eRDI
Empowering Regional Development and Innovations

Report

Assisting ERDI

Improving ERDI publicity, alumni connections and competence implementation

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eRDI
Empowering Regional Development and Innovations

Assisting ERDI 01/07/2018

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Preface

You are reading the report "Assisting ERDI". This report was written to serve as documentation for the various activities performed by Jordie Eskes during his traineeship at Karelia University of Applied Sciences.

My appreciation goes out to my supervisors Sini-Tuuli Saaristo and Liisa Timonen for their support and providing the assignments, as well as Kaija Saramäki and Helena Puhakka-Tarvainen who helped me in various ways during my stay at Joensuu, Finland. My thanks also extend to Marja Noponen for providing the materials required for the anaerobic digester.

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Summary

The ERDI (Empowering Regional Development and Innovation) project is a multinational endeavour funded by the Erasmus+ program. The project aims to increase sustainable business in local areas and spread knowledge through the sharing of information, innovation and skills. The project produces varying results like a set of international courses on bio-economy and different publications with tools and products from the different partners. The project is currently in its final phases and is focused mostly on evaluation and representation. In order to finish some of the tasks, a traineeship was offered to an Environmental Sciences student of HAS University of Applied Sciences. The tasks the trainee performed were to evaluate the experiences of the students and teachers in the ERDI courses through a survey, to design and host a sustainability workshop at the annual Scifest event (an annual festival where children and adults alike can learn about technology and new developments in the field of science) and to set up an Alumni network for the regional partners of the ERDI project.

The surveys were aimed at the experiences of the students and teachers and aimed to identify key issues that could be improved for the next year. They were based on previous surveys and processed in order to generate objective data that conclusions could be drawn from. Students were mostly satisfied with the ERDI courses, however some issues remained. Students noted that the information they received before the courses started gave them a different impression of the content of the courses. Some of them didn't know what to expect at all, while others desired the courses to focus more on the business side of environmental management. The students also noted that they had issues with the Environmental Management project, which forced them to produce their results in an unconventional format that caused confusion. The trainee recommends that the teachers offer examples of proper products in the following years.

An analysis of different social media platforms was performed to identify the ideal candidate for the Alumni network. After the ideal platform was chosen, a set of rules and guidelines for the content of the network was established and a base amount of content was posted on the network. The LinkedIn groups function was chosen as most suitable because of its dedicated moderation tools and daily digest feature. The network was set up at the end of the trainee's period so it remains unclear if it will be successful.

The development of activities and materials for the Scifest workshop was performed by the trainee as well as the eventual workshop. An analysis of the target audience was performed beforehand to better play into the characteristics of the audience. The audience was identified as consisting of mostly children aged eight to sixteen and adults. The activities included a contest where young children could design a sustainable house, a number of posters detailing sustainable business and an anaerobic digester setup. The workshop, held on the 18th and 19th of May, was a success, with a lot of attention being received from both adults and children.

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1. Introduction

This chapter contains information concerning the goal of this project. The client (Karelia University of Applied Sciences) is interested in improving different aspects of the ERDI project (Empowering Regional Development and Innovation). The activities will be performed by J. Eskes.

1.1 Organisation

The ERDI project is a multinational endeavour spearheaded by the Erasmus+ program. The project aims to increase sustainable business in local areas and spread knowledge through the sharing of information, innovation and skills. The project has numerous partners which all contribute to and benefit from the program. These partners are universities and companies that have knowledge in Bio-based Economy and are willing to cooperate in order to facilitate cross-sectorial and multidisciplinary knowledge to be created (ERDI, 2018).

The trainee will work at Karelia University of Applied Sciences in Joensuu under the supervision of Sini-Tuuli Saaristo, Liisa Timonen and Kaija Saramäki.

ERDI's approach can best be summarised in the five main goals:

1. ERDI internationalises the education by developing multidisciplinary, dynamic, working life serving, learner centred and international curriculum;
2. ERDI supports accessibility of education by applying innovative and interactive digital e-learning tools and materials;
3. ERDI defines the core competences of a bio-economy expert to rise the working life relevance of education;
4. ERDI boosts co-creation of knowledge with the working life establishing innovative, concrete and systemic participatory knowledge alliances on regional and international level; and
5. ERDI strengthens bio-economy business, entrepreneurship and employability sharing business models and innovations in local, regional and international networks.

Source: (ERDI, 2018).

The third goal in particular has contributed to the development of the ERDI courses currently being taught at Karelia University of Applied Sciences. These courses aim to share the knowledge gathered throughout the project's life cycle with foreign students and young entrepreneurs who want to get started in the field.

Some aspects of the project, like the Scifest workshop, are funded by a separate project named Secure. This project is based on knowledge exchange, much like ERDI, but is focussed more specifically on using technological solutions for cooperation between higher and lower maturity regions. (About Secure, 2018). This project, however, is not directly associated with the trainee's work.

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1.2 Motivation

ERDI aims to improve the quality of education in both Finland and foreign countries. As of April the project is in its final phases. During this phase the emphasis lies on reflection and maintaining contacts for future knowledge sharing, as well as dissemination of produced results. The development of communication networks and gathering of feedback will be performed by the trainee during this period.

1.3 Tasks and research questions

The project aims to improve multinational information sharing. An integral part of the project's approach is to reflect on previous performances and maintain networks with all the different partners. Furthermore, outward presentation of the project and sharing of the gathered knowledge is another important aspect. As such, this project will focus on three main tasks:

1. **ERDI class performance and experience surveys**

As part of the third goal of ERDI, a number of courses on bio-economy have been developed and are taught at Karelia University of Applied Sciences. At the conclusion of the current semester a round of reflection for all affiliated parties will be held to improve upon the semester and gauge student satisfaction. The surveys, as well as related questions, will be developed by the trainee.

2. **The ERDI alumni network**

The ERDI project is in its reflection phase and will be completed in December 2018. In order to keep the connections built and facilitate future sharing of knowledge an alumni network will be built and maintained. This network will be a method for the different partners of the ERDI project to share experiences and news in their respective fields, as well as keep in contact with one another. The network will initially be built and maintained by the trainee and handed over to a different party for future maintenance after the traineeship period ends.

3. **The Scifest workshop**

Scifest is an annual festival where children and adults alike can learn about technology and new developments in the field of science. ERDI will be present at this event and is planned to have an interactive workshop focussed on sustainability and bio-economy. The trainee will organize this workshop together with other parties, developing materials and activities as well as eventually being present at the workshop itself. One of these activities will include the building of a small-scale anaerobic digester for illustration purposes.

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A number of research questions need to be answered in order to accomplish the three main tasks. For clarity, each task will be referred to as ''task one, task two'' etc. from this point on. The research questions for each task can be found below.

1.3.1 Task one: Course surveys

- Which factors can influence the way a student or teacher answers the surveys?
- What criticisms do teachers and students have about the current implementation of the ERDI courses?

The research questions have led to the development of a list of questions and guidelines about how to administer them. The interpretation of the survey results has led to a set of advices and conclusions on how to improve the courses for the coming years, which can be found in chapters 6 and 7.

1.3.2 Task two: Alumni network

- What platform best fits the requirements of the alumni network?

The network is set up by the trainee and maintained until the end of July 2018. Once the network had been established, control was handed over to Savonia, the coordinator of the ERDI work package 9 (WP9 - Dissemination and Exploitation of Results)

1.3.3 Task three: Scifest

- Which parameters influence the efficiency of the anaerobic digestion process?
- What are the characteristics of the target audience and how can the workshop best utilize them?

The workshop has been held at the 17th and 18th of May in Joensuu. The development of activities and materials has been performed by the trainee and is detailed in chapter 3.

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1.4 Project boundaries

This paragraph explains the limits and boundaries set for the trainee's tasks. In general, the trainee determines what approach best suits the task at hand and is free to decide how much time a task is given. The approach is discussed with the ERDI project coordinators who have a more advisory role and voice their concerns when necessary. This process is repeated weekly to make sure the approach lines up with the demands of the ERDI project managers.

1.4.1 Task one: Course surveys

The surveys were performed in order to assess the performance of the courses and experiences the students and teachers have. The surveys were anonymous and no identifying information was asked of either the students or teachers. Factors such as socio-economic background, gender, political affiliation and similar parameters were not considered. The results of the surveys were treated as confidential and discussed with the teachers by the ERDI project managers to prevent implications arising from negative feedback.

1.4.2 Task two: Alumni network

The initial creation, period of moderation and content creation was performed by the trainee. After the trainee's period ends (end of June) the responsibility for the network carries over to the coordinator of the ERDI work package 9, Savonia.

1.4.3 Task three: Scifest

The trainee was responsible for the creative development of the workshop and has discussed his ideas with the ERDI and Secure representatives in order to formulate the best approach. Development of materials has been managed by the trainee. The anaerobic digester has not been made with scientific measurements in mind, meaning accuracy of the readings was not considered. The main goal of the digester was to serve as an example of bio-economy and allow for a hands-on experience for the guests.

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2. Literature and background information

The different tasks each required knowledge in different fields, often not directly related to one another. In order to ensure as best a result as possible, a thorough preliminary study has been performed. The main findings of this study are gathered in this chapter.

2.1 Representative surveys and objective analysis

Survey research is a method that can be used to quickly gather a lot of information on a subject. If the goal is to gather opinions and personal experiences then surveys are often one of the most cost-effective ways of gathering data (Kelley, Clark, Brown, & Sitzia, 2003). In the case of personal experiences, using a survey has several key advantages.

