

GREEN-LOGIX: VEGETATION MANAGEMENT ON ROADS AND RAILWAYS

Abstract.

In the area of transport infrastructures, spontaneous vegetation is exposed to a considerable safety risk and combated by chemical or mechanical means [1]. Glyphosate is one of the most widely used agents worldwide. Glyphosate is harmful to the environment and to health; As a result, alternative and environmentally friendly solutions are being researched in many places [2].

The project objective is to control vegetation along roads and rail-ways. The research consortium consists of the following companies: E.C.O. Institute of Ecology, biohelp, University of Applied Sciences Technikum Wien, Carinthia University of Applied Sciences (CUAS). During the project period methods of: Alternative/ecological vegetation management, mechanical vegetation management and chemical vegetation management were tested and investigated by the consortium.

The Green Logix project shows that there are many effective alternative methods of vegetation management available. Each of these methods can have a different effectiveness. The applicability of each method also depends on the field of application.

Keywords: Vegetation Management, Infrastructure, Nature Conservation

1 INTRODUCTION

Effective vegetation management of unwanted growth on railway and road bodies is an indisputable necessity, especially with regard to safety issues [2]. Different vegetation control options are available, depending on the prevailing local conditions and requirements in the track area [1]. In the course of the Green-LOGIX project, the research consortium carried out various methods of vegetation management on railways and roadways at test sites in Vienna, Linz and Villach. Various geotextiles and fleeces were tested in Vienna and Linz. The geotextiles are intended to contain vegetation as far as possible and the fleeces are particularly suitable for use in the renovation and new construction of infrastructures. In Villach, test boxes were used to observe the petrology and growth behavior of plants [4]. The main motivation for this study was to identify the correlation between rock type and growth conditions as well as the influence of temperature. At the marshalling yard in Erdberg and Wien Breitenlee, as well as Gerasdorf and Seyring, a large number of alternative sprays were tested for their effectiveness. In Vienna Breitenlee it was also possible to carry out the electro-herbicide method and two different seed mixtures were applied as competitive plantings. Selected herbicides were ecotoxicologically tested and a recommendation was made as to which of the tested substances would be of least concern for use on railway tracks and roads [7].

2 PROBLEM

The public is becoming increasingly critical of the chemical methods used to control the growth of plants [1]. For example, a ban on glyphosate, currently the most commonly used active ingredient in plant protection products, is to be expected. Mechanical methods are sometimes associated with considerable expense [2]. "Alternative" methods are not available to a sufficient extent or have not yet been tested in qualified trials.



Figure 1. Installation of geotextiles in Vienna Breitenlee (Wiegele)

3 METHODOLOGY

The consortium used a variety of methods to answer the question of the most effective replacement method. The basic investigation of which maintenance measures are currently used by infrastructure operators was carried out by means of qualitative questionnaires. The

elaboration of the question which vegetation control is effective on transport infrastructure surfaces was implemented with a balanced consideration between conventional and effective alternative methods. During the project the following approaches were tested by the consortium: Alternative/Ecological Vegetation Management, Mechanical and Structural Vegetation Management and Chemical Vegetation Management. Alternative/ecological methods are electroherbicide and competitive planting [6]. Structural measures are geotextiles and nonwovens, as well as various rock types. In the case of chemical methods, various sprays were tested for their effectiveness.

In the course of the Green Logix project, the Carinthia University of Applied Sciences tested out various mechanical methods for vegetation control on rail and roadways at various test sites in Austria. Six different geotextiles and fleeces were tested in Vienna and Linz. The geotextiles are intended to reduce the growth of vegetation as much as possible. The fleeces are particularly suitable for use in the renovation and construction of new infrastructure.

The analysis of the plant growth with different rock materials and recycling products was a part of the research. For this purpose, test boxes with different rock materials - different types of track ballast and recycled products - were filled and observed. The germination and growth behavior of the emerging plants on the different substrates was systematically documented. The analysis of plant growth in connection with different rock materials and recycling products with different test arrangements (exposures, contaminations with organic components) is the main objective of this work. The hypotheses are: To what extent does the rock material influence the plant growth? Is there a correlation between petrography and plant height?

