PROJECT NAME:

Improvement of health status of population of the Slovak Republic through drinking water re-carbonization (LIFE 17 ENV/SK/000036)"

Acronym **LIFE – WATER and HEALTH**

Coordinating Beneficiary: *Comenius University in Bratislava, Faculty of Natural Sciences*

After-LIFE Plan Including Exploitation Plan

A. After LIFE Plan

1. INTRODUCTION

The main project output can be summarized in the following highlights:

- We produced two prototypes of recarbonization reactors. Reactors are relatively cheap, easy to operate. Using them, we can reliably enrich drinking water with Ca and Mg in the village of Devičie and in the village of Kokava nad Rimavicou.
- We confirmed the improvement of the cardiovascular system in residents who started drinking water enriched with Ca and Mg by measuring the arterial stiffness.

Both of the mentioned results are of high importance for people's health, and therefore After-LIFE Plan actions will be focused in the following two main directions:

- Continued huge dissemination of the achieved results among public as well as scientific audience.
- Operation of recarbonization reactors in both municipalities for a period of five years after the end of the project in the municipality of Devičie and in the municipality of Kokava nad Rimavicou.
- Monitoring the content of Ca and Mg in drinking water in the village of Devičie and in the village of Kokava nad Rimavicou.

2. DISSEMINATION OF ACHIEVED RESULTS

2.1 Dissemination among scientific audience and concerned authorities

Dissemination among scientific audience and concerned authorities will be carried out at the following main three levels:

a) Active presentation of the results at seminars, conferences, workshops and publishing of scientific articles,
b) Educational activities at Universities,
c) Incorporation of the results into Slovak and EU legislation.

a) PRESENTATIONS AND PUBLISHING OF THE PROJECT RESULTS

The project team members will continue in next five years to present project results mainly in the form of oral and poster presentations (at least 10 presentations) and to publish project outputs in Slovak as well as international magazines (at least 5 scientific papers). Within this subtask we will distribute for free the project final monographs among scientific communities (e.g. during seminars, conferences) to raise awareness about the project results and outputs. The financial costs for this subtask realized within the After-LIFE Plan will be covered by the budget of the coordinating beneficiary (Prif UK).

b) EDUCATIONAL ACTIVITIES AT UNIVERSITIES

The project team members work also as pedagogues at: Comenius University in Bratislava – Faculty of Natural Sciences They will continue to present the project outputs – the health significance of the content of Ca and Mg in drinking water for human health when teaching students (environmentalists). They will also continue to lead Diploma or Bachelor thesis (at least 1 Diploma and 1 Bachelor thesis) dealing with the environmental-health issue implemented within this project. All these activities will not require any financial costs.

c) INCORPORATION OF THE RESULTS INTO SLOVAK AND EU LEGISLATION

The project team members will be active in the field of legislation and revision process of the guideline for drinking water quality at national as well as EU level. We will act in various forms, mainly through active participation in related consultation meetings and electronic (e-mail) communication to raise awareness among concerned authorities (Ministry of Health, Ministry of Environment, Public Health Authorities, EU Drinking Water Committee, WHO) and highlight the importance of proposed measures, new limit values for Ca, Mg and (Ca+Mg) to be incorporated into Slovak and/or EU legislation on drinking water quality. The financial costs for this subtask realized within the After-LIFE Plan will be covered by the budget of the coordinating beneficiary (Prif UK).

2.2 Dissemination among public audience

Project team will disseminate project results to Layman audience mainly through electronic (e-mail) communication and presentations of the main outputs at various discussion forums according to the request and interest of residents. We plan realization of media work – at least 2 radio/TV shows and 2 newspaper articles. The main objective of this task will be the explanation of the potential health risks associated with the low content of Ca and Mg in drinking water on human health and how they can avoid these risks by simple measures – recarbonation of drinking water. Within this task we will use Layman´s report for project dissemination among public to raise awareness about the project results and outputs. This report will be distributed among Layman audience (inhabitants) according to their interest, e.g. based on the e-mail or phone requests, during discussions etc. (the information on availability of this report for request is published on the project website).

The financial costs for this subtask realized within the After-LIFE Plan will be covered by the budget of the coordinating beneficiary (Prif UK).

3. WEBSITE

The project website will be maintained at least for the period of five years after the project end. It will be regularly updated according to achieved outputs within the After-LIFE Plan. The financial costs for this subtask realized within the After-LIFE Plan will be covered by the budget of the coordinating beneficiary (Prif UK).

4. OPERATION OF RECARBONIZATION REACTORS IN BOTH MUNICIPALITIES FOR A PERIOD OF FIVE YEARS AFTER THE END OF THE PROJECT

We will keep the two recarbonization reactors produced in the village of Devičie and in the village of Kokava nad Rimavicou in operation for at least five years after the end of the project. Coordinating beneficiary (Prif UK) will ensure the necessary amount of CO_2 and HBD for the operation of the reactors. The operators of water sources will ensure the personnel costs for the operation of both water sources.