- The research will provide empirical data, based on real-world observation of participants.
- A large amount of data can be produced in a short amount of time for little to no financial cost (Kelley, Clark, Brown, & Sitzia, 2003).

That is not to say that surveys are the perfect tool for data gathering. For one, data produced in surveys will often be lacking in depth and detail regarding the topic. Furthermore, developing the survey in such a way that no bias will influence the results is extremely important (Kelley, Clark, Brown, & Sitzia, 2003).

2.1.1 Key points for representative surveys

According to Kelley *et al.* (2003), "Good research has the characteristic that its purpose is to address a single clear and explicit research question; conversely, the end product of a study that aims to answer a number of diverse questions is often weak."

A survey with less questions and a more focused goal will often yield better results than a survey that tries to gather as much data as possible. A mistake often seen in surveys is that the researcher tries to make the survey answer questions regarding different subjects. This should be avoided where possible (Bennet, et al., 2011).

If the participant's responses to a certain issue can be estimated, it's often a good idea to use closed questions where a small number of pre-coded answers can be selected. These questions are quick to answer for the participant and are relatively easy to process for the researcher, however, a certain degree of input is lost because of the pre-determined answers (Kelley, Clark, Brown, & Sitzia, 2003). Open questions are more time consuming for both parties, but offer a higher level of input from the participant and will often yield a more insightful answer, according to Kelley *et al.* (2003).

When designing a survey, there should be clear segments that ask questions in the same theme. Multiple questions regarding the same subject should be grouped together (Bennet, et al., 2011). The use of ambiguous language that can be interpreted differently by participants needs to be avoided, and so-called 'double barrelled' questions should not be used (Kelley, Clark, Brown, & Sitzia, 2003). This is where multiple questions are asked in one question, for example, "how did you experience the semester, and what would you improve about it?''.

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2.1.2 Survey data processing

According to Baarda, de Goede, and Teunissen (2005), the results of a survey or interview should be processed using the steps found in Table 1.

Table 1: Survey analysis process

Step	Task	Function
1	Convert raw data to text	Turn your survey into data that can be manipulated.
2	Get rid of unnecessary text	Trim down the data to the essentials to cut down on bloat.
3	Choose analysis unit	Choose whether you will sort your data based on specific words, fragments or themes.
4	Sort text into fragments	Sorting the information by the analysis units to allow for analysis.
5	Labelling the fragments	Creating a clear system where fragments can be identified.
6	Identify relations between fragments	Finding common themes in the data which can be telling of important results.
7	Interpreting results	Drawing objective conclusions from the results.

As described in the table above, the results of a survey have to be processed in an objective manner. The first four steps are important as preparation. In these steps, the raw text is translated into short fragments, each focussing around a single theme or word so that they can be used as individual data points. Data should be split according to the data type as well, like emotional arguments or objective observations (Baarda, de Goede, & Teunissen, 2005).When sorting the data into fragments, each fragment should be centred around one subject or aspect and be individually understandable. These fragments should then be labelled and, based on this labelling, relations should be identified to highlight key themes and issues.

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2.1.3 The ERDI courses

The ERDI courses, which are the focus of the surveys, are a year-round set of courses that can be taken by students of all nationalities and teach in diverse subjects. Students can choose between different classes throughout the year to gain a varying amount ECTS points, as required for the student's particular situation. The following classes are taught at Karelia University of Applied Sciences:

- Strategic regional planning
- Social and Environmental infrastructure
- Sustainable and Innovative business
- Social and Environmental responsibility
- Climate and Energy planning
- Environmental Management

More information regarding the content and learning goals of each class can be found in the file ''ERDI-CURRICULUM-FINLAND-2017.pdf'' which is sent along with this report or can be retrieved on request.

2.2 Social media and network management

Developing and maintaining an alumni network requires a number of key factors. There are two key requirements for any network to be started; a number of enthusiastic and willing individuals who want to start the network, and at least some interest of a sizeable group of the target audience (How to start/create an alumni association, 2018).

There are multiple platforms that can be used for the management of a social media network. The advantages and disadvantages of these platforms are laid out in Appendix I.

2.3 Anaerobic digestion

Anaerobic digestion is a biological process where organic material is converted by micro-organisms to methane to be used as a renewable fuel source. Through hydrolysis, acidogenesis, acetogenesis and eventually methanogenesis, organic matter containing carbohydrates can be reduced to CO_2 and CH_4 (Arhoun, Bakkali, El Mail, Rodriguez-Maroto, & Garcia-Herruzo, 2013). The gas produced is then refined to increase the concentration of CH_4, which can be used for energy production. The refinement will also reduce the amount of contaminants, such as siloxanes, hydrogen sulphide, ammonia, undigested hydrocarbons and water (NFCC, 2018).

Anaerobic digestion is a renewable, environmentally friendly way of producing energy that reduces the dependency of a country on fossil fuel sources as well as reduces the amount of organic waste that needs to be composted or burned.

The process can be divided into four phases, each one producing the input required for the next phase. Through careful manipulation of the conditions inside a reactor, micro-organisms will digest the organic

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material in such a way that the final waste products are CH_4 and CO_2. Figure 1 shows a simplified diagram of the four phases.

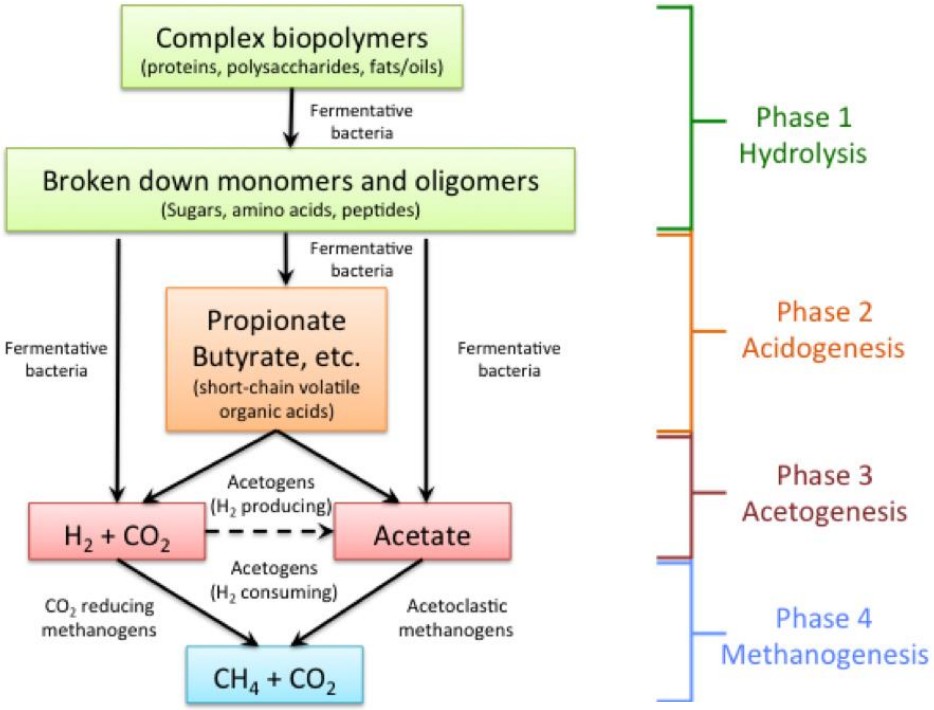

Figure 1: Anaerobic digestion phases illustrated (PennState college of Earth and Mineral sciences, 2018)

Each one of the four phases shown in Figure 1 requires a different species of bacteria or Achaea. These species do not directly cooperate with each other, but just happen to have evolved in such a way as to make this process possible. If the conditions in a reactor are not carefully fine-tuned, however, one of the phases may outpace the others and eventually cause the population to die off. An example of this is seen when overfeeding a reactor, in which case acidification will cause the conditions to become non-survivable (Luste, 2011). The required conditions will be covered in more detail in paragraph **Virhe. Viitteen lähdettä ei löytynyt.**.

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2.3.1 Basic reactor setup

Commercial anaerobic digesters are large in scale and designed around maximum productivity. The purpose of a digester dictates what design is used. A digester that, for example, is aimed more at educational purposes will have a different design. A basic, standard digester setup is illustrated below.

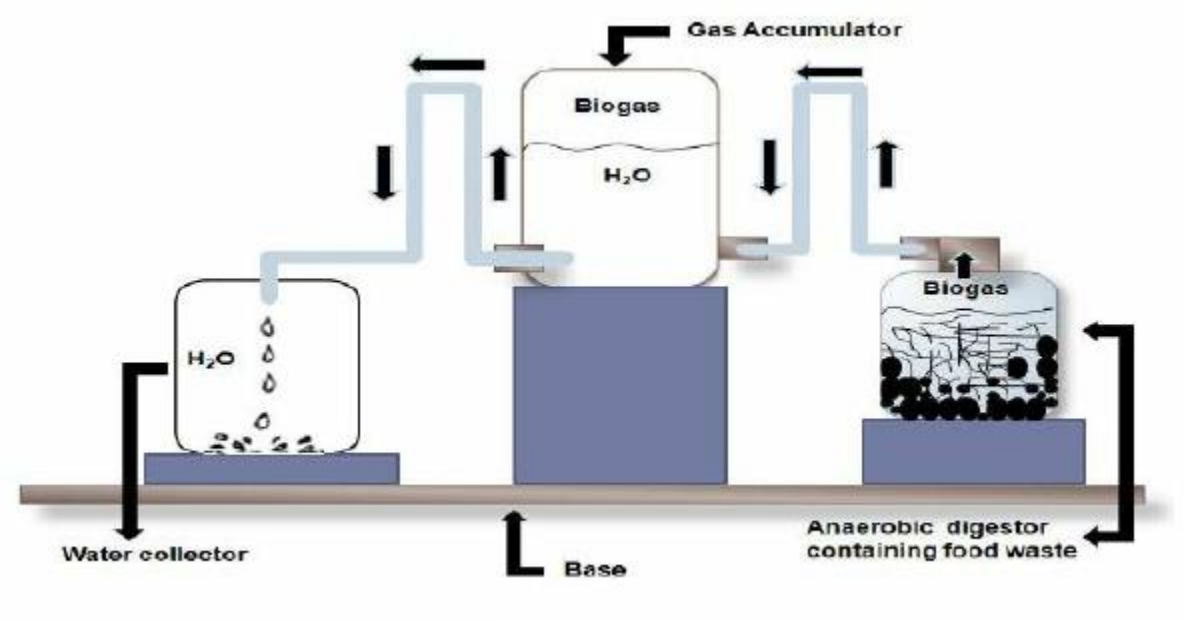

Figure 2: Batch-based anaerobic digester diagram (Hirkude, Padalkar, & Bhagat, 2011)

