

**MINUTES OF THE MEETING 16.01.2018**

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**Dissemination level**

Confidential, only for representatives of organisations invited to the meeting

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## 1. General information

### THE SIT

SITE: NATO-AIRPORT Bodo (Norway)

- shelters and runaways

Call reference: H2020-SC5-2018-19-20

### 2 STAGE PROPOSAL

- 1st deadline 27<sup>th</sup> February -10 pages proposal;
- 2nd deadline 14<sup>th</sup> November – 70 pages proposal;

## 2. Tour of the table

Consortium- we should evaluate if we have the right consortium.

### NORUT , Arntsen Bård

Structural analysis. Re-use of structural elements (beams, columns). Modelling and assessment of structures.

### KU LEUVEN

Li, Jiablin

Recycle of aggregates. Analysis and examples in China (tallest buildings with recycled materials, Recycled materials in high-speed rail and blocks. Pilot projects and demonstration projects. We have a lot of experience in recycling materials.

Luc Boehme

Structural use of recycled aggregate. We recently moved to a new laboratory. New climate chamber for freeze-thaw-testing according to different standards. New testing machines. Applications in Industries. We are in contact with Flemish Companies in road construction, recycle centres for construction and demolition waste, ready-mix concrete production and precast production. They use recycling aggregates. Development of new machines to remove attached old cement-paste to the aggregates because the attached cement-paste causes a higher water-absorption and all kind of other problems. .Our research-group is called RecyCon (see: <https://iiw.kuleuven.be/onderzoek/recycon/english>)

### UNIVERSITY OF TROMSO (NARVIK) Buyle Boy-Arne

Concrete industry, Laboratory . We have good connections with industry

### LULEA UNIVERSITY OF TEHCNOLOGY , Cwizern Andrzej

Recycle and reuse of materials.

### SINTEF HELGHELAND

Circular economy. SINTEF can bring a focus on the steel: our organisation can bring an added value during the dismantling phase, where a separation between steel and concrete is needed. In this phase, cleanliness of steel deserves particular attention. SINTEF owns big laboratory facilities where we have all the tools to perform environmental mapping of

building before the construction. Also, we are able to analyse efficient methods to recycle concrete and how to increase the amount of concrete that can be reused without any problem. We also have a big network of companies and industries.

#### NARVIK RESEARCH PARK

It represents a cluster of companies working with concrete. Companies included in this park are specialised in works during winter time ( arctic temperatures). When temperature drops below 5 degrees, the application of fresh concrete represents a great challenge for construction sites.

This cluster is a no-profit organisation, owned by universities and local communities.

#### BODO MUNICIPALITY

As authority the municipality will be more than happy to assist the consortium in testing and demonstrating the technology. The municipality can count also on its own human resources skilled in H2020 projects and in EU policies in general. The current airport was built by NATO in the 50s, very rapidly, but it consists also of an area dedicated to civil aviation. Currently, the airport is becoming a burden for the community as it is damaging the city for further growth and expansions. Since NATO has taken in consideration to move its basis somewhere else, runways and building starts to get damaged.

The municipality has decided to move the civil aviation airport (runways) in another area. The area of the airport has the same dimensions of the city; for this reason, the dismission of this infrastructure will allow Bodo to double its size. The municipality is searching for better opportunities than just landfilling.

#### **New city in the airport. (Project)**

#### UNIVERSITY OF OULO

The University mainly deals with materials science at chemistry level. We try to find new ways to recycle cements and all alkali activated materials.

#### MAPEI

Business development for environmental technology. We deal with fresh concrete. Our aim is to minimise waste water from concrete plants. Also we are involved in projects to capture polluting substances from soil through special processes. MAPEI Scandinavia has recently been granted from Innovation Norway for three projects. We are interested to see the market potential. Our interest is also the concrete performance check in arctic climate conditions. We are also committed to avoid waste of materials as in construction sites, 50 million mc of concrete are overproduced. MAPEI is also developing chemicals to clean concrete truck instead of wasting water. Health and safety issues. MAPEI also analyses the amount of CO2 absorbed by the concrete; this is an important factor as it changes the PH of the material and the corrosion of reinforcement bars starts. Among that, we do not have experience in developing machineries and equipment to dismantle buildings.

