



SYMPOSIUM

When **GREEN** takes over

Final Report

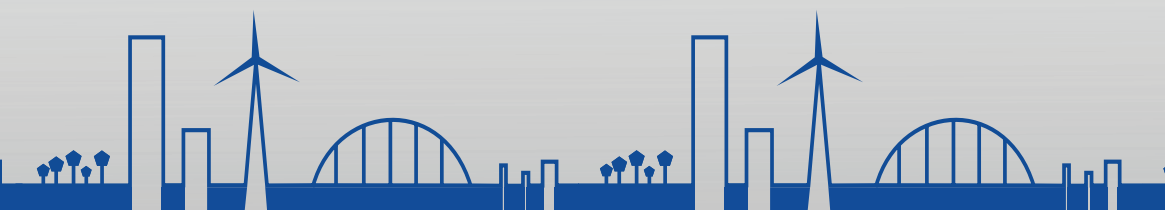
Symposium of Het Gezelschap "Practische Studie"



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Hermen van de Minkelis



Fellow Civil Engineering students, participants from the Civil Engineering sector and other attendees of this year's symposium organized by Het Gezelschap "Practische Studie", on behalf of the symposium committee 2016, I want to thank you for participating in our event.

From the moment you walked into Museum Prinsenhof until the opening of the bar in the evening we, as organization, had to stay focussed to ensure that everything would go as planned. Luckily, at the end of the day we could calmly

breathe again, enjoy a cold beer and conclude that it had been a succesful day. We hope that you feel the same about the symposium and that you had a great time and learned a lot.

To help you remember this wonderful sunny day in October we provide you with this booklet. It contains a summary of all the lectures and case studies as well as different kinds of other information about the event. By reading this memento you will not only look back on the presentations and the case study that you attended but also get an inside in the parts of the day that you could not attend. This knowledge might also be interesting to you after all.

We hope that our event left an impact and that this booklet will function as a token that helps you understand that sustainability is not only a nice topic to spend a day on during your study but that it might in fact be something that you, as future Civil Engineer, will have to associate with during the rest of your career.

Enjoy reading,

Hermen



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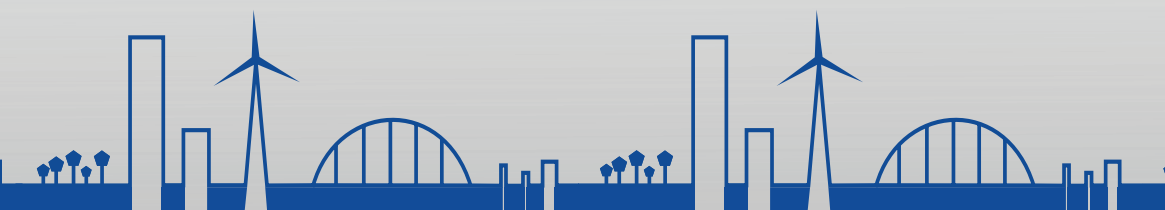
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When green takes over

Since time immemorial Civil Engineers have shaped the world as it is now. From the time of the Romans to the Renaissance and the time of the industrial revolution: one is fascinated by large structures. As the population grew and technology increased, the impact of Civil Engineering on the earth has grown as well.

In the last couple of decades, awareness of earth's wellbeing has increased. There is a growing demand for sustainability from society as well as from governments. Due to the large impact of the Civil Engineering sector on the Earth, it is expected from this sector to adapt to a new way of thinking. Clients increasingly demand sustainable products and there are many ideas that can make the Civil Engineering sector more sustainable.

But how does the Civil Engineering sector cope with a world where sustainability is required?

This was the central question at the symposium. Is this sector capable to comply with this requirement? Does this requirement make the Civil Engineering business more difficult or does it provide new opportunities in business? And to what extent is the transition to a sustainable approach noticeable in the sector? From different points of view we have tried to acquaint participants with the various aspects of this new way of thinking.

With this symposium we have introduced students to the way the civil sector is dealing with the desire for a sustainable world.





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J.W. Hoekstra



As preview of the Symposium “When green takes over” a Kick-off presentation took place on Tuesday October 4th. The presentation was given by senior adviser Jan Willem Hoekstra of Van Rossum Raadgevende Ingenieurs. This company is quite a big player in commercial and industrial construction in the Netherlands.

Jan Willem explained different kinds of sustainability and durability they applied on various buildings. The first building he came up with is The Edge, which is located on the Zuidas in Amsterdam. This is the most sustainable building in the world. But the fun thing to mention is that the building didn't have to be that sustainable initially. Later on when construction was going on, the design was quite perfect to implement sustainable elements. This was partly possible because of the atrium. Hereby it was made possible to make the entire construction climatically neutral.

Besides that, the dimensioning of the building was minimized and reused admixtures were added to the construction materials. You may think now the building is sustainable, but this is not completely true. The complete life cycle of the building has not been accounted. So when you look to the green building cycle it's not quite complete in this story. But it is still a great building.

The new building of Alliander in Duiven might be a better example. On this terrain there were a couple of buildings which were out of use. But Van



Rossum gave these a second life by integrating all these buildings by covering them with a 100 x 150 meter wavy roof. From a sustainably point of view it has a good score on use of an existing neighborhood and a positive energy use. In total 80% of the initial site was kept the same. The concrete of the other 20% was reused in new parts of the construction.

