

Circular Economy: Lock Gates

Sustainable Materials Analysis

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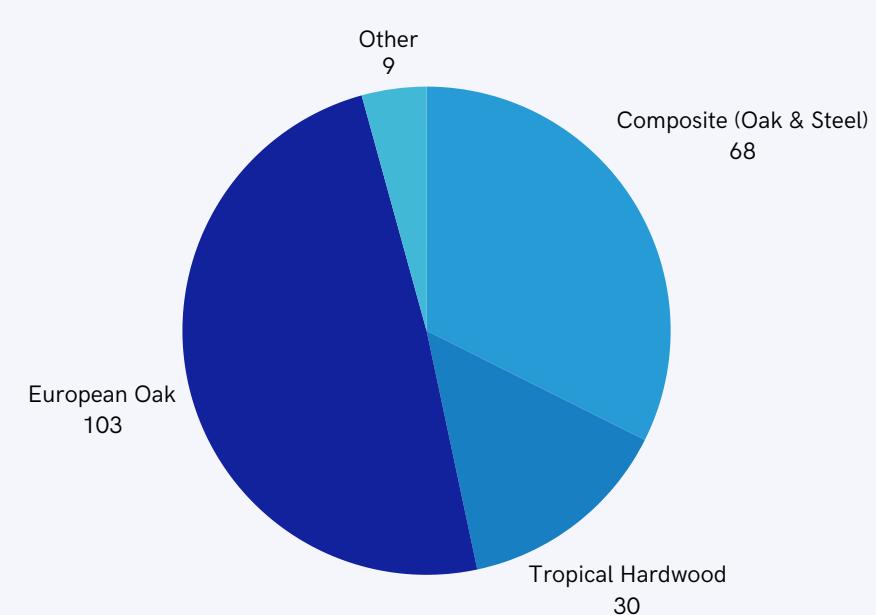
RESEARCH COACH: Ingrid de Vries

A lock (*Sluis in Dutch*) is used for raising and lowering boats, ships and other watercraft between stretches of water of different levels on river and canal waterways.

