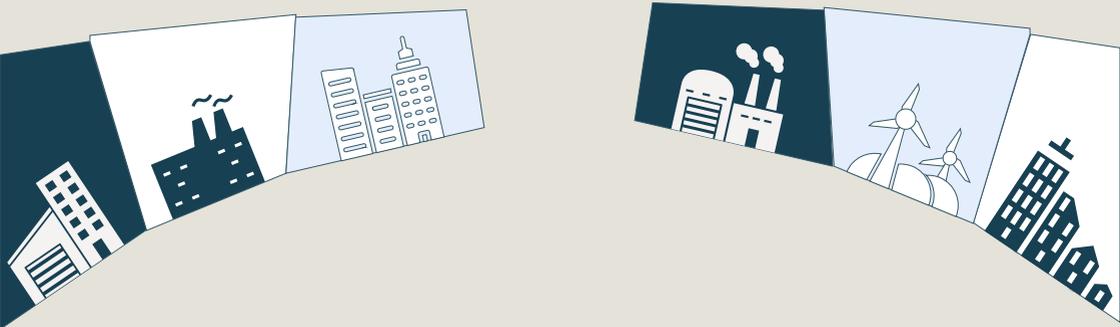


An aerial photograph showing a wide river with a rocky bed, flowing through a lush green landscape. On the right bank, there are several large buildings with red roofs and a road with cars. The left bank is mostly green with some paths. The overall scene is bright and clear, suggesting a clean environment.

An Innovative Future

Knowledge Bridge Projects
2021-2024

Clean - The Danish Water & Environmental Cluster



Knowledge and collaboration accelerate green innovation

Knowledge Bridge Projects

Case catalog of Knowledge Bridge projects carried out with funds from the cluster grant "Innovation Power Environmental Technology 2021-2024".

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Since 2021, Danish water and environmental technology companies have had the opportunity to obtain funding to enter into collaborations with a number of research institutions and GTS institutes through our Knowledge Bridge projects.

The companies have gained access to specialized knowledge and advice from the knowledge partners and converted this into new ideas, solutions, and products that have strengthened the companies' innovation and growth potential.

In addition to each project creating value for the participants, the Knowledge Bridge projects contribute to building bridges between water- and environmental technology companies and knowledge centers.

For 4 years, Clean has distributed just over DKK 11 million through six rounds across the cluster's five thematic focus areas.

This has resulted in 42 projects, all of which have promoted and accelerated the development of technologies and solutions that enhance companies' technological development while also having a positive impact on the environment.

In this catalog, you can meet 25 selected projects and be inspired by their solutions.

Happy reading!

Michael Johansen
Development Manager
Clean – The Danish Water & Environmental Cluster

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Our focus areas guide our work

Water- and environmental technology covers a wide range of technologies, that limit or correct the negative effects that our modern society has on the environment and climate.



Waste, Resources & Materials

Materials play a central role in the green transition. It is essential to promote sustainability and view trash as a valuable resource.



Water in the Technosphere

Denmark is a world leader when it comes to 'water in pipes'. This includes both solutions and products in relation to water technology.



Climate adaptation

Climate adaptation is a societal challenge that requires a holistic approach to secure cities and infrastructure.



Air

CCUS, emissions, and greenhouse gases are challenges that affect the planet. They can be solved with tech, knowledge, and collaboration.

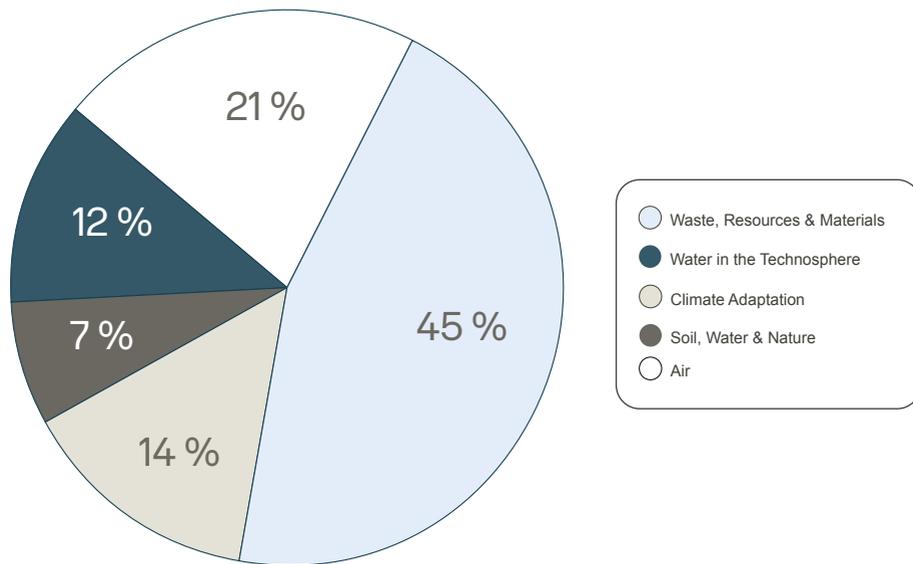


Soil, Water & Nature

The soil, nature, and biodiversity have great innovative potential within measurement, purification, and restoration.

Knowledge Bridge in numbers

The Knowledge Bridge projects have helped to bring knowledge and know-how into play between companies and knowledge institutions. Figure 1 shows the distribution of projects based on our five focus areas.

