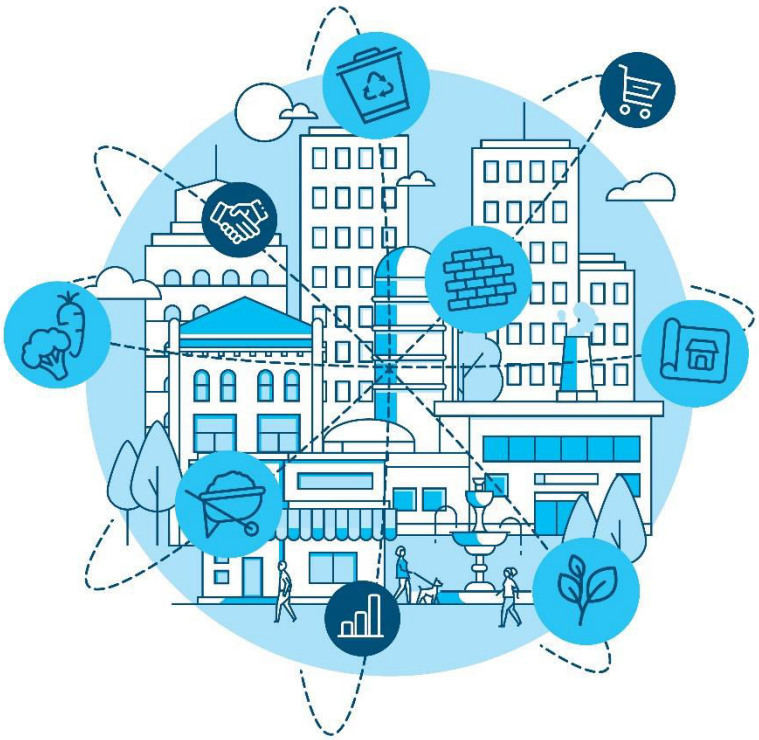
Material banks and marketplaces in Bodø

Extract from the Demonstration Report

Bodø, Norway



Contents

This text describes Bodø's experience in physical material banks and digital marketplaces. The sections come from Bodø's CityLoops demonstration report available here.

Introduction

Soil and mass management

Soil strategy

Soil and mass management is an important topic in Bodø, with low availability and long transport distances of quality masses and large amounts of traffic and direct CO2 emissions from mass handling in projects. Little is reused today due to the lack of systems in public procurements and logistics systems for reuse between projects.

Bodø municipality is working on a mass handling management strategy document and a mapping of predicted future masses and mass needs. The CityLoops Instrument for predicting soil production is used to predict soil amounts. The sustainable soil management roadmap is in combination with other Norwegian guidelines used for the mass strategy.

Logistics system

Another Norwegian municipality, Bærum Municipality, has been working to design a logistics tool to connect all stakeholders in mass management. Bodø municipality is in close contact with the project management and discuss to test the system in 2023 for Bodø's internal infrastructure projects.

Intermediate storage facility

- Need for intermediate storage and sorting space for soil and masses to allow their reutilization within and between projects.
- Existence of an area close to Bodø city centre that can potentially be used for four to five years before it will be regulated for industrial use (soil is still setting)
- Applied for a concession to manage and store masses without heavy contamination (up to Norwegian contamination classification 3)
    - Accepted by municipality and environmental authorities in 2022.
- Included rights to use the storage area in application for road renovation project in city centre (Sjøgata). The project will run 2023-2025
- All respondents on the project proposal (Sjøgata) wanted to use the intermediate storage area for improved soil and gravel reuse.

Reuse market

- Evaluating best solution for establishment of reuse material marketplace in Bodø
- A marketplace operated by the municipality is not a good option – due to regulations hindering municipalities from providing competitive advantages. Operating as a subsidized marketplace in competition with material retailers is troublesome.
- The waste company of the Bodø region, Iris Produksjon, is a commercial company (with municipalities as their shareholders) has established a physical marketplace close to the city centre. CityLoops has been involved and has helped to design a system and set up a pilot (if timespan allows).
- Iris is applying for financial support for a three-year project to establish a digital marketplace for materials.
- During stakeholder communication (workshop by Bodø municipality among others) pilot building projects have been identified for piloting the marketplace
- Iris and Bodø municipality have been in contact with national networks and competence to learn from them and design the establishment process.
- Dialogue with multiple digital platforms to evaluate the best digital options.
- Evaluating possible municipal (and other) locations for setting up a temporary intermediate storage for building materials

Circular material management processes of Bodø military airport

In the large-scale demolition project of the military airport large amounts of materials and structures need to be managed. With such large scale and complexity, it's important to have general requirements for selective demolition, establish a central recycling plant and logistics facility to prepare the CDW to be delivered to new constructions, and establish a marketplace for reused and recycled materials. The goal of demonstration action one in Bodø is to reduce demolitions and waste as much as possible by renovating and repurposing buildings, integrating circular thinking into procurement and embed circular and sustainable practices in the demolishing strategy in the New Airport / New City project.