Figure 2 illustrates the basic principles of a biogas fermenter. The biogas that is produced in the digester will collect in the gas accumulator, where it will increase the pressure on the barrier fluid. The barrier fluid will then flow into the third tank, where its volume can be measured to show how much gas is produced. The gas is still located in the second tank and can be drained from it at a later time (for example, when the barrier fluid runs out or the production rate of the digester slows down).

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2.3.2 Important parameters

Anaerobic digestion is a biological process that requires a specific set of circumstances. While the digester used for the workshop did not require as much fine-tuning as a commercial setup (because productivity was not the main goal), it was still important to avoid some key issues.

Over-acidification caused by overfeeding.

Acidification is a part of a normal, healthy anaerobic digestion cycle. The organisms, however, can only survive in specific pH-ranges. If the acidification step happens at a faster rate than the others, the pH-level will drop, eventually causing the shutdown of the reactor (Chen & Neibling, 2017). Common causes of over-acidification are overfeeding, a lack of macro/micronutrients or an unhealthy starter population. Fluctuating temperature can also cause the metabolic rate of the bacteria to become unpredictable.

Incorrect parameter ranges

The bacteria in a biogas plant require specific temperatures to operate efficiently. According to Chen & Neibling (2017) a temperature of 32° to 43° Celcius is optimal for mesophilic bacteria, while 49° to 60° Celcius is optimal for thermophilic bacteria. The type of bacteria used dictates what temperature range should be used during the fermentation process. Both of these types of bacteria survive in roughly the same pH-ranges. At the start of the process, a pH-range of 6.5-7.5 should be maintained, where a slightly higher pH is preferable to a lower one (Chen & Neibling, 2017).

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3. Methods and materials

This chapter describes the approach that was used during the project. Any deviations from the original planning are described and discussed under the heading for each task.

3.1 Project activities

Working out the approach for each task has been performed in multiple steps according to the original planning. The tasks were performed in a roughly chronological order, with the Course surveys being performed first, the Scifest workshop and its preparations second and the Alumni network being developed last. Task one and three were developed mostly in parallel, with the difference in chronology being which task was the focus of any given period.

3.1.1 Task one: Course surveys

The surveys were based on previous surveys used in past years. A separate survey was made for the teachers and the students. The main purpose of the surveys was to gauge participant's experiences and identify points of improvement. The surveys were used to find out what criticisms the participants have regarding the program. Emphasis was put on preliminary information and student expectations, student background and representation of different studies, learning experiences and how well the courses line up with the defined core competences.

The questions were based on these points and discussed with ERDI project managers before they were administered to the students and teachers. In order to conserve consistency, the surveys were split into multiple sections for each subject. The surveys were administered using Google Forms. Where possible, open questions were used to gather more insight in the experiences of both students and teachers. Closed questions were mainly used to ask how participants rated certain aspects of the courses, rather than having pre-coded answers for otherwise open-ended questions.

A high turnout rate was crucial to gather as much data as possible. The student surveys were administered during one of the final classes of the semester in order to have as many students fill it in as possible. This was not possible for every subject, however, as some parts of the courses had already finished and those students were no longer studying at Karelia University of Applied Sciences. These students were contacted via email and requested to fill in the survey. The teacher's survey was distributed via email as well.

The student survey was administered using Google Forms on the 15th of April, 2018 with the teacher's survey being administered roughly a week later. The data was then processed using a slightly modified version of the technique described in paragraph 2.1.

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Table 2 shows the steps taken to process the results and generate objective data used for both the teacher's survey and student's survey.

Table 2: Survey data processing methodology

Step	Task	Function
1	Convert raw data to text	Turn the results into data that can be manipulated.
2	Get rid of unnecessary text	Trim down the data to the essentials to cut down on bloat. Nonsensical answers were also cut during this step.
3	Choose analysis unit	Choose whether the data is sorted based on specific words, fragments or themes.
4	Sort text into fragments	The information is sorted according to the analysis unit and split into fragments.
5	Labelling the fragments	Creating a clear system where fragments can be identified.
6	Identify relations between fragments	Finding common themes in the data which can be telling of important results.
7	Interpreting results	Drawing objective conclusions from the results.

The technique described in Table 2 is used on all open ended questions. The multiple choice and scaled questions are not processed in the same way, as they already have coded answers that are considered objective data.

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3.1.2 Task two: Alumni network

The alumni network was set up and maintained by the trainee up to July, 2018. After this point control was handed over to Savonia.

Different options were considered before the construction of the network. The pros and cons of each option were listed and weighed before the project managers and trainee decided on which platform to use. The pros and cons of each platform can be found in paragraph 4.2.

A design document was made detailing the type of content, frequency and format that will be posted on the network as well as general rules and instructions. The content of this document was based on similar networks and what content could be found there. These networks were found by searching LinkedIn company pages and searching Google for alumni networks. A basic amount of content was created and posted on the network before the alumni were invited. This content consists of articles about related subjects, like the Pajathon and Scifest events.

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3.1.3 Task three: Scifest

The Scifest workshop was the largest and most time-consuming task during the project. Development of the workshop was done on a week-by-week basis, similar to the Scrum method. A meeting was held every week to discuss progress and the preferred approach. The planning for this approach can be found in Table 3. All of the activities and materials were designed by the trainee, with feedback from the project managers given every week.

Table 3: Scifest activities

Week(s)	Activity	Desired result/goal
1-2	Brainstorming, researching & discussing	Determine which activities and materials will be used at the workshop
3	Sketching/designing	Making a rough sketch of all required materials, including posters, art style and activities
4-5	Working out designs	Fleshing out the posters and other materials, ensuring the quality and art style consistency
6	Final preparations/workshop	Printing the materials, setting up the workshop and performing it

The first three weeks were considered the most crucial, as this is where all the activities and materials were planned. After this initial period, most of the time was put into the actual development of the materials.

Activities

First it was discussed who the target audience would be for the workshop. Based on previous years, it was expected that the majority of attendees would be children aged eight to sixteen, with most of the other attendees being teachers or professors. These two groups were chosen as the focus of the workshop.

The activities would need to be engaging and entertaining for both the younger section of the crowd and the adults. This means there was a need for some activities that were not overly complicated for the children, but also some activities that offered more depth for the adults.

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Eventually, one group-specific activity was made for each group and a few that were considered suitable for both audiences. Table 4 shows the different activities that were performed at the workshop.

Table 4: Activities performed at Scifest

Activity	**Target audience**	**Description**	**Materials**
''Draw and win!'' Sustainable housing contest	Children	Children were asked to design what they think future housing would look like, with an emphasis on sustainable things like renewable energy or recycling. Children took part in groups of 3-4 and each got a small prize for participating. Groups that made an exceptionally creative or clever poster got a bigger prize.	None
''Anaerobic digestion in practice''	Adults	An anaerobic digester setup was built featuring three different foodstuffs. An in-depth explanation was given about the functioning of the digester, its applications in real-world settings and the different pros and cons of anaerobic digestion. A more simple explanation was also used for younger audiences.	Anaerobic digester Poster about anaerobic digestion
''Your challenge, our wall''	All	Passers-by were asked to share what issues they think will be crucial for us in the next 50 years. They wrote their issues on a post-it which was then put on a wall, producing a collage of challenges.	Explanation stand
"Open discussion"	All	Visitors were encouraged to ask the trainees any questions they might have regarding sustainability and enter discussion.	Posters Infographic Business card

The activities were performed by the trainees Jordie Eskes and Rick Zuure. On the second day of the event, Sini-Tuuli Saaristo joined the team, adding the capability to converse in Finnish with the attendees who were expected to have a lower English comprehension, specifically in the case of young children.

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Materials

The materials required for the workshop consist of a number of general posters, a single infographic poster, multiple small business cards with facts about sustainability, an anaerobic digester setup, an animation detailing anaerobic digestion and explanation stands. The finished products can be found in paragraph 4.3.

3.1.3.1 Posters

The workshop had several posters with information about sustainability and renewable energy production. The posters were printed on A2 format, with the exception of one. The subjects of the posters were discussed beforehand with the ERDI project managers.

Early on it was decided that the graphics for the posters would be made by the trainees using Microsoft PowerPoint. In order to do this, an art style was developed concerning the use of colours, shapes, shadows etc. This art style was used consistently throughout each poster. The development of this art style was done by looking up examples of posters, finding literature on proper colour usage and trial-and-error in the creative process. The literature is found through ScienceDirect.