Another topic was the temporary movement of some roofs. Van Rossum added some additional floors on existing buildings. After that, the roofs were moved back on top of those new floors.



Jan Willem showed us some other buildings which were constructed or reused by Van Rossum. But the meaning of his story is that there are many kinds of sustainability and durability and it's very difficult to be sustainable in a lot of different aspects.

In the end the most important factor is (still) money. When a contractor offers a job to some company, they are willing to make it sustainable as long as you can make money with it...



Prof. dr. ir. H.A.J. de Ridder



Building in a sustainable way requires a well-integrated design in which it can fulfil its function for as long as possible. As professor in the Integral Design and Management and with his enthusiasm as a public speaker, Professor Hennes de Ridder was the perfect chairman. Professor De Ridder, specialized in building processes, risk management, building organization structures and contracts, introduced a new research program in 2004 within his section Building Processes: The Living Building Concept. This means that the structure over its lifetime is being maximized in ever-changing circumstances.

Let professor De Ridder be clear: climate change is a big problem and we have to find solutions and we have to speed up with that. This was the message on his first slide and set the tone for his view on the theme for the rest of the day. Because the climate has changed, and the awareness that we need to build sustainable and durable, the world has changed as well. We are living in a complex system which needs energy to survive, tends to grow and exhausts its environment including land, water and space. It also cannot be controlled, it controls itself, because of its complexity. The system is continuously adapting, evolution at elementary level. Variation, selection and reproduction is bound to change continuously. Also, the behaviour of a complex system cannot be predicted.

The bad news professor De Ridder pointed out, is that the behaviour of our global complex system is determined by economical, ecological and social-cultural relations between elements, individuals, cities and countries. Luckily, he gave us something to hang on to in the form of two big questions: How to reduce CO₂ emissions and how to change our dependency of fossil energy? The next question will then be something we, as technical students, have to find the answers to: What is the role of technology?



In the Global Agreement on Climate Change Policy, the goals of less than 2°C of global warming and preferably of less than 1.5°C are defined. A major step forward, according to professor De Ridder, because there is no discussion about the existing of global warming anymore, but he points out the critical note that a goal is not a solution. We still have to make these goals come true. In the Netherlands the agreement on energy should mean a reduction in energy consumption: 1.5% per year and renewable energy production of 14% in 2020 and 16% in 2023.

Again, a goal is not a solution. In 2015, there is an increase in renewable energy as percentage of the total energy consumption, but there is an increase in total energy consumption and therefore an increase in CO₂ emission. As a percentage of the total energy, renewable energy increases, but when total energy consumption increases as well, CO₂ emission still increases. Reduction of CO₂ emission is the only goal and not just the percentage of renewable energy.

It has been made clear that the construction industry over its total lifecycle of input and output scores really badly. Technical solutions can be solar collectors, windfarms, geothermal, tidal and also energy storage. Besides these options, the construction industry needs to be changed: industrial production, circular economy: reuse instead of downcycling after demolition, more competition on sustainability, knowledge in products and a sustainable production of materials, elements and components. The point is that these solutions are difficult to implement without a general policy on economical, ecological and social cultural changes. The solutions are no-regret solutions and all measures should be checked on reduction of CO₂ emissions.

Professor De Ridder has been an excellent chairman of the symposium and has been really critical towards the theme of the day. He has put clear what the issues are we face as civil engineers and where our way of thinking on this issue goes wrong. The Symposium Committee wants to thank Professor De Ridder again for his great effort, enthusiasm and critical note during the symposium.



C.M. Sluis - Witteveen+Bos



There is no denying that people from all over the world are in demand of good healthcare, clean drinking water and a healthy living environment. These particular points are among the seventeen sustainable development goals that have been set up by the United Nations in 2015, the same year as the Climate Change Conference in Paris. The due date for these goals is set for 2030.

The Sustainable Development goals are a continuation on the millenium development goals from the year 2000. A lot has been accomplished since. 91% of the people on Earth now has fresh drinking water and we limited the attack on the ozonlayer in such a way that it is probably fully recovered by 2050. This all sounds good, but within the broad scope of sustainable development there are still a lot of areas with much room for improvement. That is why the new goals of 2015 are set even higher.

Karin Sluis, CEO of Witteveen+Bos, was put to thinking by the Development goals. To what extent does Witteveen+Bos contribute to these goals and how can they contribute more in the future? In fact, the company is doing a couple of projects right now that already give a lot of substance to some of the focal points of the United Nations.

A good example is the project 'Ruimte voor de rivier' in Kampen. A local water level drop of thirty centimeters is achieved to reduce the risk of floodings, and a large area for nature life and recreation is created at the same time. This project contributes to the development goals by stimulating natural life on land and in the water, securing the wellbeing of the people in the region and taking climate action.



Another exemplary project is a gas plant at the Caspian Sea. Such an installation consumes a lot of water for cooling, but in this particular case all the cooling water is circulated internally. As a result, the ecosystem of the Caspian Sea is respected and the production and consumption of water and even electricity are dealt with responsively because not only does it use little water, it also generates electrical energy from the warm water in the plant.