#### UNIVERSITY OF BRNO (Czech Republic)

We carry out research activities on recycled concrete aggregates. We work on preparation of guidelines on recycling and dismantling of buildings. We prepare aggregates for future applications. Not all the types of aggregates we analyse are suitable for recycling but in our new research centre we own new technologies to test contamination and climate resistance

(artic conditions). Currently, I am conducting my research work in Iceland, which has the same climate conditions of Norway. We deal with properties of aggregates, strength and resistance, tomography. What we do, is that we take materials from the landfill and we analyse the samples in the same period of the airport. I can take part to the consortium both as Iceland, than Czech Republic.

#### GHENT UNIVERSITY

We deal with Demolition of concrete and recycling of concrete aggregates in Belgium (Road and engineering dept.). We have a previous experience in H2020 projects (even if not funded) where of course we can bring added value with our research attitude. Asphalt and field testing of routes in Belgium. Interest in airport projects.

#### IRIS

We are a waste management company. We are a private entity, owned by the municipality with a arge recycling plant and a landfill which receives a lot of wasted concrete. We are interested in developing a possible pilot for recycling of concrete. Currently, we ship sand from the southern part of Norway, as in the Bodo region we don't have raw materials. We can make new concrete out of this. We have the knowledge about how to manage waste. We sort the metals but we use concrete for roads at the landfill. Some concrete gedo for building projects (parking areas) but we think we can develop greater potentials. Sustainable management. Bodo region is currently producing a lot of waste concrete and we have to find a solution on how to reuse it.

### 3. Topics of discussion

- Why there is so much dismantling activity in the Bodo region?  
Because of the **high growth** of the region; economic growth requires urban expansion and new constructions.
- How much is the amount of materials? Runways (60 metres wide, 6,5 km long and 60 cm depth) and buildings. 225000 cubic metres (three runways) plus the amount of ruins coming from buildings (terminals, hangars...- maybe 42 shelters, corresponding to 2 months of work for dismantling).
- We should estimate whether there is a balance between the old airport and the current need of construction materials of the Bodo region.
- **IMPORTANT ISSUE.** We have some **polluted areas in the airport ( consequently, contaminated materials)** with oil, petrochemicals.... The possible application of contaminated concrete represents a challenge for the consortium.
- What is the current value chain? Usually, after the demolition of a building, the rubble is processed into recycled aggregates and can be used for the construction of roads and buildings. **The best use would be to apply these aggregates in concrete again;** this represents a challenge for two main reasons: lower properties of the recycled materials and secondly, the **existing legislative framework**. It is not possible to use a high amount of recycled aggregates in the structures of building. For this reason, if the consortium decides to proceed, an **INNOVATION DEAL – DG GROWTH** is needed; it is a lobbying activity to make sure that when the project will come to an end, the commercial exploitation of the product will be possible.
- LA test and other testing activities should be fine-tuned to the project.

**Kommentert [LB1]:** It is not sensible to mention this since in many countries in Europe recycled aggregates and recycling concrete are produced and tested according to the existing international standards and similar standards are also used outside Europe e.g. in USA, in China, in fact all over the world.

- Another issue is that the concrete industry is not so innovative. Concepts take 7-8 years to get into the market.
- **The separation between concrete and rebars could represent a challenge.** We can refer to the wet process developed in Switzerland by SEL FRAG. This company has developed a well organised method to sort rebars from the concrete. Thanks to this method, rebars come out as strength lines and they can be easily transported. This technology is currently used in the mining industry, to realise a first separation of the materials. This is the current commercial use but without any doubt, this technology has a great potential to be applied for the separation of rebars from concrete.
- Another interesting idea could be the reuse of existing structures without crushing them ( beams, columns).
- It would be interesting to evaluate if there is any chance to set **a methodology for the pre-demolition assessment** (see approved EU project with Finland).
- Environmental mapping: we need to check if there is asbestos contaminating the structures.

#### 4. The call topic – SC5- RAW MATERIALS

To develop the project proposal we need a company as coordinator of the action. Also, we need to investigate the roles of the partners to cover the whole value chain.

Also we need to investigate if other similar infrastructure are going to be dismantled across the EU and how it will happen. For this reason we need to build a portfolio of examples ( other location where to apply our solution).

Materials involved in the project, should be coherent with the scope of the call.

Also, as Norway is not EU, there should be a good reason of why we are picking this airport. NATO is a good case because airport contains all the examples of constructions ( buildings, runways, roads, hangars), it's a huge scale example and we have a lot of similar cases in Europe. Moreover, the airport has been built by NATO, but it is owned by the Norwegian Royal Airforce.

