

Sustainability Projects in Alkmaar



**Duurzaam
Alkmaar**



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Introduction



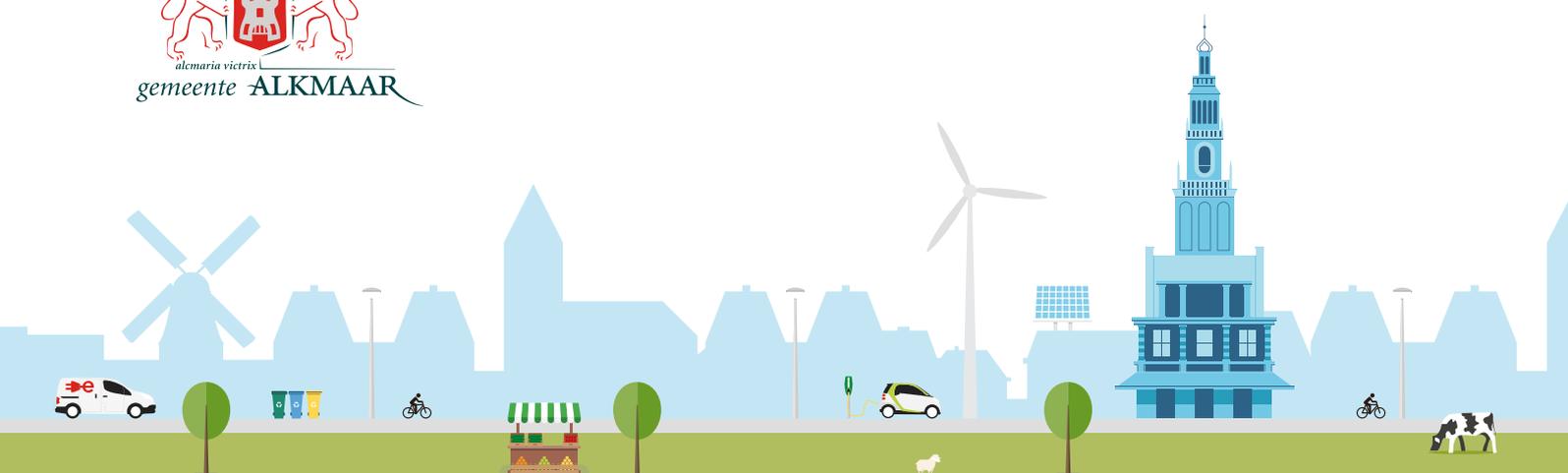
Dear reader,

A common challenge that we are all facing is the need to curb our CO₂ emissions. Many different kinds of technology for sustainable energy generation and energy efficiency already exist, but implementing these in real life situations is a major difficulty for the years to come.

In collaboration with a range of partners, the City of Alkmaar is working on addressing this issue of sustainability. Some impressive projects have been completed and there are still many projects which will contribute to sustainable energy production and the reduction of carbon emissions in the pipeline,. In this way, the City of Alkmaar, together with its stakeholders, is contributing to the global climate challenge.

Alkmaar cannot manage without the parties concerned in the field of sustainability, waste processing, knowledge and innovation. I am proud of the results that have been achieved! This brochure will tell you more about the sustainable projects in the city of Alkmaar and our alliance partners. In addition, we are convinced that we have to look abroad for experience and expertise in this field.

Best regards,
The Mayor of Alkmaar
P.M. Bruinooge





Alkmaar

Alkmaar and the region

In the heart of the world's largest tulip fields, close to magnificent sandy beaches, and surrounded by picturesque polders and quaint villages, Alkmaar is the centre of the north of Noord-Holland. A region with about 650,000 inhabitants, a half-hour drive from Amsterdam and Amsterdam Schiphol Airport, and an hour from Rotterdam Seaport. Alkmaar's history began with its development into an important location for transfer and trade.

Alkmaar, trade city

Alkmaar has further developed its position as a centre for trade over the years, providing an extremely appealing range of shops, educational institutions and facilities for business services.

The city's position as a regional centre for the north of Noord-Holland is reflected in the fact that it is home to a leading medical facility (the Alkmaar Medical Centre), to the district court and the Department of Public Prosecutions.

Victory began in Alkmaar!