A total of three posters were eventually made. The first poster explained the basic principles of anaerobic digestion, the second poster explained the difference between the long and short carbon cycle and the final poster illustrated the concept of carbon foot-printing. The final designs of each of these posters can be found in paragraph 4.3.

The infographic poster was designed by a media trainee working at Karelia University of Applied Sciences. The goal of the poster was to illustrate the current status of renewable energy production in Finland, with a comparison to the rest of the world. The information for the poster was gathered by Jordie Eskes and Rick Zuure who pitched a number of designs to the graphic design trainee. The graphic design trainee eventually worked out the established ideas into an infographic, which was iterated upon using feedback from Jordie Eskes and Rick Zuure.

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3.1.4 Anaerobic digester

The main attraction at the workshop was the anaerobic digester. The digester was used to illustrate how ordinary organic waste can be used to produce fuels and gave the attendees a real-world example of bio-economy.

The used setup deviated slightly from the proposed one due to the desired materials not being available.

A total of three setups were built, each using a different feedstock to illustrate how much gas can be produced on different types of substrates. The used substrates are listed below.

- Ham
- Cabbage
- Potato peels

The potato peels were chosen for their high starch content and were expected to produce a large amount of biogas. Similarly, the meat was used to show that proteins are also a viable energy source for the digestion process. The final bottle with cabbage was used mostly to illustrate the amount produced in the more high-potential bottles. Originally there were plans for additional bottles, but due to the limited materials being available these bottles could not be made. Each substrate is pre-treated by chopping and grinding it into small pieces in order to make digestion easy and rule out the shape of the substrate affecting digestion rate. An illustration of the digester setup is shown in Figure 3.

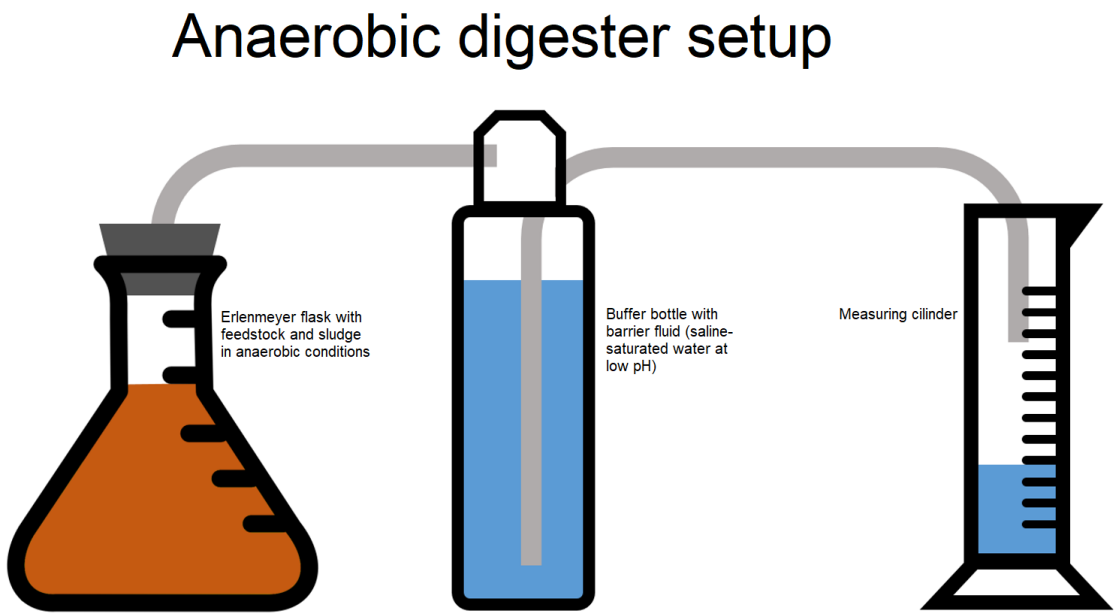

Figure 3: Anaerobic digester setup

The digester was an airtight 1000 ml Erlenmeyer with roughly 300 ml of substrate. Originally, the plan was to use Duran reactor bottles. No suitable caps could be found for these bottles, however, so

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Erlenmeyer flasks were used instead. The content was a mix of 2% DM (dry matter) digester sludge and 98% substrate. The substrate was a mix of water and feedstock with the ratio of feedstock to water being 100:1125.

An additional fifteen ml of macronutrients were added to each bottle to ensure a lack of nutrients would not influence the amount of biogas produced. The pH level was measured and adjusted to 6.8 before permanently sealing the bottles.

The digester bottle was flushed with nitrogen in order to remove excess oxygen and provide the anaerobic conditions required for the digestion process. This was done for twenty minutes, as opposed to the proposed five minutes because of the extra empty space in the Erlenmeyer flasks that would not have been present in the reactor bottles. After the Erlenmeyer flasks were closed, a hose was installed to lead the produced biogas to a 200 ml buffer bottle which was filled with a barrier fluid. This barrier fluid was 200 ml of water which has been saturated with salt, in order to prevent it from absorbing any of the produced gas, and brought to a pH of 2.0. The hose was clamped shut for ten minutes to allow the digester to stabilize, after which the gas was allowed to flow freely into the buffer bottle. The gas collected in the bottle and increased the pressure on the barrier fluid, which was then pushed into a final hose and channelled into a measuring cylinder, showing the volume of gas that has been produced. Because the gas was not be used for anything but demonstration purposes, no steps are taken to remove impurities.

The gas was collected in the barrier bottle in order to prevent it from escaping into the air and producing unpleasant odours at the event.

The materials needed for the digester were borrowed from the University of Eastern Finland. Some changes had to be made to the proposed setup because of material constraints. The setup was originally supposed to use reactor bottles instead of Erlenmeyer flasks. The switch to Erlenmeyer flasks introduced a risk of them exploding because of the pressure build-up. This was mitigated by the trainee constantly monitoring the setups to make sure no blockage was found in the tubes and lowering the amount of substrate per bottle from 400 ml to 300ml. Secondly, the usage of 200 ml buffer bottles instead of 500 ml reactor bottles meant not as much gas could be contained at once. The lowered substrate helped prevent the buffer bottles from filling up too quickly.

Due to a lack of available water heating units, the bottles were not kept at the desired temperature of 32° Celcius. The bottles were instead wrapped in aluminium foil to insulate them as much as possible and keep out light, which would have promoted the growth of algae.

An animation was made to show the process of building and maintaining the digester. This animation was played next to the digester at the workshop and was looped. The animation was made in Microsoft PowerPoint using graphics made by the trainee.

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4. Results

This chapter describes the different products for each of the three tasks. In the case of the Scifest workshop, special attention is given to the amount of attention and interest generated by the different activities.

4.1 Task one: Course surveys

Two surveys were set up; one for the students and one for the teachers. The full list of questions can be found in Appendix II. The main findings of the surveys are gathered in this chapter and discussed in the discussion and conclusion sections. The raw data gathered was too much to add to an appendix, so relevant data is supplied where needed and the full set of answers can be retrieved on request. A total of eighteen students and five teachers answered the surveys.

4.1.1 Student survey results

The first questions asked the students to disclose some basic information about their backgrounds and motivation. This was supposed to give more information to the ERDI project managers on who was interested in the courses and identify potential issues in the representation of the ERDI courses in different areas of expertise. Figure 4 shows the distribution of different areas of expertise that the students originated from.

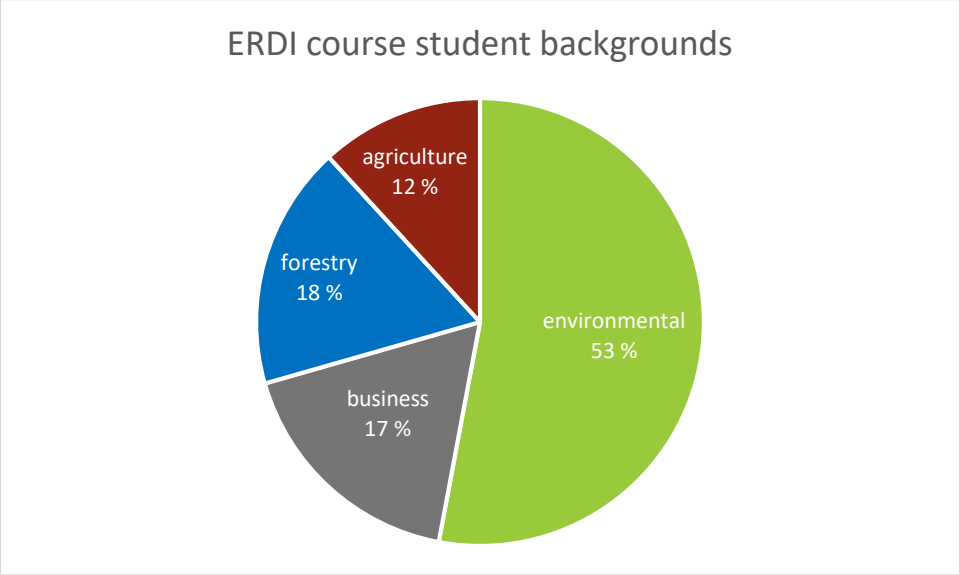

Figure 4: ERDI student backgrounds

The following questions focused on the way the students discovered the ERDI courses, their motivation for joining and the type of information they received in preparation of the courses.

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The answers reveal that most of the students discovered the courses via word of mouth, with only two students learning of the courses through the ERDI websites. Of the remaining sixteen students, three said they learned of the courses via their study counsellor, two learned of it through fellow students and ten learned of the courses through their schools without specifying beyond that. The final student did not answer the question.