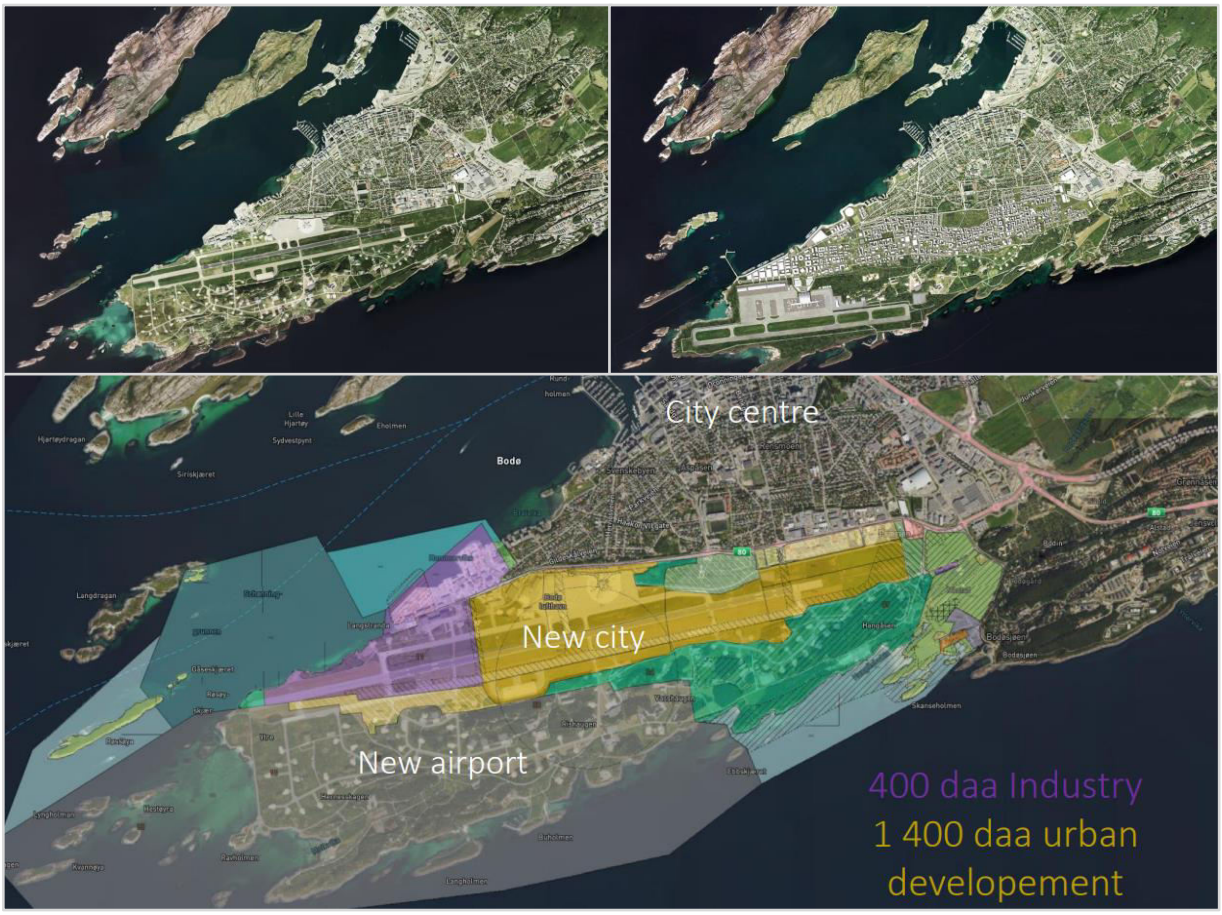


Figure 3 City today (up left); City after relocation and new city district (up right); illustration of area is to be regulated to a civil airport, and which is to be regulated to a new part of the city.

The illustration above shows an overview of the city today, the planned city after relocation of airport and construction of the new city district and a description of the plans. Bodø Municipality will be the owner of the land, structures, soil, and other resources that are freed in the process. CityLoops in Bodø has developed, tested, and implemented tools and methods that support the goal of doing this in the most circular and sustainable possible manner.

