

**Report of WP3.2 Service  
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**Baltic Sea  
Underground  
Innovation Network  
(BSUIN)**

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## 1 Purpose of the WP3.2

The aim is to create a service concept for each UL, and it can be defined as a detailed description of the customer needs to be satisfied. The outputs for the ULs are the value propositions of improved services. Based on these service concepts of the ULs a joint service offering for the ULs network can be created. The tools used in the workshops are e.g. Business Model, Value Proposition and Service Blueprint. The result of these workshops is Service design concept, which will be applied as an approach for developing a joint service offering for the UL network.

## 2 Theoretical background and the main concepts

Professional services, such as ULs also are, can be characterized by high labor content, high customization and high customer contact. An additional characteristic is the presence of a professionalized workforce, i.e. employees whose knowledge, ethical codes and loyalties may be tied to professional bodies outside of the firm. The distinguishing feature of these services is their knowledge-intensive nature. Services in general and professional services in particular are processes, or journeys, which are experienced differently by different people. (See e.g. Beltagui, Sigurdsson, Candi & Riedel, 2017)

Service design focuses on examining what happens before, during and after the core service experience, for both service providers and users. All the points of contact between the user and the service provider are analyzed. These are usually called 'touchpoints', and include e.g. the frontline staff, service environment and physical elements, brand, sales as well as communications materials and channels. To provide enjoyable experiences companies need to understand how each point of contact between the user and provider affects the service delivery.

The aim of the activity WP3.2 is to create a service concept of a new or improved service for each UL. Service concept is defined as a shared and articulated understanding of the nature of the service, its delivery and consumption. (Goldstein et al., 2002; Johnston et al., 2011 & Beltagui et al 2017). In more detail the service concept consists of these four elements:

1. Service operation: the way in which the service is delivered;
2. Service experience: the customer's direct experience of the service;
3. Service outcome: the benefits and results of the service for the customer and
4. Value of the service: the benefits the customer perceives as inherent in the service weighed against the cost of the service

The main output will be a joint service concept through a service design approach for the UL network. Service Design helps to innovate or improve services to make them more useful, usable, desirable for clients and efficient as well as effective for organizations. A joint service offering needs to be created for the BSUIN network. It consists of service concepts of the ULs.

In these creation workshops with the ULs we have used tools, such as Value Proposition Canvas and Service blueprint. Value proposition is at the core of the business model canvas. Service Blueprint is a visual way to specify and detail different stages (touch points) of a service - from the point of view of different stakeholders (front and back stages of a service).

### 3 Service Design as an approach

Service design can be considered as a mindset, a process, a toolset, a cross-disciplinary language and a management approach. Service design has established itself as a practice that enables industries to design and deliver their services with a human-centred approach. Through its tools, service designers obtain contextual and cultural understanding which creates a backdrop for new service solutions, with improved user experience and customer satisfaction. (Stickdorn & Schneider 2011 & 2018)

The main principles of service design include the following (Stickdorn & Schneider 2018):

- *Human-centred*: the experience of all the people affected by the service is considered
- *Collaborative*: all relevant stakeholders should be included in the service design process
- *Iterative* means that service design is an exploratory, adaptive and experimental approach, iterating toward implementation
- *Sequencing*: the service should be visualised and orchestrated as a sequence of interrelated actions
- *Real*: needs should be researched in reality, ideas prototyped in reality and intangible values should be evidenced in terms of physical artefacts or digital reality
- *Holistic* in nature: the entire environment of a service should be considered.

These main principles need to be considered throughout the service design process: exploration, creation, reflection and implementation stages (Stickdorn & Schneider 2011). The methods and tools used in service design enable acquiring in-depth customer understanding, which will help overcome this dilemma. Service developers are hence able to grasp with improved insight what services customers need, how they can get access to them and what their experience is of these services, and even what that experience would be like in future. Customer interviews in the exploration stage serve as a basis for ideating. Also, end user perspective is integrated into the design throughout the process. Customer data, information about who the customers are, is obtained from records of who has or is currently using a service, or by using the knowledge of staff or partners who are dealing with customers in delivering the service. Scholars emphasize the importance of embedding the service design process into existing industrial structures and processes: service designers will need to find spaces where design thinking can be used. (Keränen, Dusch & Ojasalo 2013.)