Evidently, Witteveen+Bos already contributes to the Sustainable Development goals in many ways. But to bring this statement in perspective, a survey has been done under the employees and external stakeholders to find out what, according to them, is the highest potential of the company in this aspect and how large the gap is between this potential and the current situation.

The survey shows that especially the goals of responsible production and consumption, as well as respecting natural life on land and in water, are areas in which Witteveen+Bos shows a lot of potential. But it also shows that the gap between these potentials and current performances of the company has not been closed yet. In response to these findings, six basic principles have been set up to guide Witteveen+Bos to it's fullest potential of contributing to sustainable development.

Karin is convinced that Witteveen+Bos will help to accomplish the development goals of the United Nation for 2030 and that it is in fact their responsibility to do so. Furthermore, she believes that it is the responsibility of every engineer around the world to try to improve quality of life because they have the power to make this happen.



D.B. te Gussinklo Ohmann - Van Oord



With the Gemini project Van Oord showed their project in the complicated world of offshore wind. They signed a BOP contract which means that they are ultimately responsible for Engineering, Procurement and Construction all at once. Parts of the project are outsourced to subcontractors but transportation and installment are all done by Van Oord itself and that is a great achievement if you look at numbers alone.

First, 150 monopiles were placed in the North Sea bottom at a distance of 85 kilometers off the coast. These monopiles are hollow tubes with dimensions varying up to a diameter of 7 meters, a wall thickness of 11 centimeters and a length of 73 meters. Then a foundation of rocks is placed around the monopiles that forms the scour protection to prevent the seabed from washing away around the piles. The monopiles and the scour protection form the foundation for what follows next; the transition pieces, the pillars, the generators and eventually the blades of the windmills. But that does not make an offshore wind farm. Two giant jackets need to be placed on the bottom of the North Sea to house two large offshore substations, hundreds of kilometers of infield and export cable need to be layed and burried and don't forget the fact that the export cables that bring electricity to the mainland need to be connected to the grid via another substation.

Van Oord brought an impressive fleet of vessels and machines to get the job done. Two large jack-up vessels worked full time to transport and install the wind mills, two cable-lay vessels worked round the clock to lay all cables in time, a crane dock needed to be brought in to install the enormous substations and not to mention all other vessels and machines that were used to guide the export cable through deep and shallow waters towards the Dutch shore.



Meanwhile, Gemini is almost finished but lots of new offshore wind farms are scheduled to be built. A visible trend is that these parks and the windmills themselves are getting bigger for optimisation and that a lot more farms will be built in the foreseeable future because of climate agreements between governments. For Van Oord this means that equipment, work methods and designs need to be innovated constantly to stay in the race of this new market because competition is very tight. But for sure it can be said that the breakthrough of this type of green energy offers great opportunities for Civil Engineering companies such as Van Oord



A. Schippers - Smartcrusher



Whilst working in the concrete laboratium at Delft University of Technology, Koos Schenk saw the problems with the way that old concrete is processed traditionally. That is why he invented the smartcrusher which he patented in 2011. Using this machine makes it possible to re-use old concrete for 100%. Together with Alef Schippers, Koos is working hard to put his invention into market.

To understand the value of a machine that revolutionizes the way of processing concrete it is important to understand the current method and the impact that it has on our world. Currently, when a building is demolished and the debris needs to be disposed of, the concrete in the structure is crushed. This happens in such a way however, that the gravel in the material is destroyed which devaluates the material in a way that it is basically only suitable to be used as stuffing material for roads. This means that for building a new structure, 100% of the used concrete needs to be newly fabricated.

This is where the problem lies because for making concrete, cement is needed and by producing one ton of cement, a ton CO₂ is emitted as well. Actually, for the global production of cement, more CO₂ is emitted than is done by the entire transportation sector! This is something that has to change if governments want to have a realistic chance of achieving the climate goals that they set for themselves.

The smartcrusher could be the answer for the emission problem within the concrete branch. The machine crushes the concrete with a lower force to ensure that the granulate in it stays intact but with a force high enough to pulverize the cement mixture in the material. In this way it can easily be segregated with a sieve. The sand and gravel from the mixture can directly be reused for a new concrete mixture. Further more, from research it turns



out that this reused aggregate establishes a mixture that hardens faster and even has a higher ultimate strength than concrete with fresh aggregate. This is helpful and it means that less cement is needed for achieving a certain strength, which is already a large advantage.

The real advantage however, are the possibilities for reusing the hydrated and non-hydrated cement. In a lot of applications of concrete, almost 50% of the cement does not react with water. This cement can directly be used for a new mixture after separating it. Also, the remaining 50% hydrated cement can be put to good use. This material can be used to improve a concrete mixture, act as a super activator in the production of new cement or can even be used as raw material for new cement that disposes zero CO₂ molecules when it reacts in contrast to the marl that is currently being used. Finally it even turns out that the smart crusher uses less power than conventional debris crushing machines because it applies less force.

The conclusion is that the smartcrusher makes it possible to reuse 100% of demolished concrete for a high level purpose and that an incredible decrease of CO₂ emission can be established by making use of the machine and the raw materials that result from it. This sounds too good to be true, but dhr. Schenk proved that his invention can actually function on a large scale. So what is holding back the revolution?

