this continual improvement and refinement of the software for use in everyday situations, the project partners have set up a common fund into which they pay a portion of their revenue. To ensure that all users can profit from the progress made, regular updates of the GreenCycle® database are planned.

Publications

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Project implementation period

September 2007 to December 2009
Current: Follow-up project involving 7 Swiss cities and the Association of Swiss City Gardening Departments

Sources

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