The motivation for joining the courses could be classified into three categories. Five students joined because of the multilingual and international aspect of the courses, citing the different international speakers as a great opportunity to broaden their understanding of the English language. Eight students mentioned that the subjects of bio-economy and the environment were their main reason for joining. Finally, three students gave answers that couldn't be categorized and were considered to be non-serious answers.

After this, the students were asked to rate the information they received before the program started. Figure 5 shows the distribution of student satisfaction in relation to the preliminary information they received.

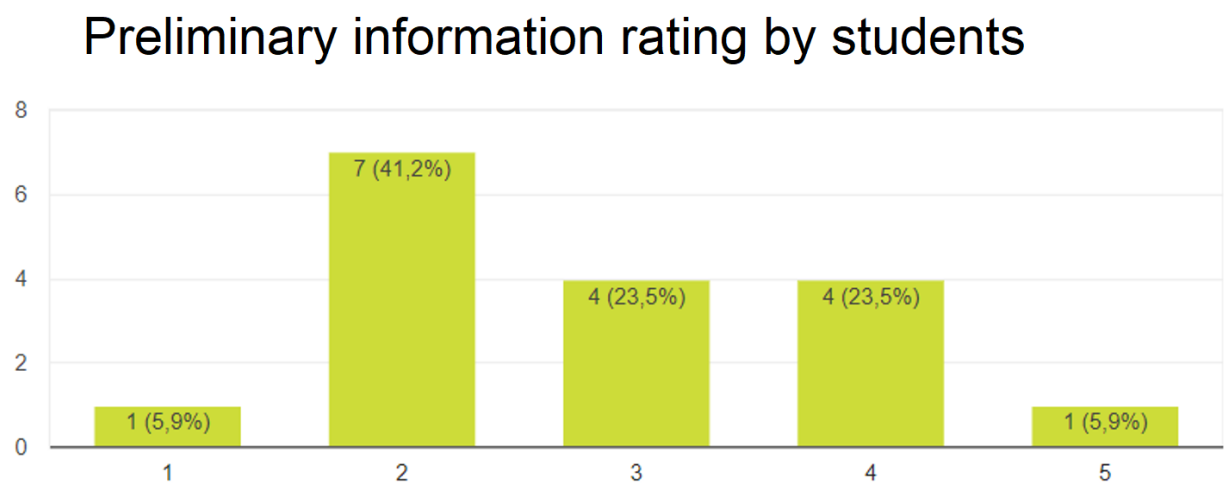

Figure 5: Student satisfaction with respect to preliminary information

A majority of the students rated the preliminary information to be unsatisfactory, with 41.2% of students listing it at a two out of five.

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4.1.1.1 Expectations

When asked how the ERDI courses met their expectations, students were generally positive and gave an average rating of 3.82 out of five. In later questions, however, the students gave a different impression. Nine students said that the courses were different from what they expected it to be, six of them even going so far as to specifically say they didn't know what to expect. Only six students said that their expectations lined up with the contents of the courses.

The students noted that they expected a more pronounced connection to the business world, as opposed to the current focus on environmentalism and technology. The way the courses are advertised talk about a nuanced approach that balances bio economy, technological knowledge and sustainable business. This is underrepresented in the actual courses, according to the students.

4.1.1.2 Likes and dislikes

The students were asked to list which parts of the courses they considered the most and least valuable and which ones they considered the most and least enjoyable. To this, a wide variety of answers were given, sometimes directly opposing the answers given by different students. The most important answers are collected in Table 5.

Table 5: Student likes and dislikes

Most enjoyable aspect	**Least enjoyable aspect**	**Most useful aspect**	**Least useful aspect**
International lectures	Environmental management project	International lectures	Environmental management project
Field trips	Sustainable and innovative business	Group work	Climate and energy planning
Strategic regional planning	Climate and energy planning	Field trips	Essays
Social and environmental infrastructure	High workload	Presentations	
Cultural differences		Different viewpoints	

The aspects are ordered based on how many students listed the aspects in their answers, going from top to bottom. Some answers that were deemed non-serious are not found in the table.

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4.1.1.3 Direct student feedback

The students were asked through several questions about what they would change about the program and whether there are subjects that should be added. Three students again emphasized that they desired a stronger connection to the business world, with one student elaborating that he wanted more examples of how sustainable business can be profitable.

Finally, the students shared their general comments on the courses and offered some suggested improvements. In general, the students were positive of the experiences they had. Four students noted that, even though the courses were different from what they expected, they had developed themselves and enjoyed their time at Karelia University of Applied Sciences. Five students expressed their frustrations regarding the Environmental Management project again.

One student in particular wrote a long segment about a motivational disparity between the students that took part in the courses. They listed that some students were unmotivated and refused to do work in group sessions and projects. The teachers left it to the students to figure out how to solve this issue, leading to frustrations for the more motivated students.

4.1.1.4 Environmental management project

During the final lesson of the semester, students talked about their experiences with the Environmental Management project. Out of the fifteen students present, eleven said the Environmental Management project was their most disliked part of the ERDI courses. The project forces the students to present their findings in an unconventional format, as they are not allowed to use a report or PowerPoint presentation. The students noted that this approach was confusing to them and a more clear description of what they can and can’t do was needed.

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4.1.2 Teacher survey results

The teacher survey was significantly shorter than the student survey and aimed mostly at their experiences with regard to student participation and motivation. The teachers were first asked which subjects they taught in order to be able to relate comments to certain subjects if needed.

The teachers were asked to rate the preliminary information they received and their personal introduction to the ERDI courses. All five teachers responded positively, saying that it was good.

When asked about their fellow teachers and the cooperation between them, four of the teachers were positive stating that it was a professional environment. Two teachers mentioned that this not being the first time they worked for ERDI helped a lot with the organization and execution.

The students' motivation, participation and ability level was rated by the teachers, with a separate questions following asking them to elaborate on their decision. Figure 6 shows the answers of the teachers.

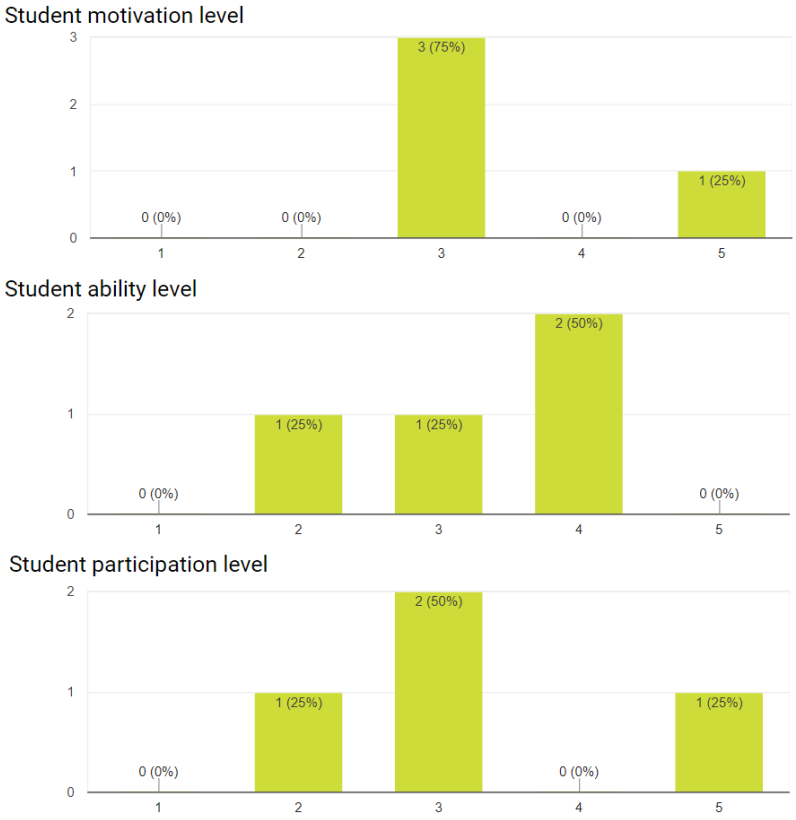

Figure 6: Student ability, motivation and participation level

When asked to elaborate, three teachers said that the students were a mixed group. Some students had high motivation and put in a lot of effort, whereas others would often show up late or skip classes and do little work. One of the teachers suggested offering a reward of sorts for student effort in order to mitigate this in coming years.

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The teachers were asked to offer suggested improvements for the next year of the ERDI courses. Once more it was stated that a reward for student effort would help mitigate the motivation issue. One other teacher mentioned requiring a higher level of English comprehension for the students in order to improve communication.

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4.2 Task two: Alumni network

Three different platforms were considered during the initial stages of the project. The advantages and disadvantages of each platform can be found in Appendix I. Eventually the Linkedin Groups function was chosen as the preferred platform.

4.2.1 Rules and design standards

After discussion with the ERDI project managers the main function of the alumni network was ascertained. The requirements for the network were as follows:

- Alumni need to be able to share interesting developments in their respective fields.
- No more than one hour of work per week can be required for maintaining the network.
- The content needs to be consistent.
- The network needs to be free of spam, self-promotion and other unrelated posts.

Based on these requirements, a list of rules was generated which can be found in Table 6.

Table 6: Alumni network rules

Number	Rule
1	- Membership is reserved for ERDI partners and interested partners. Please do not invite unaffiliated parties without consulting the moderators.
2	- All posts submitted as discussions will be moderated prior to approval. Any posts that are deemed to be unrelated will be deleted as will members who consistently violate this rule.
3	- Please refrain from posting solicitations for your business or services that you or your company provides. Any posting considered to be such will be deleted and repeat offenders will be removed from the group
4	- Please keep the group free of profanity and spam.