## 4 Service Design creation workshops

See descriptions of the labs <http://bsuin.eu/underground-labs/>

The focus of each workshop and the value propositions developed in the workshops are introduced here.

### 4.1 Callio Lab

The Deep laboratory facility Lab 2 at depth of 1.44 km is especially suited for particle physics experiments requiring low cosmic ray background. Vast tunnel network is very suitable for testing of mining and tunneling equipment.

Focus of the workshop: Data centers

What are the key requirements of data storage and managing services when considering the needs of companies and organisations interested in such hypersensitive data center services?

*Value proposition: Callio*

Pyhäjärvi Callio can compete in the international data center market only if it is able to provide underground facilities in Finland to international operators with a need to build a high-classification data center and premises can be audited by an external operator. (Lepojärvi & Murhu 2019.)

### 4.2 Reiche Zeche

The research and teaching mine Reiche Zeche, of the TU Bergakademie Freiberg . Providing possibilities for institutes of TUBAF for research and education is the core point of the activity (mostly by maintaining the infrastructure). The GFZ Underground Laboratory is operated by the Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences. It is located in the research and education mine “Reiche Zeche” in Freiberg, Germany allows testing of geophysical and geotechnical tools and methods in boreholes and galleries. The lab is ideally suited for seismic system components such as receivers and sources for three-dimensional high-resolution seismic imaging and tomography surveying.

Research infrastructure” means facilities, resources and related services that are used by the scientific community to conduct top-level research in their respective fields and covers major scientific equipment or sets of instruments; knowledge-based resources such as collections, archives or structures for scientific information; enabling Information and Communications Technology-based infrastructures such as Grid, computing, software and communication, or any other entity of a unique nature essential to achieve excellence in research.

Focus of the workshop:

What are the critical points in the service process of the long-term customers: research institutions? *Value proposition: Research institute*

Reiche Zeche's service: provision of research infrastructure  
**helps** the research institute as a key customer (GFZ)  
who wants to conduct seismic research in order to bring value to their industrial customer / project  
**by using** real condition testing flexibly, which is easily accessible and offers mine safety, user-specific mine work and TU BAF's support  
(unlike other mines without such a relationship with university)

*Value proposition: Projects*

Reiche Zeche's service: provision of research infrastructure (full-board research environment and up-front expertise)  
**helps** a research project (e.g. robotics, IoT)  
that wants to evaluate & develop new technology in a real mining context and conduct research  
**by using** the resources of TU BAF (incl. mine, expertise)  
and a wide variety of services (e.g. legal, safety, planning)  
(unlike other universities and local communities)

### 4.3 Äspö Hard Rock Laboratory

SKB's underground hard rock laboratory at Äspö north of Oskarshamn is where much of the research about the final repository for spent nuclear fuel is taking place. This is where different technological solutions in full scale in a realistic setting are tested. The Äspö Laboratory is a unique research facility and there are only a few like it in the rest of the world.

Focus of the workshop:

How can Äspö Hard Rock Laboratory support geo-measurement companies in their R&D and innovation activities?

### Value propositions (2)

1-Äspö Hardrock Laboratory's R&D&I support service for geo-measurement companies:

**helps** an expert consultancy company

that wants to do equipment testing and to complete a full-scale test in real environment & needs data access open network & coordination of other projects,

**by offering** visualized knowledge of the facility on the website and effective procedures, and up-dated, new technology, competence and fast delivery of data (unlike / better than other underground spaces)

2-Äspö Hardrock Laboratory's equipment guidance and experiment services:

**helps** a technical consultancy company

that wants to develop equipment and create new services in order to gain new knowledge --> to identify monitoring solutions, carry out technology transfer, and to evaluate developed sensor technology

**by offering** a unique facility and data set, risk management & clearly stated responsibilities, IT solutions, support for funding and innovation, and simple procedures throughout, and a world-leading experienced partner with extensive networks and competence including outreach of results

(unlike / better than other underground spaces)

#### 4.4 Ruskeala Underground Lab

Ruskeala Underground Lab was organized by the tourist operator JSC "Kolmas Plus" together with Karelian Scientific Centre of the Russian Academy of Sciences as the pilot innovation structure in mining industrial heritage investigations.

Focus of the workshop:

What are the requirements for the companies using underground space as a touristic destination to provide safety for visitors?