According to dhr. Schippers it takes time for the idea to permeate into the concrete branch. Producers of cement and gravel really have objections against the smartcrusher because for them it would mean a drop in production, contractors are just sceptical because they want to be totally convinced that the concept works and the Dutch government does not have enough proof yet to impose the method. Luckily for the smartcrusher, having a 'green' image becomes increasingly important for companies within the Civil Engineering sector so according to Alef, it will only be a matter of time before the sector will realize the high potential of smartcrushing. The only thing it needs right now is a first real investor.



R. Bracke - International Geothermal Centre



This presentation was a special one, since the lecturer, Rolf Bracke, came all the way from Germany to tell us about geothermics. Rolf Bracke is the director of the International Geothermal Centre and professor of Geothermal energy and environmental technology at the University of Bochum. Therefore he is an expert in the field of geothermal energy.

In his lecture during our symposium he showed us the large amount in possibilities for a civil engineer in the field of geothermal energy. It is quite a new field for civil engineers, but he points out that the use of geothermal energy in the heating systems of buildings is increasing rapidly in the last few years and it is expected that this increase will continue. Rolf shows us this increase in clear graphs. Since geothermal energy, in comparison to solar or wind energy, is a source that is permanently available, it is a promising alternative to fossil fuels. All over the world, geothermal energy is accessible. In Europe, except for Iceland, the availability of geothermal energy in not too deep layers is unfortunately limited. But according to Rolf Bracke, the use of geothermal pumps for the heating of buildings, is still an efficient and sustainable solution in Europe. These systems are already used in many places. For the installation of these systems the knowledge of civil engineers within this field is necessary and therefore it is important and profitable for us to learn about geothermal energy. Rolf Bracke makes this all very clear to us in an interesting and spontaneous way. It was inspiring to have a lecture from the view of a different country about a topic that is not much discussed in our study





G. van der Wegen - SGS-INTRON



During the last couple of decades voices have been heard from different directions that raise awareness for the way that humankind threatens planet Earth and preach that we need to be more considerate with our environment. Lately, these voices are answered more and more. Nations from around the globe increase political pressure to effectuate a global decrease in the emission of greenhouse gases. A true first step has been taken in Kyoto in 1997, but during the 2015 Climate Change Conference in Paris agreements have been made to really up the ante.

When it comes to the emission of greenhouse gases, the building industry is an important malefactor and within this sector the production of concrete is the largest origin of gases like CO₂. Globally, this material is responsible for 7% of all CO₂ emitted by mankind. Moreover, because the emission from other sources, such as residential energy consumption already decreased a lot, the impact of concrete still increases relatively within the building sector. In 2012, a means of qualification of this effect on the environment has been established in the Dutch building sector. This means that the confronting truth about the impact of concrete is now also reflected by an official label.

Stirred up by politics, the Dutch concrete sector is making an effort to decrease emissions. In agreements like 'green deal' and now also 'betonakkoord' in 2016, ministries from the government collaborate with companies from the sector to decrease emissions originating from the use of concrete. The goal has been set at a decrease of one million tons of CO₂ per year.

SGS Intron is a company that performs testing of, consultancy on, inspection and certification of rate of sustainability of concrete for example. Different



tools such as GPR, MRPI and Dubo-calc are used to assess the environmental impact of concrete mixtures. Also, SGS Intron developed it's own calculation tool to do the job. This tool takes into account numerous variable components of concrete and different proceedings that are involved in the production and construction process.

Ways to improve concrete mixtures can be deduced from this assessment. Examples are the replacement of clinker by blast furnace slag, minimizing cement content by adding less water with the aid of super plasticizer, minimizing transport of raw materials and recycling concrete aggregate. The advise of SGS Intron forms a guideline for companies to optimize their concrete. Time will learn whether this leads to significant results in the future.



NETICS & IHC - Building with dredging sediment

The circular economy becomes more and more important in the current society, as well as in the Civil Engineering sector. Rest material used to be seen as garbage, but nowadays it is seen as a chance to use them as building materials, which occurs for example at NETICS. The dredge spoil which comes available during dredging gets a new destination: building constructions.

NETICS has realized, for example, dike reinforcements, nature friendly shores, ports constructions, wave breakers and flooding shores while using this dredge spoil. Ewoud Volbeda and Joost Koevoets gave the participants the task to come up with an idea how this dredge spoil can be used in a delta area. Whether it would be a civil technical solution or not at all, a proper business model had to be found.

For the Dutch students and international students (participating via the exchange program IACES) it was searching for the available possibilities to use the dredge spoil for. Especially the non-civil technical solutions were hard to find because of the biased mindset of the Civil Engineering students. After a few questions about the strength, density and laboriousness of the foreseen construction material the ideas started to come and ideas have been thought out.

Building temporary houses for refugees, creating bricks or recreative land in a river, soil strengthening, dredging piles and foundations and even generating a lifestyle with the dredge spoil has been proposed.

After the enthusiast pitches of the groups, the foundation has come out as the best idea. Replacing concrete piles by the dredge spoil appeared to be the most realistic and innovative business model.

It has been a good, fun case which made the students think about reusing materials. Who knows where the foundation will be seen in future?