#### WE URGENTLY NEED TO DEFINE:

1. THE TECHNOLOGY
2. WHO OWNS WHAT
3. WHY OUR TECHNOLOGY IS BETTER THAN THE CURRENT STATE OF THE ART

As the targeted call is an INNOVATION ACTION, the EC will fund not only research activities; the consortium must already have a solution and it has to convince the EC that it is the best solution and Europe has to invest on it to realise its demonstration.

#### PROCESS

1. Inventory of the possible solutions;
2. Picking a few;
3. Build innovations over these existing solutions;
4. Demonstration activities

**Kommentert [LB2]:** Remark: this method takes much more effort to demolish a construction since it has to be cut in small sections of 1m<sup>2</sup> and the method itself is a bath method which takes 10 minutes/batch. The state of the art demolition methods and recycling process is much faster and can treat up to 300000 tonnes/year per company. I think that this is in fact a weak point in the idea of implementing a circular economy: time = money , and with this method one will not reach the same efficiency. But of course, this could be the conclusion of this project: the SEL Frag method is useful for special dismantling cases but not for ordinary demolition and recycling.

**Kommentert [LB3]:** In Belgium it is also obliged to make a pre-demolition assessment: see: <http://www.tracimat.be/>

#### POSSIBLE TECHNOLOGY – SEL FRAG

Fragmentation wet process (high TRL). 1m x 1m sample of concrete goes into a water trail. It is exposed to electric fragmentation. Depending on energy you can obtain smaller or bigger pieces.

Currently the machine works with 50x50cm and it is applied to the mining sector.

How does SELFRAG feel to scale-up and demonstrate its technology in another sector?

#### ISSUES

- **TIMELINE.** The demolition works of the airport could take 3-4 years. This is not an issue as the project needs more or less the same amount of time to be demonstrated (if it will be granted).
- **BEST PRACTICES EXCHANGES.** Possible involvement of countries outside the EU. KU Leuven can organise workshops with China (travels inside the project framework) to exchange best practices.
- **MANAGEMENT PLAN.** The Management plan could also be something new, which could be developed inside the project. Inventory to check all the parts of the buildings, high risk and low-risk (i.e. if there is asbestos on the site). According to KU Leuven, in China they still need to develop a methodology to manage the demolition activities. Of course, if these activities are planned before it is better.
- **Can be runways be considered in scope with the call? Maybe ask the EU commission about the definition of buildings.**
- In Norway, currently wasted concrete is dumped in the ocean (scandals). This is a problem that could strengthen the project. This solution is really needed!!!
- **Raw materials are scarce in Norway.** Currently they are imported (i.e. most of the rebars come from China). This project will support the reduction of import from outside. It will enhance European independence of raw materials from other countries. Also, usually, EU technologies are the best from an environmental point of view.
- Do we comply with waste water reduction? To be verified.
- Less emissions because transport will be more advantageous (raw materials come from closer).
- Electricity for crushing. Separating concrete from rebars (currently on site and by electric excavators). There is a huge push on the construction machinery industry to go electric. If we develop something based on electricity we are in line with the trend.
- Too many Norwegians on board. We should do something to get one of the big four on board.
- Also we should investigate for further solutions to develop possible future scenarios.

#### THE CALL

- The Budget: 8-13 million
- C) IS APPROPRIATE

## 5. Consortium building

DEMONSTRATE A TECHNOLOGY SOLUTION AND AN APPROACH ( BASED ON 1 OR MORE COMPANIES).

Now we have one company owning one technology ( SELFRAG).



- **UPSTREAM PHASE- SUPPLY**

- SINTEF : pre-demolition environmental mapping
- KU LEUVEN + NORUT: selective demolition