The city's residents grew rich on duties and trade, and were fond of investing in the large, richly-decorated homes and warehouses that still dominate the centre. These days, Alkmaar isn't just a city with a strong cultural and historical heritage, it's also an enterprising, modern city with almost 8,000 companies and a workforce of about 52,000. Alkmaar and the north of Noord-Holland region offer new business abundant opportunities. The favourable location, the business climate and the mercantile spirit of the people here are strong assets that are typical of Alkmaar. The history of Alkmaar began in 1254, when count Willem II of Holland granted Alkmaar its town charter. Alkmaar can be found in the history books as the first town that was liberated from the Spanish after the Eighty Years' War (1568 – 1648). 'Victory began in Alkmaar' is a familiar expression that is still used to describe the heroism of that time. On 8 October 1573, the Spanish were forced to

flee from the water after rebels pierced the dikes, the start of a period of prosperity for the people of the city.

Alkmaar, historical city

Alkmaar has almost 3,600 listed and historical buildings in the rural areas and the old city. Many of the historical buildings you see in the centre of the city stem directly from the time when Alkmaar was a rich, leading location for transfer and trade, and most transport was by water. Visitors to Alkmaar's centre can still see, and feel, the city's rich history everywhere around them. The photogenic town hall (built between 1509 and 1520) is still used by the city's administrators. It is one of Alkmaar's most famous historic buildings.

Say cheese, say Alkmaar

The cheese market is a historical symbol of much more than the dairy trade alone. It is a product of the intensive land reclamation



activities around the city in the 16th and 17th century. The people of Alkmaar were skilled developers of the innovative technology of windmills for pumping the land dry. They were fierce opponents of the “water wolf”: the open link with the sea that led to the subsidence of the peatlands below the surfaces of the lakes surrounding the city.



HVC: Energy en Waste

HVC is a leading Dutch utility company established by and for municipalities and water companies. In the Netherlands, agreements are in place for mitigating carbon emissions and for the recovery of raw materials.

The government authorities participating in HVC have their own targets in this area:

- reduction of carbon emissions of 20% by 2020;
- raw material recovery amounting to 75% of the waste flows in municipalities: household waste, paper, cardboard, textiles, organic waste.

Alkmaar is one of the HVC shareholders. The HVC head office is in Alkmaar. HVC helps Alkmaar to achieve its objectives in the area of waste, raw materials and renewable energy. Materials are recycled as much as possible by collecting various types of household

waste separately. In addition, HVC produces sustainable energy (heat, electricity and gas) from waste, biomass, wind, sun and geothermal. HVC supplies that energy to municipalities, water authorities, business and individual consumers.

Waste consists largely of potentially useful raw materials. These resources are becoming increasingly scarce and it makes no sense to waste them. So our mission is to recover these raw materials from waste and recycle them. We also convert the residual waste from which no raw materials can be recovered into renewable energy through incineration. In this way, we reduce carbon emissions and dependence on fossil fuels. To achieve this objective, we also develop projects that draw on alternative energy sources such as wind and solar energy.

Waste and raw materials

HVC creates a circular economy for its shareholders as a sustainable waste, raw materials and energy company. HVC does this by reprocessing collected waste and by encouraging the re-use of products at waste collection sites. HVC is increasingly focused on encouraging the public to separate valuable waste (such as paper, biodegradable material and artificial material) and then to submit these materials for collection. HVC processes the waste flows under its own management to ensure that the separated waste will be reintroduced to the market as recycled materials (material re-use). Our challenge is to perform even better in this area.

Waste flows that are not collected separately are processed at Sortiva, a subsidiary of GP Groot and HVC. Sortiva is the company for recycling and recovery. It separates and processes bulky household waste, wood, rubble, green waste, soil, paper, cardboard, plastics and construction and demolition waste. The company processes waste from private individuals, business and municipalities for recycling. A new post-separation plant was recently built for plastics.

GP Groot acts in three markets: 1) collection and recycling 2) fuel and oil trading 3) infrastructure and engineering. The segments reinforce one another in a circular process: waste is collected (by GP Groot) and it is then converted by means of recycling and processing into high-grade raw materials and end products (by Sortiva) and into clean energy (by HVC).

Renewable energy

The waste residue that cannot be recovered usefully is incinerated to produce electricity. The



heat produced is then used for district heating (households and businesses) and for supplies of warm tap water in the region, resulting in a reduction in carbon emissions of about 95%. The Netherlands generates most of its electricity by burning coal and gas. Approximately 5% of the energy generated comes from biomass, wind and solar energy. The goal is to raise this percentage of green energy to 20% by 2020. HVC helps shareholders to achieve their goals by producing renewable energy from waste and biomass but also from solar panels and wind turbines on land and at sea.