Royal HaskoningDHV - SolaRoad

This case, led by Royal HaskoningDHV, focused on the design and fulfilment of the Solaroad pilot in Brabant, the Netherlands. The participants were invited to create a concept that would reach ethical needs as well as functional ones by using Royal HaskoningDHV's 4 questions as a base. The questions concerned stakeholders, the long-term value, whether a project is future-proof and a look at resources and energy. The main cause of the questions was similar to the key-word of the symposium: sustainability.



Further on the participants were divided into groups and it soon became clear that the Solaroad could take many different forms. One of the groups focussed on functionality and comfort and came up with an indoor bicycle path. Other plans were made to combine light art with the capability of the road to provide its own energy. Tourism, appearance and public transport rivalry were all important subjects to think about in the process. Process was also a notable aspect of the case. One of the intentions of the four questions method is not letting engineers only mind the result. The case showed that caring for the process might just be helpful to find the way to a green environment.



TU Delft

The TU Delft case on the topic “the triple-green design and building concept” was mainly about the concept of sustainability and was given by dr. Henk Jonkers. Important questions around this topic were: What is sustainability, and which aspects of sustainability are relevant in civil engineering?

The case started with a presentation by mr. Jonkers. In this presentation he told the students about the concept of sustainability and about the three pillars of sustainability; these involve people (social fairness), planet (environmental aspects) and profit (economic profitability). In his presentation he gave different examples of sustainable projects. One of these projects was “Bosco Verticale” in Italy, this is a pair of towers which host more than 900 trees in the height. People, planet and profit all benefit in the design of this building which made this a real good example of a sustainable building.



After this inspiring presentation mr. Jonkers divided the students in three groups. Each group represented one of the three pillars of sustainability. Each group was assigned to form a formula which could represent their pillar. It turned out that making a formula for such a global subject was harder than it seemed. Nevertheless each group came up with very innovative ideas. In the end each group pitched their formula and how they came to their ideas.

Finally mr. Jonkers ended the case with the formula his department had found for sustainability. The students left the case with new insights in the concept of sustainability and new matters about this concept to think about.



Witteveen+Bos

On the west side of the Markermeer there are 33 km of waterdefences that are either not high or not strong enough to protect North-Holland from flooding. During the case of Witteveen+Bos the participants came with possible solutions for this problem, while taking into account the six sustainable design principles of Witteveen+Bos. These principles help guide the designer to get the most out of the project. For example reducing CO₂ emissions, involving stakeholders in the design process or combining different functions in the design.



After an introduction about Witteveen+Bos, this project and the six sustainable design principles the groups took three hugely different approaches to the problem. The approach chosen as best was to create a low dike combined with a movable barrier. This barrier would float and go up and down depending on the water height. This approach would solve the problem, while having a minimum impact on the view from the existing dike.



Antea Group - Spaarndammertunnel

The Antea Group case was about improving a design to make it more sustainable and it was presented by employees of Antea Group. The important question for this case was: What improvements are most beneficial to the sustainability of a planned tunnel construction. We were to act as a fake consultancy to give ideas they could use in the tunnel.

The case started with a presentation about the project by one of the employees of Antea Group. The area of operations and the basic tunnel design were shown. The presentation also stated some key points to keep in mind when improving the tunnel design. One of the key points they presented was using smart contract forms that stresses the contractor to be more sustainable. One of the examples used was contracting Philips to implement a certain amount of lumen instead of buying lights and installing and maintaining them yourself. This way Philips is accountable for the energy usage and the durability of the supplied lighting over a set amount of years.



After the presentation the groups set out to create the best suiting plan for the project. The group that won presented a plan including geothermal energy and natural lights among other things. This plan was the closest match to the plan presented to Antea Group by a real consultancy. Afterwards, the winning group was offered a tour around the construction site of the tunnel and a cake.



Shell



The case given by Shell was a bit different than the other cases. Shell has developed a game that simulates the energy market. After a small presentation about Shell and their game each participant got a role in the game. These were government, citizen, company, energy distributor or Non Governmental Organisation (NGO).

In a series of different rounds every role had to accomplish a certain goal. Governments for instance had to make the transition to a green economy whilst keeping a high standard of living for their citizens and being attractive to companies. Companies on the other hand had to try to make a high profit, just as the energy distributors.

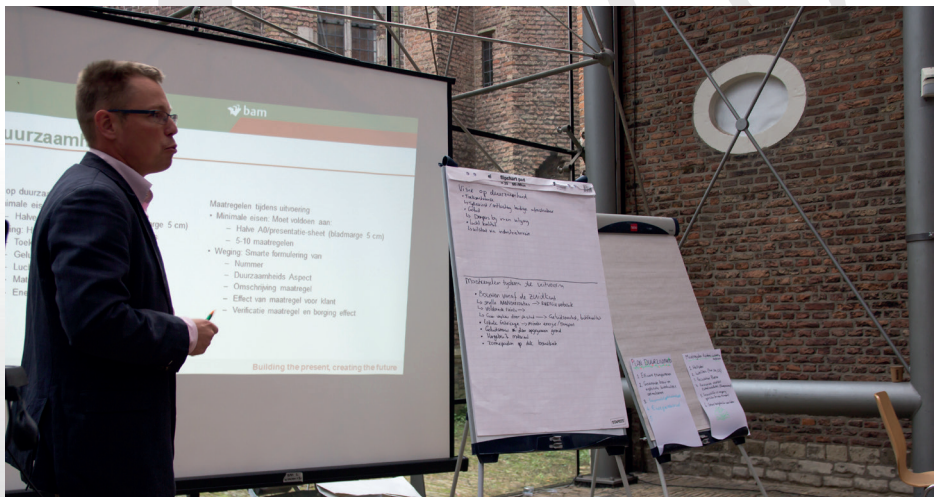
All this resulted in a slightly chaotic, but mostly fun game and in the end the results were discussed. The participants had tried to become very sustainable, but they did not manage to accomplish a 100% sustainable energy market. This was due to the fact that it takes time to build new energy sources like wind turbines or geothermal power plants. This got the students thinking on the energy goals the government had set for the Netherlands and if it would actually be possible to accomplish these goals.