The network will consist mostly of user-generated content, with the alumni being able to share developments in their respective fields. In order to keep the network active during the initial start-up phase, weekly content will be posted by the ERDI project team. This content will be shared articles and links regarding sustainable development and articles specifically written for the network.

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4.3 Task three: Scifest

The Scifest workshop took place on the 17th and 18th of May, 2018 at the Joensuu Areena. On the 16th of May, the trainee set up the stand and built the anaerobic digester. The printing of business cards, posters and the infographic were done several days in advance.

The audience at the event consisted mostly of children aged anywhere from eight to sixteen years old and adults aged from thirty to fifty years old. The children more often than not walked around in groups, sometimes with teachers. Generally, the children spoke very limited English or none at all, especially the younger children while adults had a reasonable understanding of the English language.

The activities at the workshop were built to cater to these different groups and their specific situations. An anaerobic digester and its explanation was more complex and tailored to the adult audience who could engage in conversation. An animation showed the process of building the digester with simple shapes and vibrant colours, specifically for the younger children who could not understand the explanation offered by the trainee. Furthermore, the posters were designed with vibrant colours and sprites to make the workshop more appealing to the younger audience and a poster design contest was held on the second day of the event when a Finish speaking person joined the trainee.

4.3.1 Infographic

The final design for the infographic was made by the trainee and a graphic design trainee working at Karelia University of Applied Sciences. The poster was printed by an external company on the 14th of May, 2018. The design can be found in Appendix III. The data for the infographic was based on research by (Hakala, 2011).

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4.3.2 Posters and art style

The posters were developed using the approach described in paragraph 3.1.3. Figure 7 shows some of the produced art assets and the associated art style.

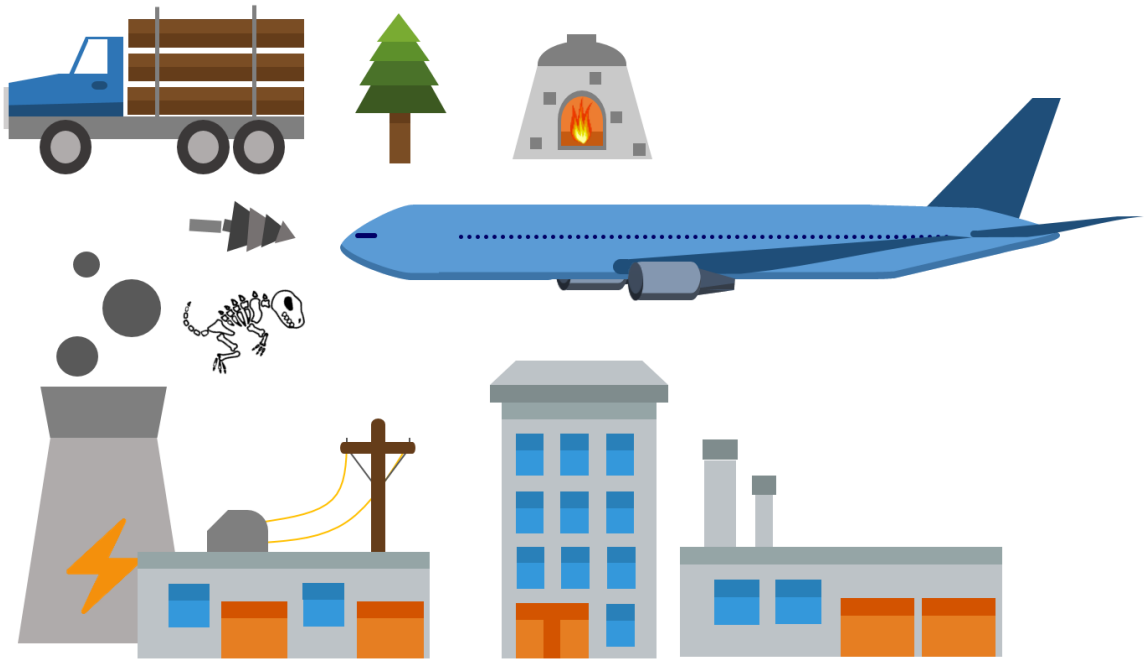

Figure 7: Poster assets using the developed art style

Considering the target audience consisting mostly of young children, the style was focused more on cartoon-like appearances than accuracy. Vibrant colours were used to make the posters more appealing and the colour scheme was specifically chosen to evoke feelings of excitement, enthusiasm and knowledge (Singh, 2006). The usage of shading to emulate shadows was consistently applied on all assets and the same level of complexity was used for each object.

The information found on each poster was based on knowledge the trainee already possessed and research by (Arhoun, Bakkali, El Mail, Rodriguez-Maroto, & Garcia-Herruzo, 2013) and (PennState college of Earth and Mineral sciences, 2018). The final designs of the posters can be found in appendixes IV, V and VI.

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4.3.3 Anaerobic digester

The anaerobic digester was built to the specifications described in paragraph 3.1.4. The full setup can be found in Figure 8.

To the left of the digester bottles was an animation that showed the process of building the digester and the different parameters that were considered during the design phase.

An ambient temperature of 20° Celcius was measured at the venue. This temperature was significantly lower than the proposed 32° Celcius, causing the gas production to be lowered.

Figure 8: Anaerobic digester setup at Scifest

The bottles were controlled every ten or fifteen minutes. At the end of each day the trainee wrote down how much gas was produced. Table 7 shows the measured totals.

Table 7: Produced biogas

Bottle/production	Ham	Cabbage	Potato peels
Gas produced – day 1	51 ml	12 ml	24 ml
Gas produced – day 2	35 ml	5 ml	33 ml

During the workshop the bottles were mainly used as a demonstration on the principles of Bio-economy. The trainee explained to interested attendees how the process worked and asked them why one bottle might produce more gas than another. The digester setup gained the most attention at the workshop out of all the activities, with most interested parties being adult teachers.

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5. Discussion

In this chapter the results of the project will be discussed and interpreted, specifically in relation to expectations held at the beginning of the project.

5.1 Task one: Course surveys

The surveys were performed on the final segment of the academic year. The students that were still studying at Karelia University of Applied Sciences were asked to fill in the survey during one of their classes, leading to a high participation rate. The students who had taken part in the studies earlier and were not present were asked to fill in the survey via email. The courses were spread out over the year with different subjects being taught at different times of the year. This led to a higher response ratio in students who took part in the environmental classes and their criticisms being over-represented. Because of the anonymous nature of the survey, it is unknown how many of the students who took part in the classes before the date of the survey actually filled in the survey. This should have been addressed by separating the results from earlier and later students in order to make them more representative of the entire group.

The trainee had no knowledge of the ERDI courses before he started his traineeship and learned about the content through talking with teachers, reading materials and attending one of the classes. Somebody who was more closely associated with the courses, like a teacher, would have more knowledge of potential issues beforehand and could make the survey better reflect those potential issues. While the current approach still generated a fair amount of feedback, perhaps it would have been better to utilize someone who had more knowledge of the courses.

The fact that the trainee was an outsider might also have helped, in contrast. Using a trainee with no prior experience in these courses allows a fresh ''outsider view'' that could reveal themes or issues that someone who is associated with the courses might not see. Furthermore, an outsider is unlikely to be biased going in to the survey.

5.2 Task two: Alumni network

At the end of this project, it is still unclear whether or not the Alumni network will remain in used. It will take some time for the network to start up and or discussion to begin within the alumni. This was started up by the trainee posting material on the network before the partners were added. If the network had been started up earlier, however, there would have been more time for the trainee to oversee the development and help where possible by generating additional content. Currently, the other tasks were prioritized over the alumni network which led to this task being pushed to the back.

5.3 Task three: Scifest workshop

The anaerobic digester was built according to the specifications listed in chapter 3. Originally the plan was to place the digester bottles in a heated water bath to maintain a steady temperature of 32° Celcius. The materials required for this hot water bath were not available at either Karelia University of Applied Sciences or UEF. The eventual setup was instead insulated to maintain as much heat as possible and overfed slightly to increase the rate of metabolism.

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This approach led to a lower than expected amount of biogas to be produced. The fact that the bottles still produced biogas (albeit at a slower rate) meant that the bottles were still usable for the demonstration.

During the first day of the Scifest event there was no native Finnish speaker present at the booth. This caused a language barrier to exist between the ERDI personnel and the attendees, mostly the children. On the second day, this was remedied when Sini-Tuuli Saaristo joined the ERDI personnel and managed most of the communication to the younger audience. In retrospect, there should have been a Finish speaking individual present on the first day as this would have opened up the workshop to a larger audience.

5.4 Continuation after the traineeship

In addition to the different activities described in this report, the trainee took part in a hackathon-style event named 'Pajathon'. This was an event where multiple teams competed to design the best solution to a humanitarian issues possible within 24 hours. The trainee took part together with two other trainees and designed a cost effective method of water purification utilizing technology used in thermal solar generators. The trainees won the competition using this design.

The prize of the competition was a development plan with guidance from the organizers and different NGOs to allow the winning idea to be worked out into a business plan. This could, however, not be used in its original form since the trainees are not Finnish and had to move back to The Netherlands after their respective traineeship periods. After some debate, a new idea was established where the guidance would be applied to a minor program at the HAS University of Applied Sciences. Here, the trainees will develop their concept alongside additional students over a six month period with the Pajathon jury acting as a client and offering guidance along the way.