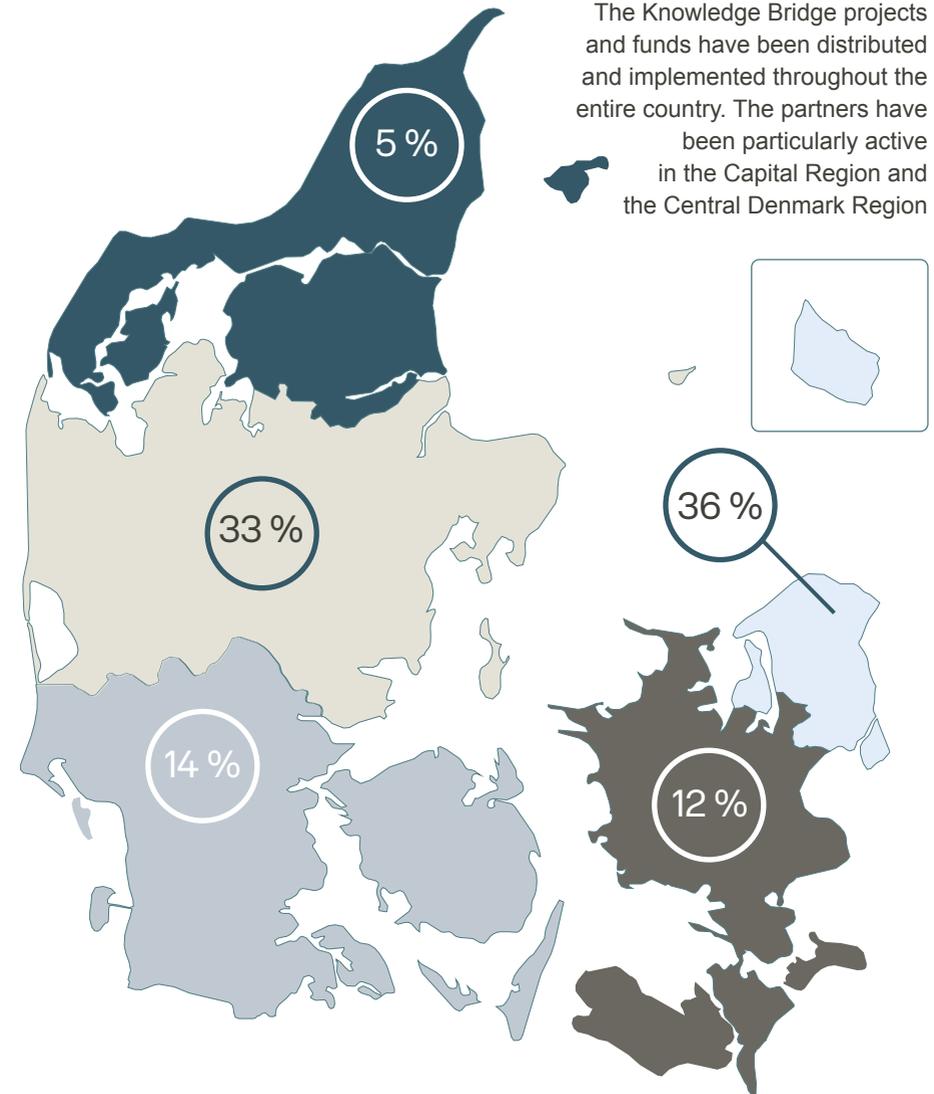


A large proportion of the projects have been about circular economy and resource utilization. Next comes air as the area where the most knowledge has been transferred to companies

A number of projects have worked within several focus areas, and we see strong synergies across them. The figure shows the projects' primary focus area.

Bridge building and knowledge across Denmark

The Knowledge Bridge projects and funds have been distributed and implemented throughout the entire country. The partners have been particularly active in the Capital Region and the Central Denmark Region





Case Collection

On the following pages, you can explore a number of cases that show the results and solutions of the projects.



Resources

MurstensRenser ensures reuse of used bricks

MurstenRenser

The environmental impact of building materials poses a huge challenge, while demand for recycled materials is increasing. Fr. Petersens Maskinfabrik in Broager, in collaboration with the Danish Technological Institute, has accelerated the development of an automated brick cleaner.

Duration

Oct '21 - Jun '22

Partners

Fr. Petersens Maskinfabrik
The Danish Technological Institute
Scan-Viasn

The project aimed to generate knowledge about and develop a mechanical and automated machine for recycling bricks.

The concept is simple but innovative. Instead of cleaning mortar manually, the machine can do it faster and automatically. With help from the Danish Technological Institute, the machine factory has achieved a proof of concept for their solution.

In addition to a proof of concept, the project has also expanded the network and unique knowledge to the machine factory.

With this project, MurstenRenser has gained critical knowledge about technical conditions, helping bring the solution closer to market launch.

The project has given us new perspectives and approaches that can help further develop MurstenRenser.

- Anders Melchiorson, CFO, Fr. Petersen Maskinfabrik

The solution can help improve the environmental impact of construction positively by reusing more bricks. Simultaneously, it can help reduce CO2 emissions as fewer bricks need to be fired



BioFrass creates natural plant protection

An innovative collaboration has generated knowledge about BioFrass' properties as a pesticide-free plant protective agent for horticulture

The project focused on significantly improving plant weight and health by using the natural product BioFrass.

BioFrass is made from insect residues and when mixed with bacteria, it can boost the plants' immune systems.

The project has created great value for Queen Genetics and BioInsect. The results showed that the bacteria that were best at resisting fungal attacks have not yet been approved by the authorities for use in nurseries

One of the best results we got was that when we mixed frass with the bacteria, then the plants grew better than the control plants. It simply provided extra nutrition for the plants.

- Neda Nasiri, Consultant, Danish Technological Institute

In the future, the partners will look even more closely at the properties so that approval can be granted.

Until then, the collaboration has shown how combined expertise can lead to solutions and knowledge that benefit the environment and businesses

Duration
Aug '23 - Jul '24

Partners
Queen Genetics
Danish Technological Institute

BioInsect

Effective protection of groundwater against pesticide residues

Protecting groundwater from pesticide pollution by establishing bioremediation barriers

Pesticides in groundwater are a known and growing challenge, with the search on for more effective and less environmentally harmful cleaning methods. Here, a Knowledge Bridge project has gained insights into underground treatment zones.