Soil databank/marketplace

For the actual soil management in projects the construction companies are the ones responsible for soil management in each project. They are commonly working from project to project and are not well connected or informed about parallel projects. Most soil is therefore deposited in the landfill outside of Bodø city (IRIS). This drives the

cost of projects up, but lack of systems for reuse and increased risk makes landfilling the most used method.

One of the large barriers for reuse is the lack of knowledge of options. Bodø therefore has evaluated options for establishment of databanks or marketplaces to match surplus and need for soil.

Goal for databank: To give overview of future and present available surplus soil and locations with need for soil, to enable a market for transfer of soil between projects.

Identified requirements for databank:

- Estimated for surplus soil, with location, volume, quality, contamination, and timeframe for availability.
- Estimated need for soil, with location, volume, quality, timeframe, and permission to receive soil.
- Contact information between projects (or chat function etc.)
- System for tracking soil transfer between projects (to avoid illegal reception)
- It should be designed to allow establishment of a market for the soil (with prices and logistics)

There are currently no available market systems meeting all the requirements (in Norway), but a few databases software options meeting some. There is also one system under development by another Norwegian municipality, under an initiative called Bærum Ressursbank. This is an initiative to create a network for best practice for soil management. Their soil market system is being developed to meet all the above requirements. It will be available for testing from mid-2023.

Bodø municipality has been working to establish close contact with Bærum Ressursbank to be one of the pilot cities to test the market system. Through meetings, discussions, and active involvement in the competence network, Bodø has been able to establish a close connection. It has also resulted in the establishment of a local soil competence network in Bodø, which will also work to include private actors to use the market system.

Figure 9 Description of Bærum Ressursbank marketplace criteria. More information at Bærum Ressursbank webpage.

Bærum Ressursbank has worked to design the market system since 2019 to make sure to include all the stakeholders in the value chain and work within all relevant regulation. A description of the system can be seen in the illustration above, created by Bærum Ressursbank. CityLoops has not been involved in the system but has facilitated for Bodø municipality to test in our projects. Bærum Ressursbank is working to make the marketplace available nationwide, and Bodø wish to assist in the ambitions.

In addition to Bærum Ressursbank market system, Material Mapper, the software described under section 4.4.2 for soil prediction can also be used as a soil marketplace. Material Mapper has the ability to automatically detect projects and make generic estimates of surplus soil volumes, where all the projects are collected in a map functionality with contact information. It also has a marketplace functionality where projects can offer soil and give the necessary information about quality, contamination, available volumes and when it will be available, and give climate

footprint calculations. It also has chat functionality for communication between projects, order transport and order some documentation.

At the time of the purchase of the marketplace it is however evaluated to not be suited for full scale use, as the systems for documentation of contamination and traceability is not good enough to keep track of poor soil management, contamination, and illegal landfilling. The systems for ordering transportation and some documentation through the system are also not compatible with municipal requirements for public procurements. The system can however be tested on a case-to-case basis.

Bodø municipality will keep working with Material Mapper to improve the functionality for municipal use. The focus will however be on Bærum Ressursbank marketplace, as the system has a more thorough approach and is more likely to become a widely used software across the country.

More information about other functions of the software under chapter 4.5.2 Digital marketplace and construction material tool.

Intermediate storage for soil

Optimally soil should be transported as short distances as possible and only be unloaded once, back in the project it came from or directly reused at another destination project. Supply and need for soil do however often not match in time, making intermediate storage a necessity. Space for intermediate storage is often scares in urban construction projects, making external intermediate storage necessary. In Bodø there are few central areas suitable for soil storage, and it is challenging to find good options.

In the overall municipal area plan (Kommuneplanens arealdel) for Bodø four areas are reserved for intermediate storage for soil. Neither of the options are, however, central, or practically useful without cleaning, and establishment of infrastructure for heavy transport and operation.