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6. Conclusions

This chapter lists the conclusions for each of the individual tasks, with respect to their original research questions. The project was carried out over a period of four months and led to the development of a workshop at the Scifest event, the successful implementation of an Alumni network and a list of course recommendations based on surveys.

6.1 Task one: Course surveys

- What criticisms do teachers and students have about the current implementation of the ERDI courses?

The main way students are currently introduced to the ERDI courses is via their university or study counselor. Out of sixteen interviewed students, only two said they discovered the courses through a different method, such as social media or the ERDI website. Students also noted the current implementation of the courses has little connection to the business side of environmental management and that they would like for this connection to be more pronounced.

Students mostly enjoy the multilingual and multicultural aspect, which could be used in promotional materials to build upon the strengths of ERDI. They also mentioned that the preliminary information for the courses, such as the content on the ERDI website, does not properly describe what they are actually like. Nine out of fifteen students said that the courses were different from what they expected it to be, six of them even going so far as to specifically say they didn't know what to expect.

The Environmental Management project and its implementation was the most unanimously disliked part of the ERDI courses, with eleven out of fifteen students listing it as their least favourite part. During the discussion it became apparent that this was partly due to the unconventional way the students had to produce their results, being unable to use a standard report or PowerPoint presentation. One student did not answer the question.

- Which factors can influence the way a student or teacher answers the surveys?

The type of language used in surveys can influence the way people answer questions. Using subjective language can cause someone to change their opinion and lean more in one direction of an answer, such as using negatively charged words to describe aspects of the courses. Similarly, the use of ambiguous language can confuse someone and cause them to misunderstand the question. In order to avoid these situations, the surveys were made to be as objective as possible and overly complex language was avoided where possible.

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6.2 Task two: Alumni network

- What platform best fits the requirements of the alumni network?

Based on the features of each individual platform, it was determined that the LinkedIn Groups platform is best suited for the alumni network. Being able to effectively moderate content, maintain a professional outward appearance and the daily/weekly digest feature outweigh the negatives of using this platform.

A list of requirements was formulated for a successful and sustainable Alumni network. According to the trainee, the network can only be successful when these four points are managed carefully:

- Alumni need to be able to share interesting developments in their respective fields.
- No more than one hour of work per week can be required for maintaining the network.
- The content needs to be consistent.
- The network needs to be free of spam, self-promotion and other unrelated posts.

6.3 Task three: Scifest

The workshop took place on the 17th and 18th of May, 2018. Over the course of the event, many children and adults participated in the events at the ERDI & SECURE stand. On the first day, a new group of attendees would visit the booth every ten or fifteen minutes. During the second day, this was increased to a new group every ten minutes on average.

- What are the characteristics of the target audience and how can the workshop best utilize them?

The audience at the event consisted mostly of children aged anywhere from eight to sixteen years old and adults aged from thirty to fifty years old. The children more often than not walked around in groups, sometimes with teachers. Generally, the children spoke very limited English or none at all, especially the younger children while adults had a reasonable understanding of the English language.

The activities at the workshop were built to cater to these different groups and their characteristics, such as knowledge level and interests. An anaerobic digester and its explanation was more complex and tailored to the adult audience who could engage in conversation. An animation showed the process of building the digester with simple shapes and vibrant colours, specifically for the younger children who could not understand the explanation offered by the trainee. Furthermore, the posters were designed with vibrant colours and sprites to make the workshop more appealing to the younger audience and a poster design contest was held on the second day of the event when a Finish speaking person joined the trainee.

- Which parameters influence the efficiency of the anaerobic digestion process?

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The ambient temperature at the venue was 12° Celcius lower than the optimal temperature of 32° Celcius for the digestion process. The digester was insulated and overfed to counteract this, leading to a noticeable production of biogas over a period of two days.

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7. Advice

A list of recommendations was generated based on the student and teacher surveys to improve the implementation of the ERDI courses in following years.

The Environmental Management project is considered one of the least likeable parts of the courses, due in no small part to the unconventional and confusing way the end product for each group needs to be made. A critical look at the Environmental Management project would help alleviate the frustrations of students by offering a more structured approach. Showing end results from project groups in previous years would give the students some ideas for the kind of products they can produce and help prevent confusion.

One of the main concerns brought forward by the students was the preliminary information not being in line with the actual courses. The trainee advices the ERDI project coordinators to update the promotional material and make it reflect the ERDI curriculum more closely. Considering that students noted they most enjoyed the multilingual experience, including this in the promotional material could help as well.

Most students came to know of the ERDI courses through their universities. If a larger attendance is desired, then discussing alternate approach vectors for new students could make this possible. This could be achieved through a larger social media presence, if the budget allows for it.

The trainee advices the ERDI project coordinators and Savonia to maintain a consistent schedule when posting content to the Alumni network. Keeping up with discussions going on inside the network and participating should help develop the network quicker and promote activity.

In trainee recommends that the ERDI project coordinators make use of the established art assets for posters used during the next Scifest event. This could save a lot of time designing materials.

During the Scifest event, it was beneficial to have a Finnish speaking person present considering that most guests did not speak English. At the next event, there should be a Finnish speaking person present on the first day and not only the second day.

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Appendix I: Social media options consideration

This table lists three different services that were considered for use in the alumni network, each with its main features, advantages and disadvantages laid out. This information is based on research by the trainee himself.

Linkedin groups			Linkedin company page			Facebook groups		
Main features	**Advantages**	**Disadvantages**	**Main features**	**Advantages**	**Disadvantages**	**Main features**	**Advantages**	**Disadvantages**
- Purpose built for group management	-Easy moderation	- Bad reputation	- Company updates (with custom photos)	- The ability to upload a logo (albeit as company logo)	- Might give the wrong image (as it's not really a company)	- Simple post formatting for users	- More casual	- Less professional
- Dedicated moderation tools (ban/block, automatic join messages etc.)	-Simple to use for both moderators and users	- Doesn't get much support from Linkedin anymore	- Allow posting as 'company' (ERDI project) or individual user	- You can post as the company or an individual	- Less developed permission system for employees	- Event coordination and announcement	- Widely used platform	- No dedicated moderation tools
- Share posts with all users, let users share posts as well	- Good for promotion of projects	- No more functionality to upload a group logo	- Cover image	- Ongoing support by Linkedin, constantly being developed and iterated upon		- Integrated file-share service	- More customisation options (logo, banner etc)	
- Daily/weekly digest of user activity in the group	- Recent changes make discussion more fluid	- Often used for self-promotion by users	- Dedicated moderation tools (however, fewer than for Linkedin Groups)					
Groups are a discussion forum, meant for this type of usage.			**Company pages are for communication from employer to employee, not meant for discussion groups.**			**A more casual discussion forum. While less professional, still made for this type of usage.**		

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Appendix II: Survey questions list

The different questions that were administered using Google forms are listed in this table. The first introductory questions (marked as yellow) are always used to gather background information about the person filling in the survey, such as their background or motivation. The questions are sorted in three different types; multiple choice, open or scaled questions. Where possible, open questions were used in order to make as much data available as possible.

Questions **Students section 1 (general)**	**Type**	**Questions** **Teachers section 1 (general information)**	**Type**
Which field are you currently studying in?	Multiple choice	Why did you choose to teach in the ERDI semester?	Open
Which courses did you take during this semester?	Multiple choice	Which subjects did you teach during the ERDI semester?	Multiple choice
Where and how did you first hear about the ERDI courses?	Open	How would you rate the information you received and your personal introduction to the ERDI courses beforehand?	Open
What was your motivation or reason for joining the ERDI courses?	Open	What are your thoughts on the teaching team and their performance during the ERDI courses?	Open
How would you rate the information provided before the start of the semester?	Scale	How would you rate your students' motivation level?	Scale
How did the ERDI courses meet your expectations?	Scale	How would you rate your students' ability level?	Scale
Which parts of the ERDI courses were most useful to you?	Open	How would you rate your students' participation level?	Scale
Which parts of the ERDI courses were least useful to you?	Open	Please elaborate on your answers to the previous three questions.	Open
Which parts of the ERDI courses were most enjoyable to you?	Open	**Teachers section 2 (experiences)**	
Which parts of the RDI courses were least enjoyable to you?	Open	How would you rate your overall experiences?	Scale
Where there subjects you feel should have been included in the courses but weren't?	Open	How would you improve the ERDI courses?	Open
What would you change about the current program?	Open	Do you want to take part in the ERDI courses again in the future?	Multiple choice
Students section 2 (experiences)		Why would/wouldn't you want to take part again?	Open
How would you rate your overall experience with the ERDI courses?	Scale	How satisfied were you with your own teaching during the semester?	Scale
Was the ERDI course like you expected it to be? If not, what was different?	Open	Do you have anything else to add or comment on?	Open
To what degree would you recommend the ERDI courses to a fellow student?	Multiple choice		
Do you have anything else to add or comment on?	Open		