- **MIDSTREAM PHASE - SELFRAG**

- SELFRAG: technology provider

- **DOWNSTREAM PHASE- VALORISATION, END-USERS**

- SINTEF+ CELSA: melting process of rebars ( control of the cleanliness of the steel);
- UNIVERSITY OF GENT -BRNO TECHNICAL UNIVERSITY – KU LEUVEN: aggregates
- MAPEI: Mix design
- LTU SWEDEN: dust (sludge recovery);
- OULU UNIVERSITY: CO2 balance;
- Who is going to evaluate? Who are the End users? Product quality validation – **NBI concrete company**. (concrete for artic climate), **BEST (concrete company)** – Czech republic; **EFDCOM**
- NORUT, KU LEUVEN: Reuse of structural elements ( beams, columns, foundations).
- **ANALYSES**
- NARVIK UNIVERSITY OF NORWAY – testing methods fine tuned to the proposed solution. Compliance with regulatory framework.
- Who is going to develop the economic analyses, the business model? Municipality of BODO? Mapei also can provide info and relevant data. Usually, the technology provider is in charge of that. If more partners will be involved, a neutral member of the consortium is advised.
- **TENTATIVE COORDINATOR**
- IRIS – they will check internally if they have HR available.
- **DISSEMINATION AND COMMUNICATION ACTIVITIES**
- A partner is needed . Consultancy or communication agency (the choice depends on the priorities of the consortium).

**Kommentert [LB4]:** Pre-demolition assessment TraciMat: inventory list of all materials present and allocation of high risk or low risk elements. High risk should be removed separately so that all the rest can be treated as low risk. This has an economic advantage. TraciMat stands for tracing materials. In Belgium, the pre-demolition assessment can be done by a demolition contractor.

## 6. Work Packages

### Work Packages

- **WP1. Project management** (usually less than 7 percent , coordinator more involved, but also other partners).
  1. PROJECT COORDINATION
  2. MONITORING OF TECHNICAL DEVELOPMENTS
  3. FINANCIAL AND ADMINISTRATIVE MANAGEMENT
  4. ORGANISATION OF PROJECT MEETINGS
  5. PREPARATION OF REPORTS
  6. INTERNAL AND EXTERNAL COMMUNICATION
  7. COMMUNICATION WITH THE EC
- **WP 2. Assess permission**
  8. SAMPLING AND MAKE AN INVENTORY OF THE SITE
  9. PRE-DEMOLITION MAPPING
  10. C&D W MANAGEMENT PROTOCOL COMPLIANCE
  11. ENVIRONMENTAL MAPPING (HAZARDOUS POLLUTANTS – PETROCHEMICALS PCVS, OILS)
  12. SPECIAL CIRCUMSTANCES FOR DEFENCE BUILDINGS
- **WP3. Design and building phase**
  1. PROCUREMENT (SERVICES /EQUIPMENT)
  2. LOGISTICS
  3. DESIGN THE SMART DISASSEMBLING OF TOOLS AND METHODS (SELECTIVE PART)
  4. DETAILED DESIGN AND HIGH ENGINEERING OF THE PROTOTYPE
  5. DUST AND SEDIMENTS WASTE WATER TREATMENT
- **WP4. Running of the technology**
  1. RUN 1 SCANDINAVIAN LOCATION 1
  2. RUN 2 SCANDINAVIAN LOCATION 2
  3. RUN 3 EU LOCATION 3
- **WP5. Evaluation of the output products ( applications)**
  1. EVALUATION OF CONTENT OF POLLUTANTS AND REBARS MELTING
  2. ASSESSMENT AND EVALUATION OF SLUDGE RECOVERY METHODS
  3. AGGREGATES ( LABORATORY ANALYSIS)
  4. 3 CONCRETE COMPANIES USING AGGREGATES COMING FROM THE DIFFERENT SITES
  5. ASSESSMENT OF THE POSSIBLE REUSE OF STRUCTURAL ELEMENTS
  6. REGULATORY FRAMEWORK – GUIDELINES AND RECOMMENDATIONS
  7. LCA - SOCIO ECONOMIC ANALYSIS
  8. TECHNO-ECONOMIC ANALYSIS
- **WP6. Exploitation, dissemination and communication**
  1. COMMUNICATION, DISSEMINATION AND EXPLOITATION PLAN
  2. COMMUNICATION ACTIVITIES
  3. DISSEMINATION ACTIVITIES
  4. EXPLOITATION ACTIVITIES
  5. WORKSHOPS AND ORGANISATION OF THE FINAL EVENT

**IDEAL SITE: ready mix plant** We need more ready mix plants and they will certainly be interested. But we need partners from other countries. European Ready Mix Organisation (congress in OSLO soon)

**Kommentert [LB5]:** No problem: KU Leuven RecyCon has contacts with several companies that can provide:

- Demolition + recycling process + ready mix concrete
- Use of fine & coarse recycled aggregates in e.g. road construction and also produce washed recycled fine aggregates to replace natural sand
- Use of recycled aggregates in precast concrete and in road constructions

I will send the coordinates of some companies to Alessia