Duration

Nov '21 - Aug '23

Partners

TEMCompany Ejlsvov
Danish Technological Institute



The project aimed to investigate microorganisms and geological potential for underground treatment of pesticide residues to protect local groundwater.

In the project several relevant pesticides were assessed for their potential for microbial degradation.

Based on a screening of the literature in the field, the Danish Technological Institute conducted a series of laboratory tests that investigated how the pesticides could be degraded in oxygen-free environments through the use of microorganisms.

The results of the project have provided the foundation for new ideas and strengthened the relationship between the partners for future collaboration.



Sorting and recycling of textile waste

The textile industry is one of the most environmentally damaging industries in the world. Therefore, it is crucial to utilize textile waste in a value-creating way.

TechKnow and HAACK Recycling both work with textile waste.

TechKnow pre-sorts waste streams and HAACK Recycling shreds textiles into new products. Through the project, both companies have developed their solutions and market potential.

TechKnow developed their technical facilities so that the waste fraction of textiles reached 92% purity. Furthermore, they have investigated possible solutions to ensure the dryness of the waste textiles so that mold cannot thrive.

HAACK Recycling has sourced portions of the textiles from TechKnow for use in the production of acoustic decorative modules for both private and commercial markets.

With help from the Danish Technological Institute, they tested and evaluated their product so that it could be fully developed for commercial use.

Both companies have benefited from the project, which has helped expand their network, knowledge, and significantly enhance the value chain and recycling of textiles.



Photo: TechKnow

Duration

Jan '21 - Dec '22

Partners

TechKnow HAACK Recycling
Danish Technological Institute

Upcycling of textiles for lamps

With a focus on reusing larger amounts of textile waste, Eseba has created an innovative product, where you can replace PVC with textiles in lamp screens.

Startup company Eseba has developed a solution by using textile waste and remaking it into a hard material that can be used to produce for example, lamps, chairs and similar products.

Together with DTU and lamp designer Tom Rossau, Eseba has gained a strong foundation to further develop a circular product.

The concept is that the material hardens through a process where organic chemistry is utilized as a replacement for PVC-coated paper.

The feedback and experience gained, Eseba and Tom Rossau, have shares with DTU, which have had a central role in the project. They have contributed to developing a frame that makes it possible for textile material to harden.

At the same time, Eseba has created a platform for the use of organic chemistry through the project collaboration with DTU.

The partners experience exchange and collaboration have resulted in the development and sale of a new lamp model to customers.



Duration

Apr '24 - Nov '24

Partners

Eseba DTU Tom Rossau



Photo: WOHN A/S



A circular and cheap solution on housing shortage in cities

Turn waste into homes

With inspiration from the Tiny House – movement, WOHN has created a cheaper and more sustainable solution on the housing shortage in several cities by 3D-printing houses from waste plastic and sawdust.

Duration

Oct '21 - Dec '22

Partners

Danish Technological Institute
FireEaters
DBI
WOHN

Through the project, WOHN has developed further and documented their solution regarding building regulations with help from DBI and TI.

Using waste plastic and wood to 3D print houses reduces the carbon footprint of construction and is cheaper than steel and concrete.

The solution can help cities such as Copenhagen, Odense, and Aarhus with housing shortages, where circularity is built in from the start.

A 3D-printed house of just over 20 m² costs around DKK 300,000, and after a 50-year lifespan, the houses can be reused to build new ones.

For every 20m² of housing, we convert 4 tons of plastic waste and save 15 tons of CO₂ compared to traditional construction.

- Morten Bove, Director, WOHN

The project has been a great help to WOHN, enabling them to improve their choice of materials and printing parameters so that the first houses can be launched on the market within the next few years.

Improved air measuring with micro-sensors

Multi-calibration system for microsensors for air quality monitoring

22.000 healthy years of living lost

Bad indoors climate result in approximately 22.000 lost healthy years of living in Denmark. 2/3 of the lost years of living is due to particle pollution.

(Sundhedsstyrelsen, 2023.)

Duration

Jun '22 - Jun '23

Partners

FORCE Technology
Leapcraft

C. K. Environment



The demand for efficient and affordable air sensors are increasing. As a result, more people want to be able to monitor indoor climate and air quality.

The challenge is that many sensors do not meet the same quality as official measuring stations.

Therefore, the project aimed to develop and create a micro-sensor that could measure various gases and air particles.

The partners built a calibration chamber and developed the necessary software which has significantly reduced the complexity and cost of sensor calibration.

Leapcraft and C. K. Environment have provided sensors and data for testing and software

This has paved the way for more efficient functional testing, making it cheaper to calibrate and develop low-cost sensors for air quality measurements in the future.



Algae plastic and its properties

Compostability and carbon fixation of algae plastics

Algae could be a new alternative to fossil materials in the plastics industry. This project investigated the properties and degradability of algae plastics.

The project has investigated the properties and potential of algae plastics to absorb and break down carbon.

Together, the partners have gained valuable insights into the development of algae plastic so that it can also be home-composted according to current standards. In the future, algae plastic could therefore become an obvious alternative to fossil-based materials.

One of the project's most successful activities was the composting tests carried out in laboratories, which clearly showed the potential of algae.

Another important learning from the project was that the composition of the algae plastic with fibers can influence its composting time.

The Knowledge Bridge project raised Dansk Algeplast's product from TRL 2 to TRL 4-5 and the results are used by the start-up company Dansk Algeplast to further develop and strengthen both the product range and knowledge level.

The goal with the algae plastic is to get it to the commercial market and thereby contribute to reducing the environmental footprint of various industries.