In order to answer the research questions, a test arrangement with 36 test boxes was started in Villach. In the test boxes where 12 different rock materials in diverse arrangements tested. The following materials were installed: granite, diabase, basalt, limestone, crushed sand, recycled asphalt, recycled concrete. The following insights were gained in the course of the scientific test sites. Large aggregates are more resistant to fouling than mills. Pure material is more antifouling than impure material. Diabase is more growth-inhibiting than granite. Recycled asphalt is more growth-inhibiting than recycled concrete. Crushed stone is more growth-inhibiting than limestone slate. The experiment could show that there is a significant correlation between petrology and growth behavior.



Figure 2: Installation of the test boxes in Villach at the campus of the Carinthia University of Applied Sciences. (Wiegele)

4 RESULTS

The main results from the Green-LOGIX project are that the petrology of rock types has a great influence on the growth behaviour of plants. The rock types diabase, granite, limestone and basalt proved to be more vegetation-inhibiting in rock size 2 than crushed aggregate and calcareous shale [4]. The shoring of geotextiles reduces the emergence of vegetation, the success will be shown in the long run. As a result of the project, the two alternative spray mixtures: (Stomp® Aqua + Katana® + Nozomi®), (Nozomi® + Katana® + Duplosan® Super) were found to be particularly effective [5]. The application of the electro-herbicide method can achieve good results under the right conditions [4]. In the course of the Green-LOGIX project, a management summary was prepared which compares all the methods investigated and presents them sorted according to their effectiveness and economic efficiency.

5 OUTLOOK AND CONCLUSION

The Green-LOGIX project shows which methods of vegetation management are available and effective. These findings make it easier for infrastructure managers to dispense with the active ingredient glyphosate and optimize the use of construction methods and mechanical methods. With the information from the project, infrastructure managers can decide which vegetation management methods are best suited for different applications [3].

6 ACKNOWLEDGEMENT

The research leading to these results have been financed by: Austrian Federal Ministry for Climate Protection, ÖBB-Infrastruktur AG, ASFINAG and Österreichische Forschungsförderungsgesellschaft mbH

Research Consortium: Carinthia University of Applied Sciences, E.C.O. Institute for Ecology, biohelp, University of Applied Sciences Technikum Wien.

7 REFERENCES (IEEE)

- [1] Nolte, R., et. al, HERBIE - Vergleichende Bewertung von Verfahren zur Vegetationskontrolle und zum Vegetationsmanagement bei den europäischen Eisenbahnen", 2018.
- [2] Pietras-Couffignal, K., Below, M., Schuh, T., Yilmazer, P., and Nolte, R., Future vegetation control of European Railways State-of-the-art report (TRISTRAM Final Report), 2021.
- [3] Verkehrsinfrastrukturforschung Austria. GREEN-LOGIX. Vegetationskontrolle an Schienen und Straßenwegen. Allgemeine, verständliche Zusammenfassung der Projektergebnisse, 2020.
- [4] Schneider, M., Wiegele, E. and Steiner, T. Projekt Green-LOGIX. Vegetationskontrolle an Straßen und Schienenwegen. Ergebnisbericht Fachhochschule Kärnten, 2020.
- [5] Stolz, M., Fuchs, D., KRAFTENEGGER, C., GOTTSCHLICH, H. Projekt Green-LOGIX. Vegetationskontrolle an Straßen und Schienenwegen. Ergebnisbericht biohelp, 2020.

[6] Grigull, M., Köstl, T., Kirchmeir, H. Projekt Green-LOGIX. Vegetationskontrolle an Straßen und Schienenwegen. Ergebnisbericht E.C.O. Institut für Ökologie, 2020.

[7] Olscher, C., Gepp, B. et.al. Projekt Green-LOGIX. Vegetationskontrolle an Straßen und Schienenwegen. Ergebnisbericht FH Technikum Wien, 2020.