Ministry of Natural Resources provide companies with rights of using the objects of mineral resources by licensing. All the requirements of the safety are established, regulated and fixed in terms and conditions of license. ROSTEHNADZOR (Technical Supervisor of Russia, department in Ministry) provide the supervising and control within the framework of the authority.

The Cultural Heritage Objects (CHO) are protected and preserved by Republic Center on the cultural heritage preservation. Popularization of CHOs includes the historical mines, which are on the CHO list. This means to establish a border of territory of CHO and using conditions and obligations. In addition, the organization concludes the obligations in the Security Certificate with the company-user of CHO, and monitor and control the company's activities (business activities) from the CHO protection point of view.

KRC offers the following services for Ruskeala (and historical mines for tourism destinations):

Scientific research to promote legislation *by providing* geophysical measurements, safety calculations, threat estimations, recommendations on how to control stability of working queries, instructions for safety; and monitoring of roofs, ceilings, paths, water flowing and radiation levels.



*Value proposition for historical mines as touristic destination:*

KRC's service for companies using underground space as a touristic destination

**Helps** a company (like Kolmas Plus) that wants to do business (also with subcontractors) underground providing safety for visitors in offering unique touristic experience in the historical mine avoiding too much bureaucracy

**by offering** a patented method of controlling the underground stability and long-term co-operation  
And an effective system which can be used also elsewhere by even a non-specialist in underground measurement matters in the context of historical mines for tourism.

#### 4.5 Summary of the workshops and the results

Summary of the workshops and the results are described in Table 1.

Table 1. Summary of the workshops

Name & Date	Number of participants	Focus / question for the workshop	Tools used in the workshop	Results in brief
Callio November 2018	19, potential customers and service providers, experts, and Master students	What are the key requirements of data storage and managing services when considering the needs of companies and organisations interested in such hypersensitive data center services?	Presentation of Callio's business concept, Keynote speech > Context Map Four-fold chart Business Model Canvas	Context Map – findings Preliminary service ideas Services for further development Four business models (drafts) SWOT-analysis Recommendations Value proposition (Master's Thesis)
Reiche Zeche February 2019	10, mining professor, mine manager, experts and researchers from the research institutes and projects	What are the critical points in the service process of the long-term customers: research institutions?	Tree about collaboration and relationship Value Proposition Canvas	SWOT-analysis Tree about collaboration - results Recommendations Value propositions for research institutes & projects Critical points in the service process Breaking news from the workshop: Recap
Äspö April 2019	8, representing customers, SKB, the local community, consultants and research institutes	How can Äspö Hard Rock Laboratory support geo-measurement companies in their R&D and innovation activities?	Tree about collaboration and relationship Value Proposition Canvas Service blueprint	Tree about collaboration - results Value propositions for two customer groups Service blueprint SWOT-analysis Recommendations
Ruskeala May 2019	14, Kolmas Plus, Ministry of Cultural Heritage, Ministry of Natural Resources, Geological Institute of Russian Scientific Academy	What are the requirements for the companies using underground space as a touristic destination to provide safety for visitors?	Tree about collaboration Four-fold chart Interviews (for Value proposition analysis)	Preliminary service ideas related to safety for Ruskeala SWOT-analysis Recommendations for Kolmas Plus Recommendations for Service Provider Service for Ruskeala (and historical mines for tourism destinations) offered by KRC

#### 4.6 Conclusions

From the customers' point of view it is important that the UL is in stable political society and business environment, its services are reliable, certified, and secured. Customers appreciate physical accessibility, ready-made infrastructure and spaces, stability and predictability, and good data connections. In addition, sustainability and reasonable price are important for them. Customer value is always an issue of costs and benefits.

ULs should look for new customer segments and create new services. They should also create and describe business models for the chosen customer segments and services and make value propositions based on their competitive advantages.

The services of the ULs should be described, and the service paths (customer journey), service blueprints made also tangible for the customers. Critical points in the service process were e.g. increasing unexpected costs, limitations and unexpected restrictions concerning the services underground.

Productization of services could increase openness and credibility for the service provider. That would also make services simply and easily accessible for customers. Customers would appreciate a service concept with a clear pricing model.

Communicate the value proposition, not only the technical value for the customer (image, value-in-use). Make the process and content of services visible on the website. Market actively (including newsletters), focus on the high quality of the product/service. Become active in selling. Get references and use them in marketing. Establish systematic communication practices with customers and other stakeholders.