Duration

May '24 - Oct '24

Partners

Danish Seaweed Danish Algae Plastic
Danish Technological Institute

A dike system to protect against flooding

HiddenDyke - hidden, flexible dyke solution

DKK 406 billion in economic losses

An estimate from DTU in November 2024 shows that the damage costs of flooding are expected to be around DKK 406 billion in Denmark.

(Halsnæs et al., 2024)



Photo: HiddenDyke

Compared to permanent dikes, HiddenDyke does not require much space as it is hidden

- Director of HiddenDyke

With storm surges and flooding becoming more frequent in the future, there is a need to rethink coastal and urban protection. That's why HiddenDyke has developed an effective dyke solution that does not spoil the view. In collaboration with DTU, a proof of concept was created.

The EU has predicted that flooding could cause up to €25 trillion worth of damage by 2050. To address the challenge, HiddenDyke developed a semi-permanent solution that can protect urban coasts and harbors from flooding without disturbing the local environment.

When a flood warning is issued, the HiddenDyke system with anchors fixed to the ground is installed and air is pumped in instead of water.

It is a faster and easier solution than traditional water tubes.

Together with experts from DTU Construction, the partner group tested small-scale models of the system in 2022, which provided a proof of concept and greater knowledge about the system's properties.

Today, the solution is being developed with support from InnoBooster, and full-scale tests are planned in port areas together with the Emergency Services in Southern Jutland.

At the same time, HiddenDyke's solution is being tested in the Interreg Germany-Denmark project 'DANGER 112'.

Duration

Sep '21 - Dec '22

Partners

DTU Construct	HiddenDyke	Nordiq Group
HedeDenmark	ViaCon	6 th Sense Solution

Recycling of plastic-aluminium composites



Used signs from shops are often made of plastic-aluminum composites, called sandwich panels, which are complicated but desirable to recycle.

Through the project's feasibility study, the project partners demonstrated that the sign material could be separated and recycled with economic benefits for the entire value chain.



Duration

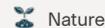
Nov '21 - Dec '22

Partners

Danish Technological Institute
Prounit Frames

Bendixen
Vink Plast

Power center Grindsted



A group of partners have investigated electrolytic water purification with heat recovery of contaminated groundwater near Grindsted.

After an educational process and success in breaking down vinyl chloride, the partners established CleanLab Grindsted to ensure the project's work is anchored and used in the future.



Photo: Billund Kommune

Duration

Mar '23 - Mar '24

Partners

Aalborg University
GEV Holding
Electrocell Europe

Region of Southern Denmark
GeoDrilling
ATES



With knowledge & collaboration we create innovation





Resources

Waste sorting with robotic arm and AI

Robotsortering af blandet byggeaffald

One of the construction industry's biggest challenges is documenting the sorting rate of mixed construction waste to meet regulatory requirements. With AI and new technology, Solum may have found the solution.

Duration

Apr '24 - Oct '24

Partners

DTU

Solum

Roskilde Municipality

Trap Rose & Ekblad

Only 10% of construction waste is currently recycled, but the potential is far greater. That's why Solum near Roskilde has invested in a robotic system that can optimize sorting.

Using robotic arms and AI, the system is able to scan and sort the waste into clean fractions that can be easily recycled.

As part of the project, Solum has tested the system and had an LCA calculation model prepared by DTU, which documents the system's efficiency and its potential to contribute to a more circular economy.

The results show that the system sorts almost six times better than manual sorting.

The project gave us important knowledge that can tell us how much better robotic sorting is than manual sorting.

- Anne Dorte Fethers,
Development Manager, Solum

The calculations showed that robotic sorting can reduce CO₂ emissions by approx. 150 kg per ton of waste.

This data has given the partners a strong basis for further development and optimization of the plant for the benefit of Solum and Roskilde Municipality.

A repeat of the project is already planned to achieve further improvements.

Upcycling bread scraps - From food to fuel

New way of upcycling bread waste



+ 800,000 tons of food waste annually

According to the Danish Environmental Protection Agency, we throw away 873,014 tons of food in Denmark. This happens at all stages from producer to consumer. (Fødevarestyrelsen, n.d.)

Duration

Apr '22 - Dec '22

Partners

DTU Food
Biotrans

G2B BioSolutions
Easyfood

GG2D

Instead of throwing out bread after its sell-by date, it can be converted into bioethanol. An alternative fuel that can minimize fossil emissions.

Through the project, biotech company G2B BioSolutions has created the basis for the development of a larger GUDP project.

The biggest challenge with industrial bread is often the high humidity, which is a breeding ground for mold. Once there is mold, the bread cannot be recycled.

The project is a good start for larger projects. It has helped a lot to see the potential for everyone.

- Mohammad Amin,
Associate Professor, DTU Food

Together with DTU Food, G2B BioSolutions mapped methods for optimizing the lifespan of bread on shelves, which is now part of the basis for the further development work via the GUDP project.



Water

Innovative solution at hydrogen sulphide in wastewater

Development of computerized electrocoagulation for H₂S control in wastewater systems



It is very valuable for us as a company to participate in projects that increase our knowledge level.

- Lasse Majgaard Hansen, Project Manager, AL-2 Teknik

Hydrogen sulphide is a key issue in wastewater. It smells bad and can cause corrosion of wastewater pipes. Removal often requires the use of additional chemicals and incurs higher costs. To solve the challenge, the project has developed a promising solution: computerized electrocoagulation.

Wastewater treatment plants often spend many resources on hydrogen sulphide challenges in the sewage system, and the problem is expected to increase in the future.

Through the process, the companies have gained access to experts at Aalborg University and the Danish Technological Institute, who have contributed with new insights and proposed solutions.

Through the Knowledge Bridge project, the partner group has developed and investigated electrocoagulation and its capabilities.

At the same time, the partners have created a prototype and pilot plant located at Aalborg University that students can use for experiments and education.

In short, electrocoagulation works by applying electricity to iron plates, which releases iron ions that react with organic matter and combat hydrogen sulphide formation.