BAM - Rotterdamsebaan

The third case in the second shift was given by BAM. This company was recently contracted to develop the Rotterdamsebaan in The Hague. It is a new road between the junction Ypenburg and the center ring of The Hague. The city of The Hague chose the design of BAM because of its relatively high sustainability factor.

During the case, the participants had to think about the different aspects that are important in designing such a new road. The problem is that the new Rotterdamsebaan had to cross a residential area and a canal. This resulted in a small workspace and transportation of building equipment and building materials should be planned precisely. Furthermore, it was also important to think about the long term impact of the Rotterdamsebaan. Not only the construction has to be sustainable, but also the exploitation of the complete new road connection. All in all, the case gave an insight of how the sustainable aspects of a big project are implemented and executed in a large company such as BAM.



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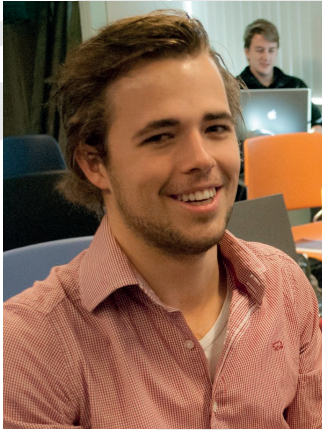


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Gijs Hendrickx



When green takes over, a really hot topic at the moment. More and more are businesses claiming to be green, but how green are they, and what does being green actually mean? Being green is thinking about nature, being sustainable; reduce the emission of carbon dioxide, construct an energy neutral building, etc. These are just a couple of examples to become a 'green business'.

The symposium started with a kick-off lecture by Van Rossum. Besides these measures, they introduced a more effective, yet an underappreciated measure to reduce the impact of humans on nature: renovation. You can build as energy neutral as you can, but still you are building something that will have a huge impact on the environment. Before the symposium was even started, the committee made everybody have a second thought about the topic.

One week after the kick-off lecture, the symposium took place at a beautiful location: Museum Prinsenhof Delft. Totally in vision with the lecturer of the kick-off lecture, this building is renovated recently after it was build more than six centuries ago. So even though it might look as an energy-inefficient building, it is a much greener building than you might think beforehand.

The day of the symposium started with a short presentation by Karin Sluis, CEO of Witteveen+Bos, about the Sustainable Development Goals (SDG's) and how we did with the Millennium Development Goals (MDG's). Karin Sluis highlighted that we have made a lot of progress but still have a lot to do.

From there, the day was divided into two shifts. I did the first shift, which meant I started with a case followed up by two lectures. The case, provided by NETICS and IHC, asked us to make a business plan for a product made out of dredging material. Nowadays, the two companies already make concrete



like construction material out of the dredged sediment; they upgrade the low-valued dredged sediment to a more high-valued construction material. As in many cases concerning sustainability, the technology is available, but the mind-set of the people is the obstacle to a greener future. This technology is a perfect example of that.

After the case and a little walk through the museum, where the founder of the Netherlands was killed, we had a presentation about geothermal energy. An energy source that is already used a lot in certain places around the world, e.g. Iceland. Geothermal energy is endless but unfortunately not that accessible all over the world. Nevertheless, it can be used more than is done nowadays. So again, it is not the missing technology but the lagging mind-set.

The last part of the first shift was a presentation about creating awareness about the emissions that come along the production of, e.g., cement. A lot of carbon dioxide is produced due to the creation of cement. Reducing the amount of concrete in your design will result in a greener design and minimize the emissions due to a new construction.

After one case and two presentations, we all came together to debate about how green the building industry truly is. Some small questions were presented to stimulate the debate. One surprising outcome is that the students of today do not fully believe that the companies in the civil engineering business are presenting to be green because they care about the environment, but because it has become a demand from society; if they do not act as a green business, they will lose projects and the company becomes bankrupted.

All in all, it was an interesting day at which the participant was not allowed to blindly believe all the stories that were told. The title chosen for the symposium is completely in line with the outcome of the debate: When green takes over, companies will adjust their way of working to remain a player on the market of civil engineering. One can even say, it does not matter if a building company wants to be a green company, they have to.