Creating innovative value propositions includes the ability to translate intangible value propositions into desirable, often more tangible offerings. By using service design methods value propositions can be prototyped early to allow emerging ideas to be shared and modified with users, experts, employees and so on.

## 5 Service Design reflection workshops

In order to create the joint service offering for the UL network two reflection workshops were arranged in autumn 2019. The first one was for the representatives of ULs and the second one for all BSUIN partners. Both workshops were held online via Skype for business. The invitations were sent a month before. The material of the workshop was sent in advance for the invited participants. Summary of Service Design reflection workshops is in Table 2.

Table 2. Service Design reflection workshops

Name & Date	Number of participants	Focus/question for the workshop	Tools used in the workshop	Results
Service offering for the UL network with the representatives of ULs 3.10. & 4.10.2019	4	Core/supporting/additional services for the UL network	Online workshop via Skype for Business. Interactive discussion on 7 topics. Material provided in advance.	Limited number of services for the UL network: essential and extra services. Some characteristics of value proposition.  Conclusion: How to transform the infra (rock) into service(s)?
16.10.2019 Service offering for the UL network with BSUIN partners	7	Essential and extra services for UL network Touch points of generic customer journey Characteristics of value proposition	Online workshop via Skype for Business. Interactive discussion. Material provided in advance.	The service offering: essential (basic) services and extra (additional) services.  The stages of the generic customer journey.  The central elements of the value proposition.

## 5.1 Theoretical background and the main concepts

“Customer journey” means the sequence of events that customers go through to learn about, purchase and interact with company offerings –including commodities, goods, services or experiences. (see e.g. Norton and Pine 2013.)

Customer journey canvas can be used as a practical tool, see more e.g.

<https://canvanizer.com/new/customer-journey-canvas>

Service blueprinting aids in describing the service processes, enabling clear and detailed descriptions of all relevant activities and participants and separating visible and backstage actions. (See e.g. Äspö creation workshop). Service blueprints also support the understanding of services, identify potential points of failure in the process and facilitate communication (see e.g. Harkonen, Tolonen and Haapasalo 2017).

In order to clarify the services (i.e. the service offering), the necessary service components need to be analysed and defined. This is intended to clarify the core structure of the services so that they do not need to be re-invented every time they are provided. Analysing the elements also enables an understanding of which service elements can be considered to be essential and which of them extra. Those extra elements can either be supporting elements or additional services. The convenience of the essential core service can be enhanced by additional services and supporting services, being particularly useful to distinguish oneself from the competition. Tailoring services to fulfil particular customer needs becomes possible once it is clear which elements are core, supporting or additional. (Harkonen, Tolonen and Haapasalo. 2017).

## 5.2 Results of the reflection workshops

The core, supporting and additional services were discussed in the first workshop. This kind division appeared to be problematic, e.g. supporting and additional services were difficult to distinguish from each other. The participants preferred a limited number of services. The services must be simple and clear. Therefore, it was jointly decided to have a two-fold classification: essential and extra services. This was also supported by Harkonen, Tolonen and Haapasalo (2017).

In the second workshops the essential and extra services were reviewed and reflected. And after the second workshop the facilitators modified the services once again.

### 5.2.1 Joint Service Offering for the BSUIN network

Basic services are the essential, fundamental, core services, which help the customer to solve the problem. The customer pays for them. Additional services are supporting and extra services that add value to the customer. They add the competitiveness of the offering and distinguish it from other service providers. The additional services are always combined with the basic services and they are never needed alone.

The essential services:

- Research infra
- Underground infra
- Site characterization and knowledge
- Wide expertise for underground projects

The additional services:

- Underground logistics
- Coordination of research projects
- Industry specific machinery & equipment
- Support for R&D projects (e.g. funding and innovation)
- International co-operation
- Extensive networks
- References of successful projects
- Demonstrations
- Underground and industrial tours
- Meeting rooms