The project showed promising results for the technology to be used in areas with small volumes of water, where there are often also challenges.

Duration	Partners		
Nov '21 - Dec '22	Aalborg University Technological Institute	AL-2 Teknik Sulfilogger	Silkeborg Forsyning Mariagerfjord Vand



A detailed insight into the properties of rainbeds

Microbiological potential in rain gardens

There is an increasing focus on the role of cities in relieving the sewer system through nature-based climate adaptation solutions. Rainwater gardens have great potential that can be utilized to achieve treatment requirements for locally derived rainwater in urban environments.

Duration

May '22 - May '23

Partners

VIA University College Byblomst
Silkeborg Forsyning Byggros



Byggros on Funen has set up a number of innovative pilot scale setups to test plants, media, microbiology and water quality from inlet to outlet. The aim has been to learn more about the purification effects in rain gardens.

Throughout the process, the microbiology and filtration effects have been measured and assessed. This has given the partners greater insight into the effects and the hope that it will eventually be possible to document how plant compositions, organisms and soil interact in water purification.

LAR-beds can help to collect rainwater and increase biodiversity locally - for the benefit of the sewer and the citizens, who get something of aesthetic value to look at.

We constantly need to get better and smarter. That's why a Knowledge Bridge project with VIA was super relevant to us.

- Mette Lorentzen, Director, Byblomst

The Knowledge Bridge project has added an extra layer of knowledge to e.g. Byblomst, which has now gained greater insight into choosing plants that can help compete with other players in the market.

After the end of the project, the partners have chosen to stay in touch to discuss the next steps and collaboration opportunities.



Air

Cleaner air in garbage trucks

Improving the working environment in the waste management industry with air purification

Waste management workers are at high risk of airborne viruses that can cause health problems. Through tests in refuse trucks, the project has investigated the positive effect of air purification systems.

Duration

Jun '24 - Oct '24

Partners

GC Healthcare Remondis
Danish Technological Institute

The project has generated great interest among unions and employers, as data showed that integrated air cleaners in cabs can improve the working environment.

In the process, Remondis provided their refuse collection vehicles and GC Healthcare supplied their AG25- air purifiers.

For 12 weeks, the air in two refuse collection trucks was recorded and cleaned using the air purifiers.

The average concentration of particles smaller than 0.01 in diameter decreased by 2.8-18.4 $\mu\text{g}/\text{m}^3$ during the project period and the refuse workers involved experienced a greater sense of well-being at work.

Although the project and results were relatively limited, the strong partnership and project outputs have created great interest among professionals who would like to improve the working environment for waste management workers.

The Danish Technological Institute has presented the experiences, which gave industry professionals and decision-makers a unique opportunity to experience the technology in practice and discuss how air cleaning solutions can be integrated and used as a part of future health and safety initiatives in the waste management industry.



Innovative climate adaptation for home owners during cloudbursts

Test and development of a downpipe valve

Sewers can't always handle the torrential downpours that hit with greater frequency. That's why a new innovative solution will limit the system's capacity challenges by directing rainwater into gardens without any construction work.

An innovative cloudburst valve ensures that ordinary rainwater is led into the sewer, but when extreme rain strikes, the valve can shut off and instead lead water out to seep into the garden.

This frees up space in the sewers, so expensive and CO₂-heavy expansions of the sewer system can be reduced.

The solution can be mounted directly on existing downpipes and decouple several m² of roof surface, avoiding potential overflows.

The cloudburst valve can handle the peak of the heavy rainfall and not only cloudbursts, while everyday rain is handled normally.

Through the project, Updrift Copenhagen has received guidance from Schoeller Plast and Danish Technological Institute to further develop a prototype for further production.

The collaboration has verified the product, which contributes to a more efficient and cheaper solution for citizens and municipalities when it comes to climate adaptation locally.



Duration

May '24 - Nov '24

Partners

Schoeller Plast

Updrift Copenhagen

Danish Technological Institute

Better doors - Less replacement

Better doors, less replacement - Fire improvements
of existing entrance doors

Can you improve the tightness of old apartment doors?
This has been the focal point of a project that has tested different
solutions to make old doors meet today's fire requirements.

Duration
Apr '24 - Dec '24

Partners
Hovedstadens Bygningsentreprise DBI
A4 arkitekter og ingeniører



In many buildings there are old, beautiful
infill doors that, after many years, do
not have the same tightness as before.
This leaves room for smoke to enter,
increasing the risk of toxic smoke and
fire.

Throughout the project, the partners
have tested different solutions to seal
and brace the old doors. They have
tested with both cold and hot smoke,
where DBI has carried out a number of
effect measurements.