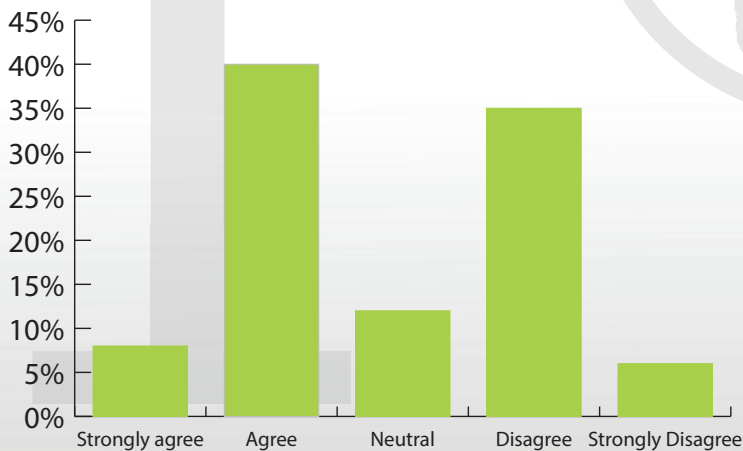


The final event on the Symposium was the debate. We created four statements that the attendees could comment on with Feedback Fruits. The debate panel, consisting of civil engineering professionals, could comment on all the statements if they wished to do so. The statements were as follows:

1. The international building sector is not capable of making the necessary steps towards sustainability in time.
2. Contractors and designers work sustainable because it is imposed on them, not because it is their own ambition.
3. Sustainability is being taught at TU Delft because it is a desirable topic, not because lecturers wish to raise awareness.
4. Civil engineering companies would go bankrupt if they would not adapt to society's desire to become sustainable.

The international building sector is not capable of making the necessary steps towards sustainability in time.

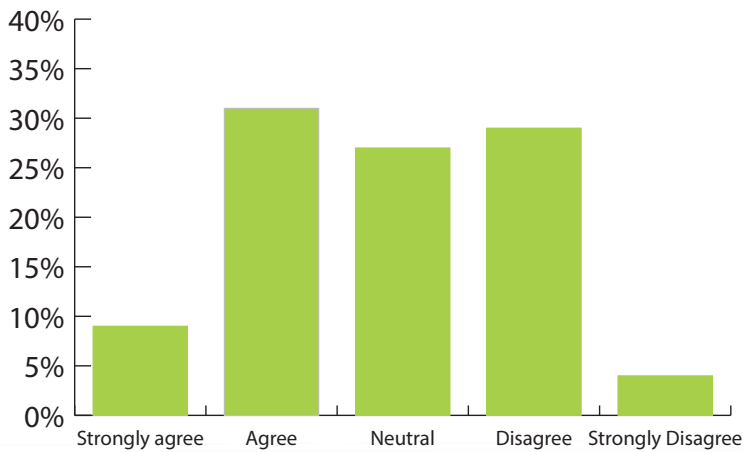
The result this statement was as follows:



The debate panel disagreed with this statement. They concluded that the international building sector can make the necessary steps, if the contractors and employees want to become more sustainable.

Contractors and designers work sustainable, because it is imposed on them, not because it is their own ambition.

The result this statement was as follows:

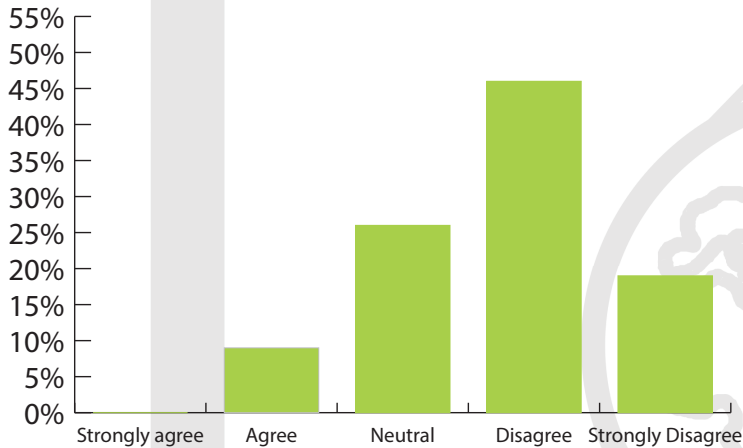


The panel concluded that it is not necessarily imposed on the contractors and designers to work sustainable. But if the client wants a building to be sustainable, they will deliver. They also agreed that talented engineers fresh out of graduating will choose for companies that build more sustainable.



Sustainability is being taught at TU Delft because it is a desirable topic, not because lecturers wish to raise awareness.

The result this statement was as follows:

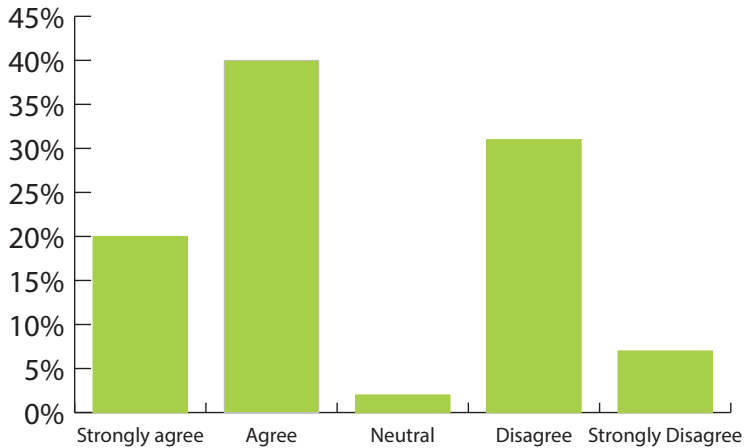


Henk Jonkers commented on this statement. He is the chair of sustainability at civil engineering. Mr. Jonkers thought that this is not the case.