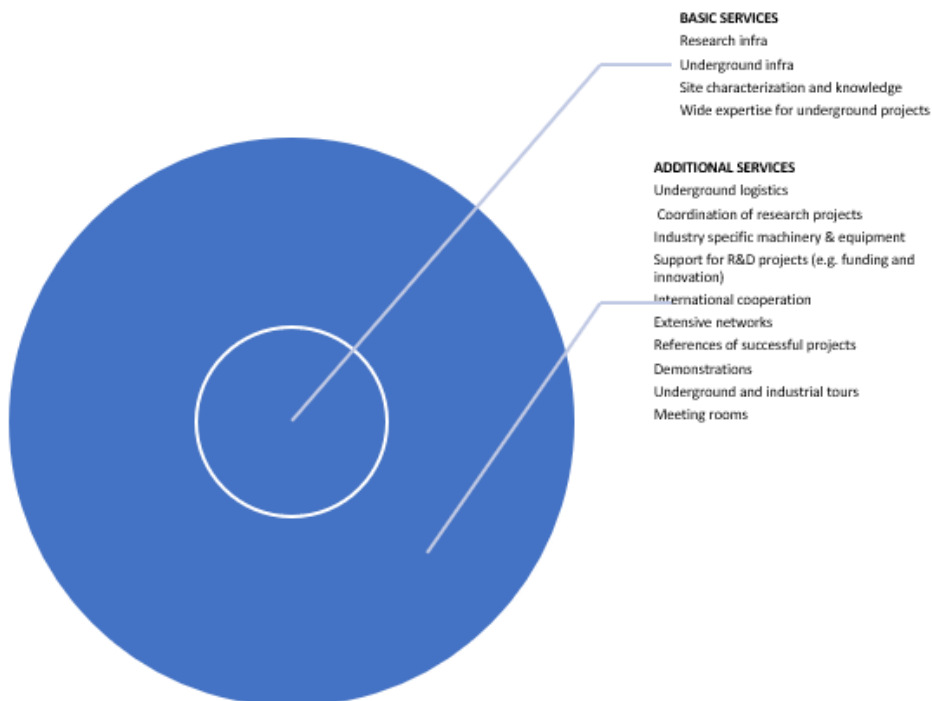


Figure 1. Joint service offering

### 5.2.2 Business Model for the BSUIN network

The business model of the BSUIN network can be found:

<https://canvanizer.com/canvas/rt9WeGhXDzYYU>

The business model is based on the data, results and analyses of all the previous workshops. There is no cost structure and revenue streams in the business model, because the network is not business-oriented. The value proposition will be reviewed and completed in WP3.5.

### 5.2.3 Generic Customer Journey

The generic customer journey was jointly created in the workshops, and especially the touch points were discussed.

The generic customer journey is divided into:

- pre-service period
- service period
- post-service period

The general customer journey for the UL network can be found:

<https://canvanizer.com/canvas/rg37NTprGvQQq>

## 6 Conclusions and recommendations

The aim in WP3.2 is to create a service concept for each UL. Service concept is defined as a shared and articulated understanding of the nature of the service, its delivery and consumption. (Goldstein et al., 2002; Johnston et al., 2011 & Beltagui et al 2017). The outputs for the ULs are the value propositions of improved services. Based on these service concepts of the ULs a joint service offering for the ULs network was created.

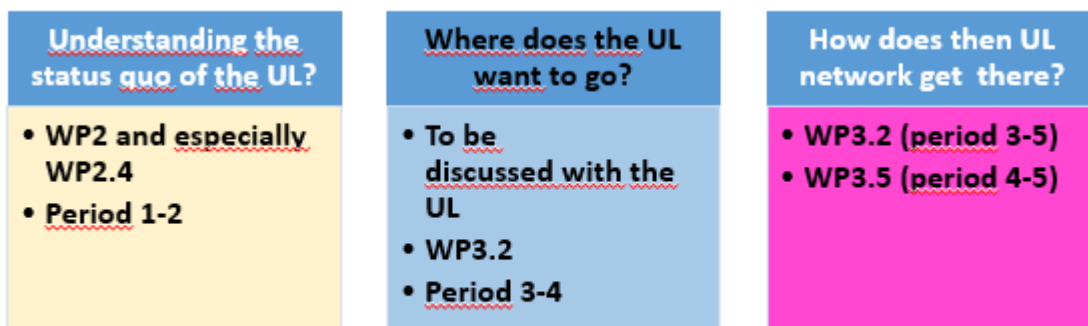


Figure 2. Service development process in the BSUIN project

In order to create the joint service offering for the UL network two reflection workshops were arranged. Service components were analyzed and defined to clarify the core structure of the services. It was jointly discussed in online workshops which service elements are essential and which of them extra for the network. Generic Customer Journey was also identified and described.