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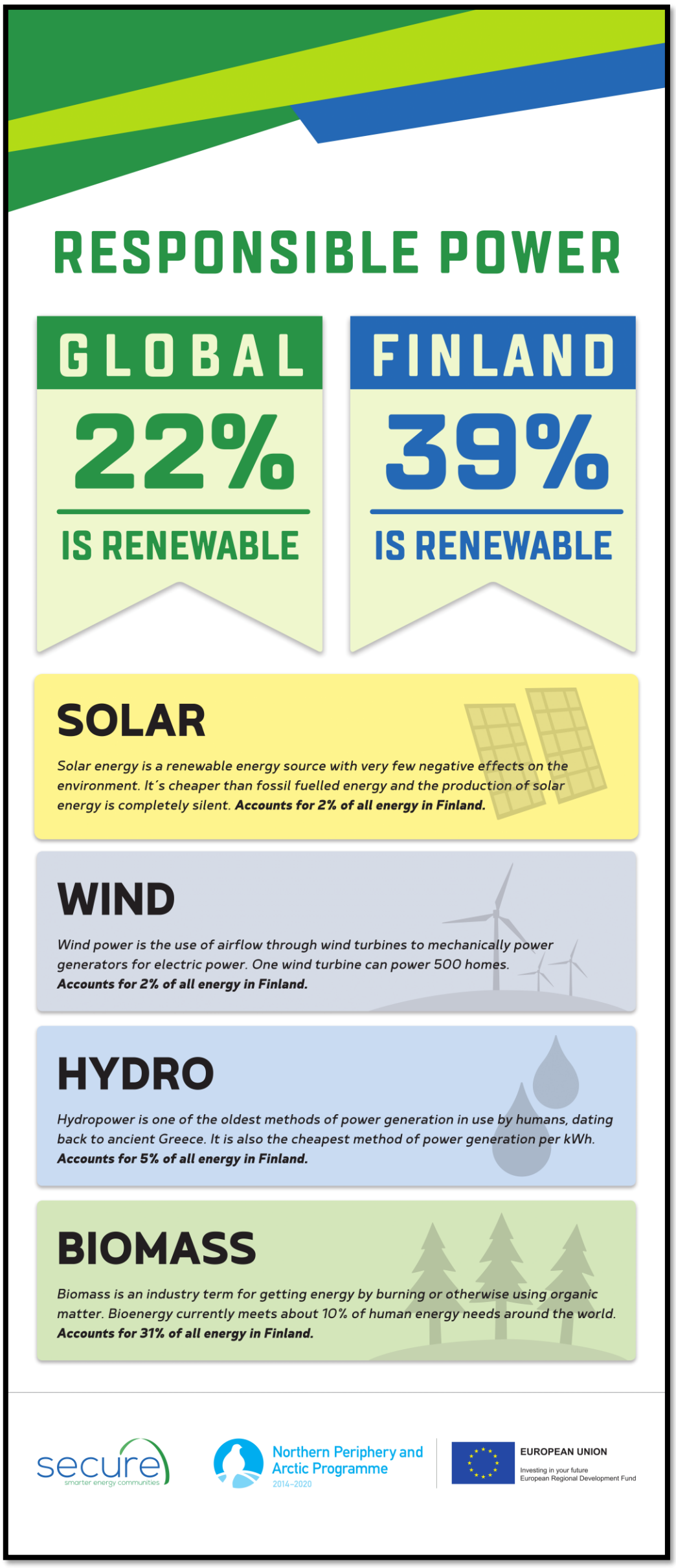
Appendix III: Infographic design



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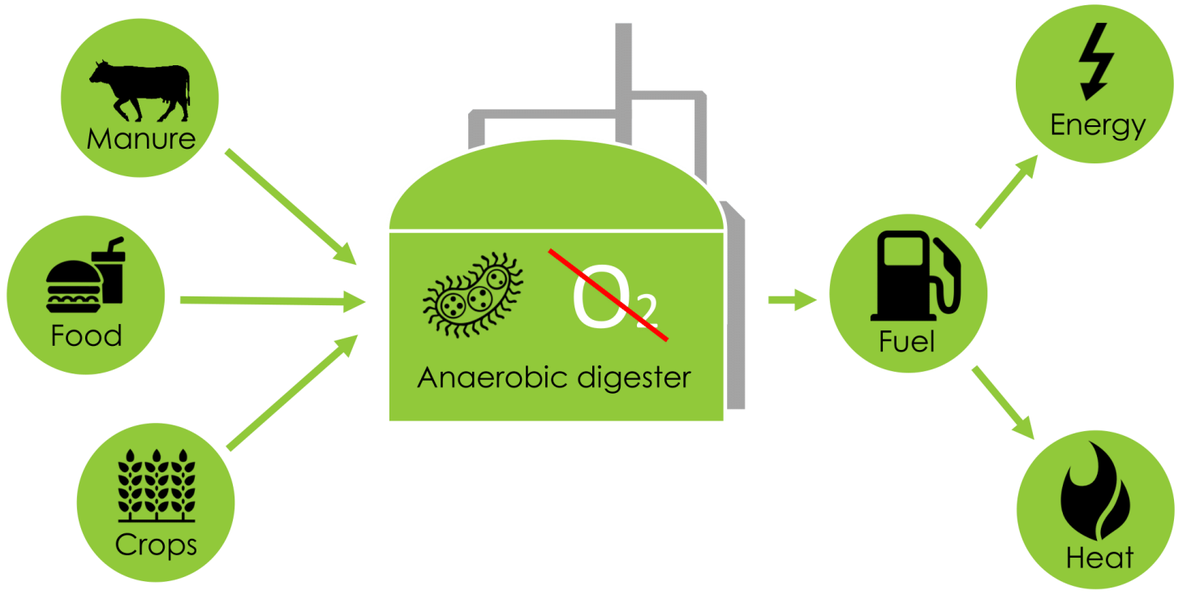
Appendix IV: Anaerobic digester poster

What is anaerobic digestion?

A way to let nature work for us!



Organic molecules → Methane (CH_4)

↑ Proteins ↑ Carbohydrates ↑ Fats

How does it work?

Normally, food rots. But, without oxygen…

…some bacteria can turn organic materials into methane!

We use this to turn organic waste into fuel. This fuel is an environmentally friendly, renewable way to warm ourselves and keep the lights on. All we really need is some organic waste, a few bacteria and an airtight tank.

Biogas – easier than it sounds.

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

secure smarter energy communities

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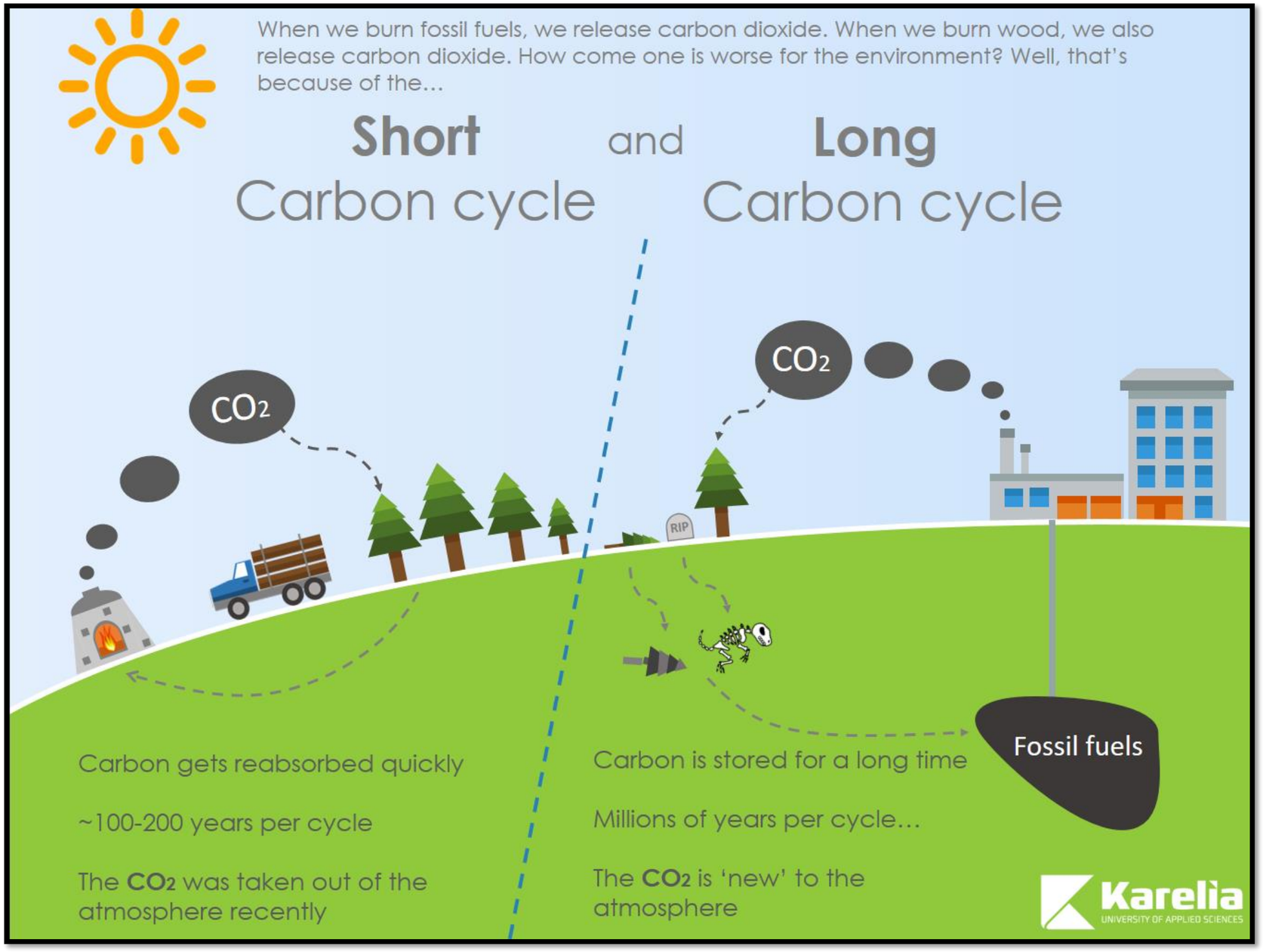
Appendix V: Long and short carbon cycle poster



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