Civil engineering companies would go bankrupt if they would not adapt to society's desire to become sustainable.

The result this statement was as follows:



The panel agreed that if companies that stay away of any trend that impacts the sector greatly could go bankrupt. If sustainability develops into an important trend, then companies must follow to survive.



Het Gezelschap "Practische Studie" is the study association for Civil Engineering students at Delft University of Technology. In 1886 a few members of student society 'Delftsch Studenten Corps' decided to give Civil Engineering students the opportunity to mutually discuss Civil related matters.

For over 122 years, the study association offers a variety of study-related and additional activities. To be able to organize all activities 180 out of 2000 members are actively engaged in the organization of activities divided over 26 committees. The overall governance of the association is done by 7 board members, who put their study on hold for an entire year.



The civil engineering symposium is organised by the symposium committee of Het Gezelschap "Practische Studie". This committee has a year to organise an inspiring symposium. This edition, the theme of the symposium is 'When green takes over'. With the main question, 'How does the civil engineering sector cope with a world where sustainability is required?'

The symposium committee is formed by the following persons:

Hermen van de Minkelis
Remco van Poelgeest
Sjoerd van der Heijden
Paulina Kindermann
Philippine van Tets
Nicole Hartman
Maud van Delden
Maarten Kroll
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Supervisor of Board 123





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Chairman Bouwend Nederland

Ing. M.C.J. van Pernis (Martin)
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Prof. ir. K.C.A.M Luyben (Karel)
Rector Magnificus of the Technical University of Delft

Prof. dr. ir. B.M. Geerken (Bert)
Dean of the Faculty of Civil Engineering and Geosciences at the Technical University of Delft

Prof. dr. J.F.T.M. van Dijck (Jose)
President of the Koninklijke Nederlandse Akademie van Wetenschappen

J.M. van den Elzen (Johan)
Chairman NLingenieurs

Mr. ing. J.H. Dronkers (Jan Hendrik)
Director General Rijkswaterstaat

Dr. H.M. Jonkers (Henk)
Head of the research chair Sustainability at the Technical University of Delft

Prof. dr. ir. S.N. Jonkman (Bas)
Professor integral hydraulic engineering at the Technical University of Delft

Prof. dr. ir. M.J.C.M. Hertogh (Marcel)
Professor Integral Design and Management at the Technical University of Delft



After a year of preparation for the symposium 'When green takes over', the symposium committee would like to thank certain people. It would not have been possible to organise this symposium without all the sponsors, companies, professors and the TU Delft. Our thanks go to:

Day's Chairman:

Prof. dr. ir. H.A.J. de Ridder

Speakers:

Ir. C.M. Sluis

Ir. D.B. te Gussinklo Ohmann

Prof. Dr. Rer. Nat. R. Bracke

Dhr. K. Schenk

Dr. G. van der Wegen

Cases:

Antea Group

BAM

NETICS & IHC

Royal HaskoningDHV

Shell

TU Delft

Witteveen+Bos

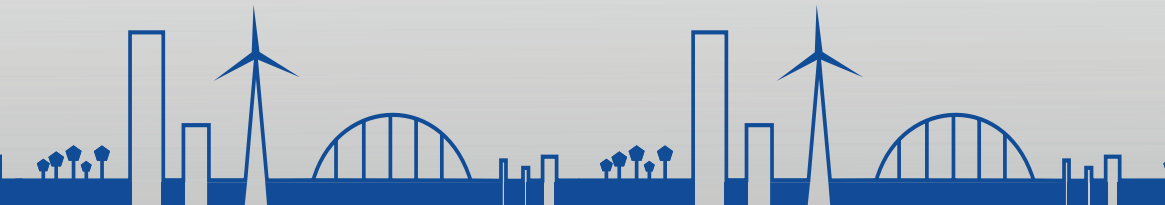
The professor panel

The committee of approval

Museum Prinsenhof

Study association Het Gezelschap "Practische Studie"

All participants of the symposium 'When green takes over'



This Final Report is an edition as part of the civil engineering symposium 2016

'When green takes over'

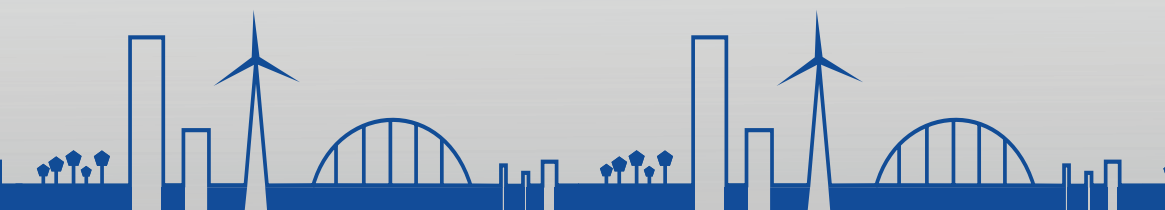
*Organised by Het Gezelschap "Practische Studie"
Study Association of civil engineering students
of Delft University of Technology*




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Yusuf Can Caglayan



SYMPOSIUM WHEN GREEN TAKES OVER

Het Gezelschap "Practische Studie"