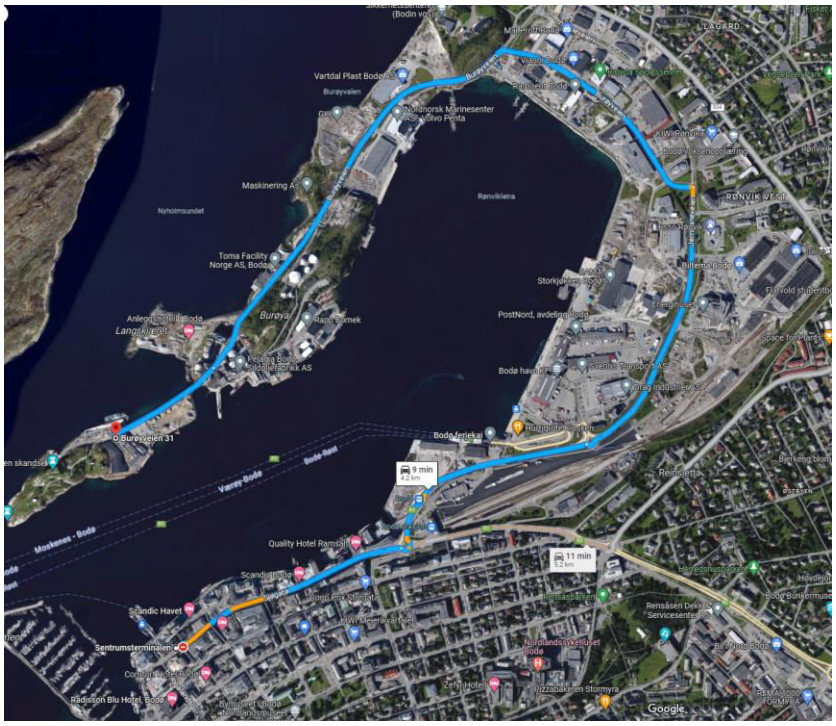


Figure 10 Map showing the location of Burøya intermediate storage. The storage is 3-4 km by road, or less than a kilometre by boat from the road construction project in Sjøgata in Bodø city centre.

There is a need for more central and suitable intermediate storages, as well as more experience with the establishment of new and temporal intermediate storages within the municipality.

At Burøya, close to Bodø city centre, an available location was identified as suitable. The area is municipally owned land that is filled out in the sea for establishment of an industrial area. The infilled soil needs to be settled for four to five years before it is considered stable enough for construction. Until it is settled it has a great location for soil management. The location is shown on the map above.

To use the location for intermediate storage it needed concession from environmental authorities (Statsforvalter). The intended use and operation were described in an application process that was answered and approved within a few months. The area was approved for intermediate storage of clean and slightly contaminated soil (up to grad 3 in the Norwegian system (going from 1-5)). Because of the settling of the soil, an important constriction was added, not allowing to fill more than 1,5 m in height.

The road Sjøgata in Bodø city centre has been dedicated as a pilot construction project for the airport and new city district for implementation of circular and low emission measures. In the tender, the intermediate storage at Burøya was made available for construction companies to use, with a general criterion for the project

that all reusable soil from the project was to be reused. The project will undergo from 2023-2025.

Some barriers turned up when intending to start using the storage, which has postponed the operation. Establishment of construction roads was more challenging than expected because of the ground conditions, making it a large investment for the construction project. The height restriction of 1,5 m storage piles also makes the operation more area intensive, with consequences for the practical operation of the site. The municipality is currently looking for models to cooperate with the construction company to establish the necessary infrastructure.

As a consequence of not being able to use Burøya, the option of establishing intermediate storage at the local landfill site came up as a good alternative. Priorly this was only used as a landfill site, but operation of an intermediate storage has now been established. The storage is further from the city centre than preferred, but it is a good alternative to the prior linear approach. The co-location of landfill and intermediate storage also gives some benefits, as less investment and operational costs are needed because the site is already operational. It is also possible to leave the soil in the intermediate storage while waiting for lab results for contamination, potentially allowing more reuse of soil that would otherwise be landfilled because of uncertainty. Much of the soil in Bodø is contaminated and needs landfilling with today's regulations, and the intermediate storage makes it possible for the transporters to bring soil back to the project when going to the landfill, reducing transport of new soil.

The options for intermediate storage are further described in the CityLoops Bodø's Business Case.

Gathering and digitalizing data for reuse or recycling + use as material passports + marketplace

Digital marketplace and construction material tool

Bodø Municipality has started to use the software Material Mapper. The software was intended for use for soil prediction and management but does also have multiple functions for digital overview of materials and waste in upcoming constructions, as well as a marketplace for reuse of materials.

Reuse mappings: The software collects information about upcoming construction projects in Bodø automatically from public documents. Among the documents collected and digitalized are reuse mappings. As of now reuse mapping is not common practice, but this will be implemented by rule in future projects. This function can give an overview of reusable materials in multiple upcoming projects before they are demolished. The information can be coordinated with construction projects along the same timeline for direct reuse. It can also give an overview of types of available materials on a city level. The functionality requires digitalization of PDF reuse mappings. It is a new function and is yet to be tested.