5. MONITORING OF THE CONTENT OF Ca AND Mg IN DRINKING WATER

Continuation of monitoring of Ca and Mg content and conductivity in water sources (Devičie village and Kokava nad Rimavicou village) for a period of five years after the end of the project. The conductivity value will be recorded at least once a month, the content of Ca and Mg in the drinking water will be determined twice a year. We note that there is a continuous measurement of conductivity at both water sources, and the content of Ca and Mg in the water must be in accordance with Decree of the Ministry of Health of the SR no. 247/2017 Coll. (Slovak drinking water standard) monitored in each water source at least twice a year.

The financial costs for this subtask realized within the After-LIFE Plan will be covered by the budget of the coordinating beneficiary (Prif UK).

B. EXPLOITATION PLAN

The usability of the project results is mainly based on the high importance of the achieved results for human health. Further use of the project results is in the following main areas:

1. Improvement of water quality (increase in Ca and Mg content) in the public water supply,
2. Improvement of water quality (increase in Ca and Mg content) in individual sources of drinking water in domestic wells,
3. Measuring the elasticity of the residents' blood vessels for the purpose of susceptibility to cardiovascular diseases.

All three mentioned scopes of the project's usability are based on voluntariness.

The basic premise of the further usability of the project results is the achieved results, and in particular that we proved that it is possible to enrich drinking water with Ca and Mg in a relevantly simple and not very financially demanding way using the two prototypes of recarbonization reactors developed by us. The content of Ca and Mg in drinking water is very important for human health. We have proven that with a low content of these elements in drinking water, people have a weakened cardiovascular system and their life span is shortened by up to five years. After regular consumption of water with increased content of Ca and Mg, their cardiovascular system improves.

Based on the above-mentioned results and their extensive dissemination, further use of the achieved results by the professional and lay public is fully assumed.

1. Improvements in the quality of water in public water supply. As an example of the further use of the project results in this area, we present the interest of two Slovak water companies - Stredoslovenská vodárenská prevádzková spoločnosť, a. s., Banská Bystrica and Podtatranská vodárenská prevádzková spoločnosť, a. s., Poprad.

Stredoslovenská vodárenská prevádzková spoločnost, a. s., Banská Bystrica. When the recarbonization reactors developed by us prove themselves in long-term operation, according to the statement of the director of StVPS, they will be applied to other water sources as well.

Podtatranská vodárenská prevádzková spoločnosť, a. s., Poprad. Management employees of the mentioned company participated in an information meeting for water managers (water source Kokava nad Rimavicou, June 14, 2022). They showed great interest in the manufactured prototype. In the majority of water sources operated by them, there is very low mineralized water with low Ca and Mg content and low water hardness. The low hardness of water also manifests itself in increased corrosion of water pipes, and mainly for this reason there is great interest in the prototypes of recarbonization reactors produced by us. They plan to produce similar reactors at several of their water sources.

The entire technical documentation of the production of recarbonization reactors is published on the website of the project.

2. Improvements in water quality in individual water sources. We have received more than 10 requests from the lay public for advice on how to increase the Ca and Mg content of individual water sources. We advised everyone how they can increase the content of Ca and Mg in drinking water with minimal financial costs.

3. Measuring the arterial stiffness of the residents'. The results of measuring the arterial stiffness of the residents' were published only six months before the end of the project (July 2022). Despite this, we were approached by two large organizations, the Research Institute of Water Management, Bratislava and the Slovak Technical University in Zvolen, and many other individual interested parties with a request to mediate the measurement of vascular elasticity.

Certainly the most convincing proof of the usability of the results of the project solution is the project of the organization St. Nicolaus – trade, a. s., Bratislava, Gemerka plant. This organization deals with the sale of Gemerka mineral water with a high content of Ca (433 $mg.l^{-1}$) and Mg (130 $mg.l^{-1}$). In 2023, Gemerka plans to distribute free mineral water to selected respondents in villages that are supplied with drinking water with a low Ca and Mg content. At the same time, respondents will measure the elasticity of blood vessels before and after consuming Gemerka mineral water.

The flexibility of blood vessels will definitely improve in the respondents.

The project will be implemented in order to increase sales of Gemerka mineral water.

KEY RESULTS OF THE PROJECT - enrichment of drinking water with Ca and Mg and improvement of vascular elasticity were achieved and published in the final stage of the project, approximately six months before the end of the project.

That is why it is **very important to disseminate the results widely even after the end of the project.**

We will certainly provide the necessary information to all other interested parties.