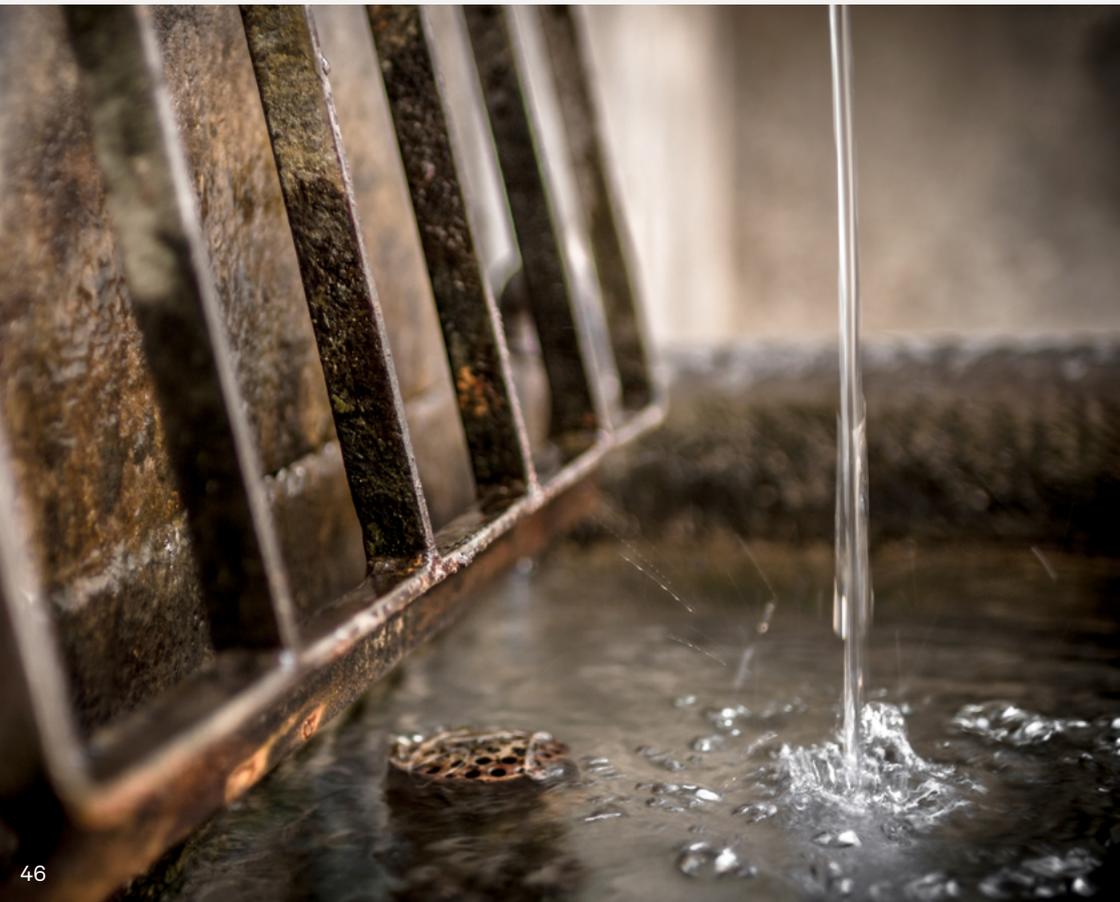
This has resulted in better insight into
how to extend the life of an old door and
at the same time meet the stricter smoke
tightness requirements.

The partners can now initiate dialog
with various housing and cooperative
associations and look at concrete
upgrade solutions rather than expensive
replacements.

The project has also generated ideas for
a new process for fireproofing old doors
to reduce the need for replacing doors in
the long term.

Unique technology provides greater water understanding

SmartCityWell



The project has given us valuable knowledge that can be used for future climate adaptation tasks.

- Mikkel Priess, Founder, SmartWell

Heavy rainfall puts pressure on the sewer system and climate adaptation can be expensive. Therefore, you need to think about capacity utilization. SmartBrønd has developed a solution that has been tested in collaboration with the University of Copenhagen and Frederiksberg Municipality.

SmartWell has created a solution that provides high precision and logging of data that municipal utilities can use to monitor water levels and flows. The solution will make cities' climate adaptation projects smarter.

Through the project, the partners have installed and tested the solution at selected locations in order to optimize the utilization of local climate adaptation projects.

In the project, the University of Copenhagen has built a hydrological model, which together with SmartBrønd's solution has collected data.

The partners' different knowledge and experiences have created a good synergy, which has provided greater clarity and momentum for everyone.

The data has been delivered to Frederiksberg Municipality, which has been given the opportunity to optimize their climate adaptation projects.

Today, the solution is being further developed, so that the increased rainfall can be handled better without creating too much pressure on the sewer system.

Duration

Aug '23 - May '24

Partners

SmartWell
Aagren Tech

University of Copenhagen
Frederiksberg Municipality

Decentralized removal of PFAS in groundwater

Sustainable reduction of PFAS pollution at groundwater wells

PFAS is difficult to degrade and is also called perpetual substances. It has been found in groundwater, which is why a Knowledge Bridge project has investigated the potential of resins to remove PFAS at groundwater wells.

Duration

Sep '23 - Nov '24

Partners

Danish Technological Institute
ECT2 Tune Waterworks

Greve Waterworks
Danske Waterworks



The project has investigated the possibilities of removing PFAS from groundwater by using special cleaning materials called resins (synthetic binders) through pilot tests.

The pilot tests showed that short-chain PFASs and PFOA were difficult to handle. In addition, it was shown that the lifetime of the resin could not necessarily be extended by regeneration with salt water.

The project concluded that it is necessary to pre-treat groundwater, e.g. by aeration and filtration, before passing it through resin filters. This makes it easier to reduce PFAS in drinking water and ensures more effective treatment.

The project is an important step towards ensuring clean drinking water in the future, and has created new knowledge that can be used by waterworks throughout Denmark.



Reduced air pollution with nanobubbles

Nanobubbles for aeration and purification of wastewater

Aeration of wastewater treatment plants accounts for up to 50% of total electricity consumption. TechRas Nano has tested a new solution with nanobubbles that can reduce air pollution and potentially energy consumption.

Duration
Feb '23 - Jun '24

Partners
Aalborg University
Hillerød Wastewater
TechRas Nano



Air nuisance challenges at wastewater treatment plants are greatest in the summer, when citizens spend time outdoors.

As part of the project, TechRas Nano tested their nanobubble solution at Hillerød Spildevand to investigate the potential of the technology and reduce the worst odors.

The nanobubbles, which are extremely small, have a large surface area that effectively traps the surfactants that inhibit the cleaning process.

These substances can include oils, soaps and detergents.

The wastewater is fed into a container where over 500 million nanobubbles are added per ml. The water is then returned to the clarifier, where an altered redox potential counteracts the formation of odorous hydrogen sulphide.

Aalborg University has analyzed the bubble properties and contributed valuable knowledge about the solution's potential as a plug-and-play technology.