Material estimation: The software also estimates material use for a new construction project, based on statistical data of material use in historic projects for similar building types. This information can give an interesting overview of material consumption in the city and for the potential for improved circularity. Included in the estimator is also a CO2 calculator.

Waste estimator: Also based on statistical waste data from construction and demolition projects, Material Mapper has implemented a waste generation estimator for the upcoming projects (construction, rehabilitation, and demolition). The estimator has been compared to waste “budgets” required in the planning phase of projects and has proven to be more accurate than the budgets in a majority of cases.

Material marketplace: Materials from the reuse mappings or other reusable materials can be offered to others through an integrated digital marketplace. The marketplace is currently created for soil and masses but is under development for other construction materials. Bodø municipality are interested in testing the marketplace for reuse of municipal furniture to see if it is functional for larger scale use of building materials.

Physical material banks

At the beginning of the CityLoops project there were no initiatives for reusing construction materials in Bodø, other than unregulated sales by households through Facebook groups and the national marketplace for used items, www.finn.no. There is local production of concrete (with cement produced in Nordland County) and asphalt, and there is a relatively large wood industry in the region. Other than that, close to all construction materials are imported. With large distances to the rest of Norway and Europe, import implies long transport distances and high emissions and costs.

CityLoops in Bodø has worked to understand the status and readiness of the market for new reuse options and facilitate the establishment of a reuse market. In addition, an important work to develop internal procedures for material planning and reuse mapping in the municipality has been important for the work of CityLoops in Bodø.

Reuse market

The work to establish reuse market was done through stakeholder involvement, market analysis for digital and physical options and discussions with relevant stakeholders in an establishment.

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- Iris is applying for financial support for a three-year project to establish a marketplace for materials.
- During stakeholder communication (workshop by Bodø municipality among others) pilot building projects have been identified for piloting the marketplace
- Iris and Bodø municipality have gotten in contact with national networks and competence and learn from them to design the establishment process.
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- Evaluating possible municipal (and other) locations for setting up a temporary intermediate storage for building materials

Early 2023 Iris opened the marketplace for construction materials as a small-scale pilot. To minimize risks and gather experience the marketplace was started together with a small construction project that would use reused products for interior materials, such as doors, indoor windows, wall panels, flooring, roof materials and furniture such as sinks, toilets and such. They also teamed up with donor demolition projects with collaboration agreement to test how the marketplace can work, as well as with demolition and construction companies who can deliver their reusable materials to the marketplace.

Iris rented a small space with possibilities to expand the rental area. The location was strategically chosen close to large retailers for new construction materials – reducing the barrier to stop by the reuse market.

The plan is to slowly scale up other projects as well, and they have agreement with larger construction projects down the timeline. The plan is to have an operational market where they coordinate materials between projects and receive and sell reusable materials to customers, in addition to a more passive role with rental of intermediate storage space for customers who want to store materials for future reuse.

CityLoops Bodø has participated in the planning process, and Bodø municipality is participating with a test case and donor building in the demolition and construction of Løding school. For the project of Løding school some parts of the interior of the building have already been removed by efforts from Iris Salten and Bodø Municipality as an initiative from CityLoops

Bodø Municipality has spared resources as the financial burden of tearing down materials and removing interior is moved to IRIS. Furthermore, this results in Bodø Municipality not having to allocate resources for handling waste in this project. This initiative also stimulates both Bodø Mun. and IRIS ambitions of increasing the degree of circularity in waste handling. IRIS is donating the materials and interior to Kirkens Bymisjon, a local charity – that also ensures the social sustainability aspect of the project.

Phases

In the process of developing physical material banks and digital marketplaces, there are a number of steps that must be taken in order to design a successful outcome; these steps can be adapted to various local circumstances.

Spot the problem. For the creation of physical material banks and digital marketplaces, a thorough understanding of the requirements is essential. While physical space is required for the storage of physical material banks, the issue with digital marketplaces may lie in their scope, dissemination, and the need for someone to keep it up to date. However, for both physical material banks and digital marketplaces, resources (technical, physical, economic, human, etc.) for running their operations and assuring continuity is a shared common challenge.

Find a group of collaborators. People can contribute expertise, knowledge, and perspectives to the creation of physical material banks and digital marketplaces; therefore, a combination of broad knowledge, experience, experts, and inter-disciplinary teams is of great value during this phase.