The result of these workshops is Service Design concept, which will be applied as an approach for developing a joint service offering for the UL network (Figure3). This approach was applied as the services of ULs are knowledge-intensive, processes, or journeys, which are experienced differently by different people. (See e.g. Beltagui, Sigurdsson, Candi & Riedel, 2017). Developing UL services is an ongoing process. The idea is that each UL gets value in the network and utilizes it in its unique service offering.



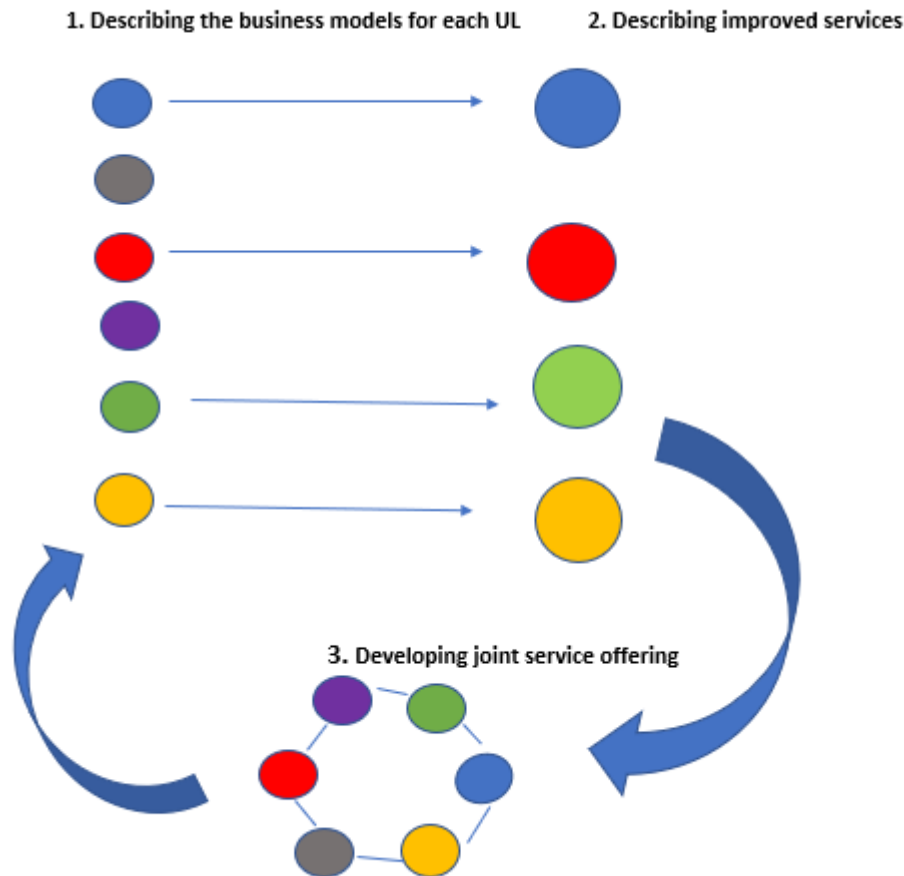


Figure 3. Service design concept

Challenge: How to transform the underground infrastructure into services? This is a question for each UL and for the UL network.

It is recommended that the ULs would describe their own service offering with the model presented by the facilitators. It makes their services more concrete and accessible for the customers. Together with the business model(s) and value proposition the service offering is a base for marketing. It is also recommended to describe the customer journey of the UL.

## 7 Further actions and research

Creating innovative value propositions includes the ability to translate intangible value propositions into desirable, often more tangible offerings. By using service design methods value propositions can be prototyped early to allow emerging ideas to be shared and modified with users, experts, employees and so on.

Some ideas of the value proposition for the forthcoming UL network were jointly identified in the reflection workshops:

- the EUL (European Underground Association) will be a continuum of the BSUIN project
- will combine experts of the field
- established network creates credibility for potential customers
- will help marketing and marketing communication
- will attract new projects
- will reach other stakeholders (politician, decision makers, potential users & customers)
- will outreach greater audience, ordinary people, scientists

The network will create a beneficial environment for sharing experience and information, e.g. locally developed practices & solutions, encourages experience exchange. It will also support the long-term development of regions.

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