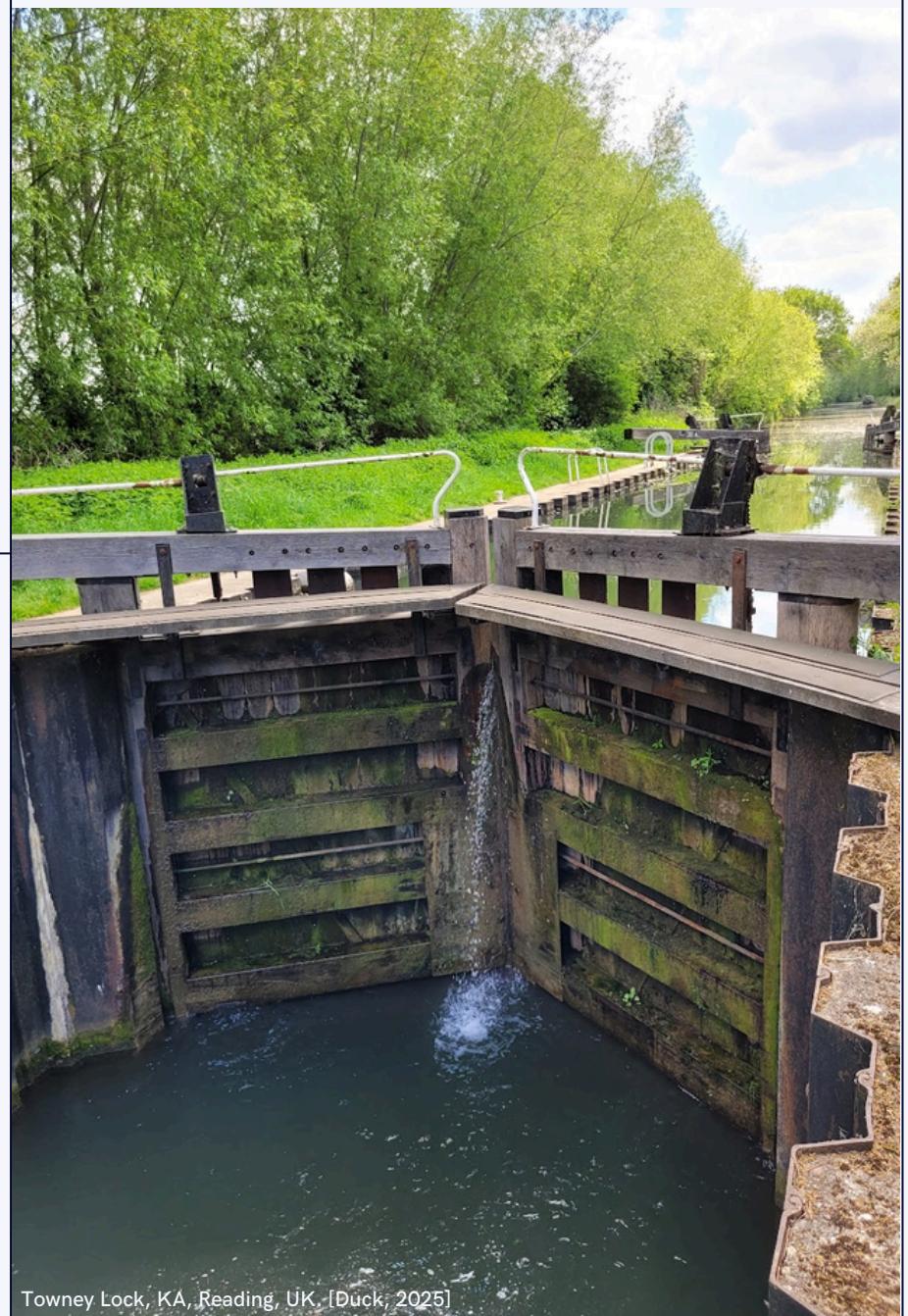
Introduction

The Kennet & Avon Canal, at 140km long, links London with the Bristol Channel. There are 105 locks along the canal, the majority of which have gates made of European Oak. Both the material and construction method of lock gates on the canal have not significantly changed since the canal's reopening in 1990. The current gates are often not meeting the 25 year life span they were designed for.

Current Lock Gate Materials on the Kennet & Avon Canal



Affiliations



Objectives

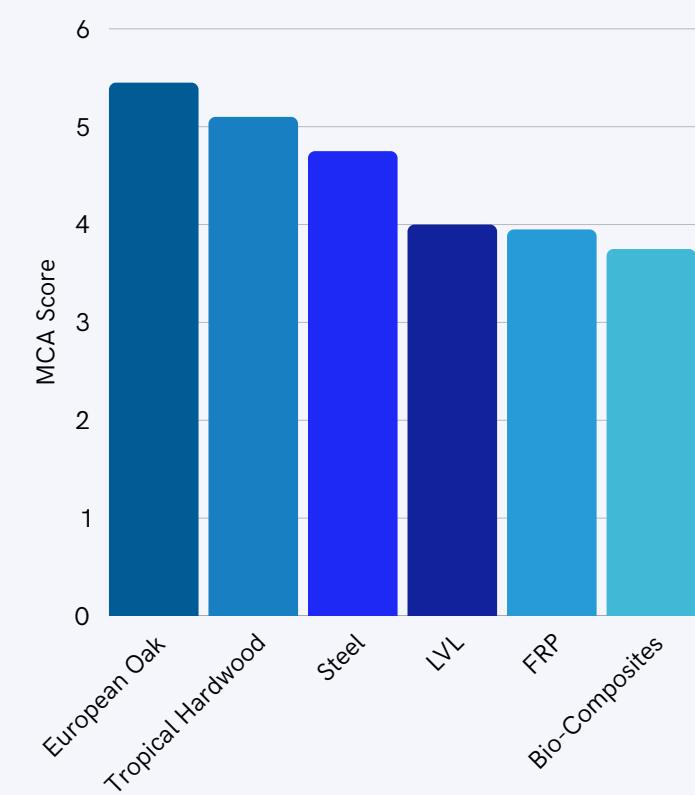
The principal goal of this research was to identify and assess materials for lock gates that offer optimum performance, whilst minimising maintenance challenges.

Methodology

Research was needed to determine possible materials and their suitability. This was gathered through:

- Interviews - both internal (CRT) & external
- Site Assessment
- Multi-Criteria Analysis (MCA)
- Literature Research

MCA Score for Lock Gate Materials



Analysis

7 Criteria for evaluating materials:

1. Workability & Installation
2. Durability & Service Life
3. Cost & Whole-Life Value
4. Maintenance & Repairability
5. Aesthetic & Heritage Considerations
6. Environmental & Ethical Factors
7. Weight, Buoyancy & Mechanical Properties

6 Materials identified as potential and put through an MCA to determine the most suitable.

Results

European Oak scored the highest, indicating that it is the most suitable material for lock gate construction (in its current format) on the KA.

Limitation - the MCA did not allow for Composite gates (different materials for different elements).

Conclusion

The research confirmed that the current preferred material, European Oak, is the most suitable for lock gates on the KA. However, the results are biased due to limitations of current processes employed and in an 'idealised' MCA. Tropical Hardwood scored highest.



Key References:

Daniel, R., & Paulus, T. (2018). Sustainable Gate Design. Butterworth-Heinemann. | George, I. (2019). Alternative Lock Gate Design. Arcadis. | Greenaway, H. (2023). Calculating the Carbon Footprint of Lock Gates. Canal & River Trust. | Sims, T. (2017). Asset Strategy for Oak Lock Gates. Canal & River Trust.