Air

From sensor to health - Viruses in daycare centers

Detection and reduction of airborne
viruses in daycare centers

Children and employees in daycare centers often get sick. That's why a project investigated the link between indoor climate and sick leave and found important opportunities for improvement.

Duration
Sep '23 - Aug '24

Partners
IoT Fabrikken X Systems
Danish Technological Institute

For 6 months, two daycare centers had their air quality measured for CO₂ and VOC (odorous gases such as perfume and sanitizer), analyzed at the Danish Technological Institute.

An important lesson was that VOC and CO₂ do not always follow each other, and no correlation between indoor climate and viruses was demonstrated.

However, the analyses and experiences provided valuable insight into capturing and reducing airborne viruses.

They also showed that many systems focus on CO₂ rather than VOC, even though VOC can also impair the indoor climate.

The project enables us to test new research in reality together with companies that create value for society.

- Freja Rydahl,
Consultant, Danish Technological Institute

Despite challenges, the project partners have had the opportunity to test products and new research together.

The experiences and new knowledge generated by the project are now being used in a larger project via the Working Environment Research Fund with participation of approximately 20 institutions.

CO₂ capture based on knowledge and experience

Preventing toxic by-products of amine-based CO₂ capture

Through testing in both the laboratory and at two incinerators, the partners have gained practical and Knowledge-based experience that can strengthen the development of CCU plants.

Carbon capture is necessary to reduce the amount of CO₂. However, current technologies emit NO_x-gases, which inhibits deployment.

Therefore, the partners came together to test different methods to remove the unwanted substances.

One method showed that using ozone could break down 70-75% of the compounds after just 1-2 minutes of exposure.

It was great to collaborate with TI and make measurements on our Carbon Capture system. It provided valuable knowledge and a basis for further development.

- Alexander Jensen, Project Manager, Ammongas

The knowledge from the project is currently being used with DTU and Aalborg Portland to improve the technology at Ammongas.

At the same time, the Danish Environmental Protection Agency has shown interest in the knowledge on CO₂ capture, which can be used to assess potential emissions from Carbon Capture plants.

Duration

Apr '22 - Sep '23

Partners

Snedker Solutions Ammongas
Danish Technological Institute

Eco-friendly sailing with battery-powered engines

Testing and approvals related to maritime standards

Noise and emissions are recognized as health threats. Searine wants to change that by offering a zero-emission and quiet alternative to polluted and noisy diesel engines for sailboats.

Duration	Partners
Apr '24 - Dec '24	FORCE Technology RD8 Searine



Many sailboats today are equipped with an auxiliary engine that can be called into action if necessary. These engines are typically diesel powered, which creates noise both above and below sea level, as well as emissions that pollute the environment.

Searine is developing an engine that runs on battery power, which is much quieter. In collaboration with FORCE Technology they have researched the market and the product design.

It turned out that Searine's product can help reduce pollution in the maritime sector without causing harm to people or material.

However, the partner group found that the product lies between the responsibilities of two agencies. Sailing is under one agency and the engine is under another agency. Validation and approval can require a lot of bureaucracy between the two agencies.

Sustainable asphalt on its way with Visibuilt

Bio-based road surfacing with lower carbon footprint

Asphalt is currently produced using waste products from the oil industry, which is both expensive and energy-intensive. Through a collaboration, startup Visibuilt has created an innovative road surface based on the fermentation of mycelium.

Duration

Jan '23 - Jul '24

Partners

Munck Asphalt Visibuilt
Danish Technological Institute



Visibuilt is a biotech startup that has developed a natural binder for the asphalt industry.

With the product visiBIT, fermented fungal mycelium can be used as a binding agent in asphalt, replacing bitumen.

The Knowledge Bridge project has provided Line and Visibuilt with important insight into VisiBIT's properties and green benefits. The Danish Technological Institute contributed knowledge about road construction requirements and suitable fungi, while Munck Asphalt supplied test materials.

Visibuilt has continuously tested, developed, and optimized the process and product, which has generated great interest from both industry players and investors.

Without the collaboration, and the early data through the Knowledge Bridge project, it would not have been possible to get ready for an EUDP application.

- Line Kloster, Founder, Visibuilt

The product can help revolutionize the asphalt industry—without requiring new plants or factories.

By bringing together the entire value chain from suppliers to customers, Visibuilt gained opportunities for sparring, testing, and knowledge sharing.

The project results also led to an approved EUDP application, forming the basis for greater collaboration between the partners in the coming years.



Participants in Videnbro

In the last 4 years, almost 120 private companies have had the opportunity to support and knowledge from various knowledge partners. Here you will find the complete list of knowledge partners and companies that have participated.

Knowledge partners

- Technical University of Denmark
- Danish Fire and Security Technology Insitut
- FORCE Technology
- University of Copenhagen
- Danish Technological Institute
- VIA University College
- Aalborg University

Businesses

- 12plus30
- 6th Sense Solutions
- A.P. Møller - Mærsk
- A:GAIN
- A4 Arkitekter og Ingeniører
- Acoplastic
- Aguardio
- AL-2 Teknik
- Alfa Laval Copenhagen
- Ammongas
- Anno Studio
- ATES
- Bendixen Neon
- Biolnsect
- Biotrans
- Birdie
- Blue World Technolgies
- Bollerup Jensen
- Burnblock
- ByBlomst
- Byggros
- C.K. Environment
- Dalgas
- Danfoss
- Dansk Alge Plast
- Dansk Tang
- Danske Waterworks
- DFDS
- EasyFood
- ECT2
- Ejlskov
- Elastisense
- Electrocell Europe
- ERA Recycling
- Eseba