Establishment of commitments and objectives. Once a team has been formed, it is necessary to determine everyone's commitments and objectives, as well as the project's ambitions and ambition levels.

Negotiation and ideation. Sharing responsibilities and duties, as well as discussing the benefits for each stakeholder, will ensure the stakeholders' prior commitments. In this phase, it is essential for the group to engage in a variety of creative and innovative discussions and to be open to suggestions that may or may not have been tested previously.

Planning. Once there is an idea and responsibilities and benefits have been established planning takes place. Management of time, dates, data, and resources can shape the way forward to develop those physical material banks and digital markets. Communication is critical, establishing a channel of communication and sticking to the plan must be a priority. However, some unanticipated problems may arise along the way, and the group should ideally be open to modifying and enhancing expectations and procedures; if possible, it is prudent to allocate additional time for deviations.

Implementation. This is the hands on the job part, actions following plans and creative problem solving developed in previous phases will help to apply the knowledge for the development of markets both digital and physical, As stated previously, some deviations may occur, but a strong and resourceful group of

collaborators can find solutions. It is important to build resilience and to dare to test, this practical part might entail some failures, learning from failures is good and provides us with important knowledge we would not have gotten otherwise.

Evaluation. Either after having finished the project or as a continuous step involved in several phases, evaluating milestones, and comparing it with expectations can provide us with a picture of what went better than expected and where we need to improve. This plays an important role for continuous improvement and serves as a guiding tool for future replications as well.

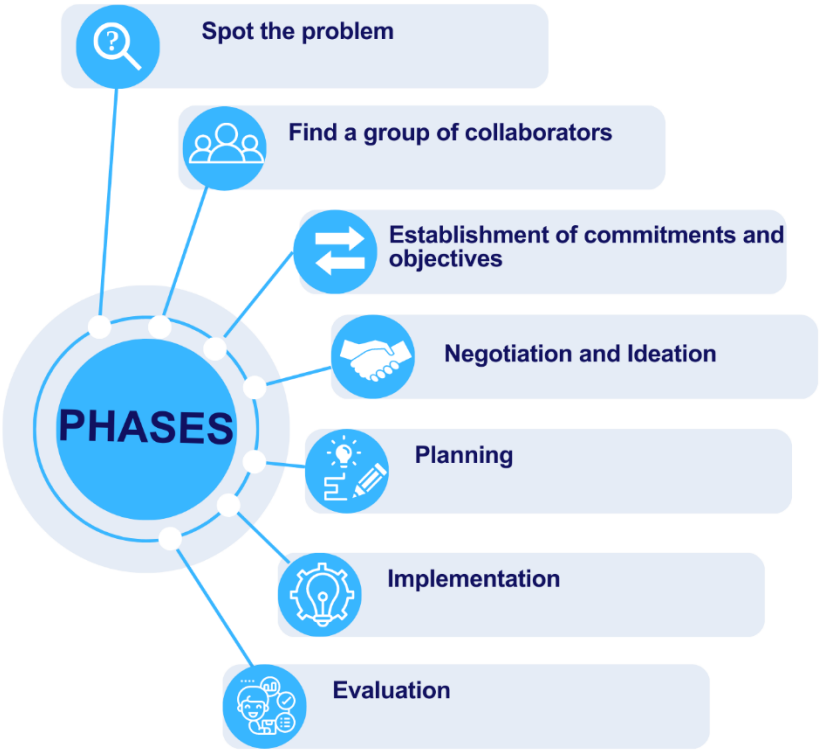

Figure 11 Physical material banks and digital market phases general phases.

Conclusion

Physical Material banks. Creating a physical material bank is not an easy task but material banks are necessary to store materials and keep them readily available for their future use, they may imply costs, logistical work, technical regulations, feasibility evaluations and they need to be logistically close or as close as possible to their source or destination in order to diminish emissions that could be caused of transport of materials for instance. Coordinating and involving different stakeholders like in the case of Iris with authorities and other stakeholders has proven to be beneficial.

Digital marketplaces. Today there is a diverse offer of online services that function as digital marketplaces, however their development depends on their dissemination and legitimization. In the case of Bodø, material mapper has been of great help for data development but there is still a way forward to create a digital solution, and this solution have to be adequate for the city's needs based on its waste stream information and availability of materials.

CITYLOOPS

CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and bio-waste, where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and soil, and bio-waste, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspects of CityLoops are stakeholder engagement and circular procurement.

CityLoops started in October 2019 and will run until September 2023.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821033.