- BlueKolding
- Fatto A Mano Furniture
- FireEaters
- Fr. Petersen Maskinfabrik
- Frederiksberg Municipality
- Fshore
- G2B BioSolutions
- Gaia Wood Technology
- GC Healthcare
- GeoDrilling
- GEV Holding
- GGG2D
- Greve Waterworks
- Grobund
- Grohouse
- Hafnia Tankers
- Hedehusense Østre Vandværk
- HiddenDyke
- Hillerød Forsyning
- Hovedstadens Bygningsentreprise
- HAACK Recycling
- IoT Fabrikken
- KI Rådgivende Ingeniører
- Leapcraft
- Lendager Group
- LightNove
- Lolland Savværk
- Mariagerfjord Vand
- Maturix
- Munck Asfalt
- Naturpladsen
- Noignes
- Nordiq Group
- OL Seals
- Olicem
- Pilebyg
- PowerCon
- Prounit Frames
- Queen Gartneri
- Ravendo
- RD8
- Re-Claim
- Remondis
- ReVærks Tegnstue
- Ribe Flaskecentral
- Rock Flour Company
- Roskilde Municipality
- Rønne Havn
- Saltofte Gods
- Scan-Visan
- Schoeller Plast
- Searine
- Silkeborg Spildevand
- SmartBrønd
- Snedker Solutions
- Solum
- Stoko Plast
- Sulfilogger
- Superwood
- Techknow
- Techras Nano
- Tegnstuen Drivkraft
- TEMcompany
- The UPCYCL
- Tom Rossau
- TRE - Rådgivende Ingeniører
- Trelleborg Sealing Solutions
- Tress
- Tune Waterworks
- Upddrift
- Copenhagen
- Viacon
- Vink Plast
- Visibuilt
- Vognmand Per Ørum Juul Jensen
- WaterCare Guard
- WOHN Homes
- Wärtsilä Danmark
- X System
- Xtel Wireless
- AAB
- Aagren Tech
- Aalborg Havn

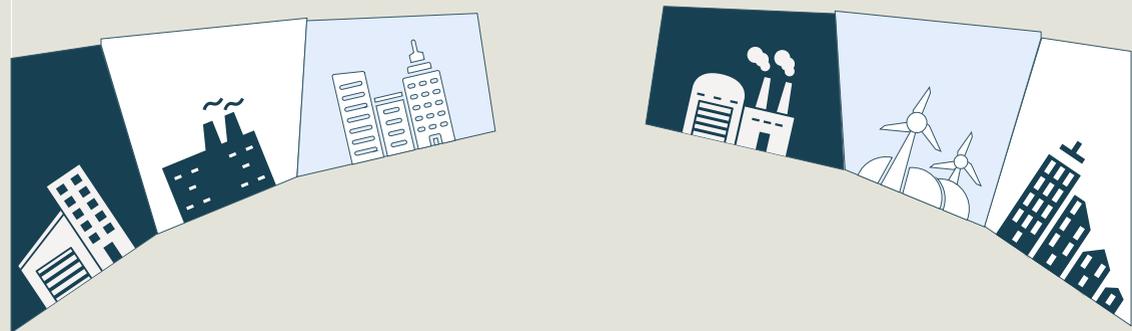
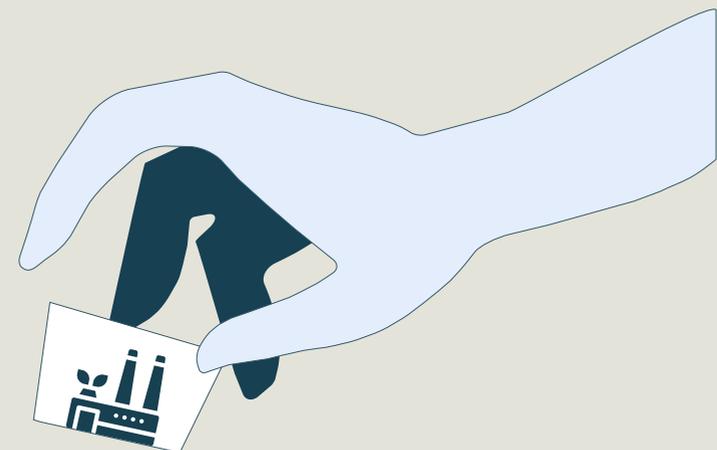
References

- Fødevarestyrelsen. (n.d.). *Food waste in numbers*. Last visited February 11, 2025 at: www.foedevarestyrelsen.dk/kost-og-foedevarer/start-og-drift-af-foedevarevirksomhed/hygjefne-og-indretning/madspild-i-foedevarevirksomheder/madspild-i-tal.
- Halsnæs, K., Kaspersen, P. S., Mik-Meyer, V., & Sunding, T. (2024). *Economic consequences of flooding* (Main report, November). DTU, Department of Management, Technology and Economics.
- Sundhedsstyrelsen. (2023, 22. september). *Indoor climate*. Last visited on February 13, 2025 at: www.sst.dk/da/Borger/Straaling_miljoe-og-klima/Forurening-og-kemi/Indeklima.

Other projects

In addition to the 25 cases you have encountered in this catalog, there are also a whole bunch of other projects you can dive into on Clean's website. Here you can read about, among other things, these Knowledge Bridge projects:

- Structural health monitoring
- Development of the market's best and most innovative impregnation technology
- Zero Emission Port Stay
- Reuse of PFTE
- Circular Practice - CO₂ Assessment of Industrial Resource Symbioses
- Urban Tin mining
- Naturpladen - grown acoustic panels
- Validation of improved indoor climate through nudging
- Integration of compact Raman spectrometer for innovative PFAS measurements in the field
- Flexible AMS for Carbon Capture Plants (FlexiAMS-CC)
- Greenlandic Rock Flour
- Test bench for vertical LAR
- Guidance fire test for biogenic and non-toxic fire coating in upcycled biocomposite for 3D-printed homes
- Grobund working community





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