Together with the City of Alkmaar and other municipalities in the region, HVC is contributing to the acceleration of sustainable energy production in the region with the DECRA incentive fund. DECRA made a flying start in 2014 by investing in a wind turbine in Alkmaar. The wind energy that is produced generates returns that can be used in a revolving fund approach to launch new sustainable projects from individuals, companies and local energy cooperatives.

Most sustainable district heating in the Netherlands

HVC is working on the construction of a sustainable heating network in Alkmaar and the neighbouring municipalities. This district heating is fed with the heat from the BioEnergy Plant (incineration of wood waste containing paint or glue) and the Waste Incineration Plant. The heat that is released is used first to produce electricity. The residual heat is used to feed the district heating. Because the district heating is connected to the



BioEnergy Plant, Alkmaar has the most sustainable district heating in the Netherlands.

The construction of the district heating in Alkmaar began in 2009. At present, more than 4,000 housing units in the city of Alkmaar are connected to the district heating. In addition to housing, the AFAS football stadium, companies, school buildings, the municipal swimming pool and other municipal buildings are also connected to the network. Gas and central heating boilers are no longer needed here. The connection to the district heating reduces carbon emissions by up to 95% and so the district heating in Alkmaar makes a major contribution to the climate objectives.

A future without natural gas

The district heating in Alkmaar is developing all the time. In 2018, it will be approximately 20 kilometres long and there will be about 10,000 housing units connected. Most of the district heating in the Netherlands focus primarily on new buildings, but the heat in Alkmaar also supplies heat to older buildings. It is precisely because it is sometimes impossible to insulate existing buildings due to technical or financial constraints that a connection to the district heating can be a useful alternative for natural gas.

In the Netherlands, energy consumption for heating in the built environment (homes, businesses, greenhouses) accounts for more than 30% of total energy consumption. Natural gas plays a major role. So there is still a lot to do in terms of carbon reduction. That is why the Dutch government has decided that natural gas will no longer be used in the Netherlands by 2050. That is a major challenge involving many parties.

With its district heating, Alkmaar is in the vanguard of this effort to create a future without



natural gas. That is why the city has signed the 'Areas without Natural Gas' Green Deal with thirty other municipalities, twelve provincial authorities and five network operators. The aim is to accelerate the heat transition by getting to work on removing natural gas from local areas and, as a result:

- to acquire, share and further development of knowledge;
- to eliminate ambiguities in legislation, funding, responsibilities and competences;
- to further public ownership of, and involvement in, these changes.





INNOVATION:

InVesta & Energy Innovation Park

Alkmaar is working on the construction of a new economic structure based on the theme of energy innovation in order to create more high-quality jobs and sustainable solutions. This means that students can work on innovative solutions to global challenges with the latest technological developments. And they can be sure that they will find interesting jobs after they graduate.

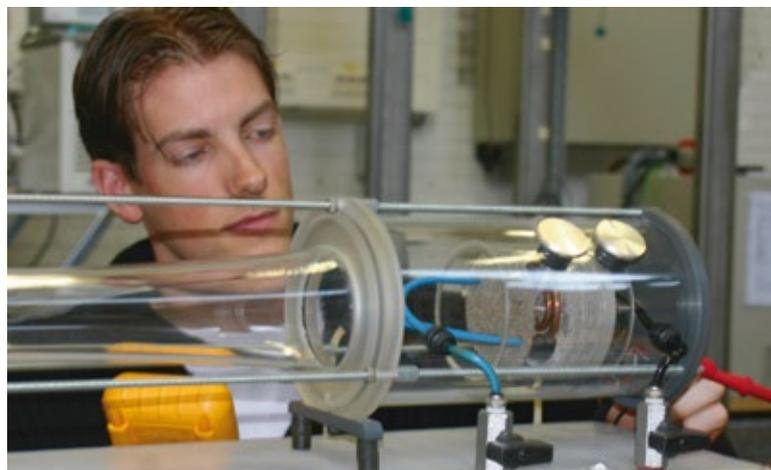
Alkmaar has an Energy Innovation Park on the Boekelermeer industrial estate to accommodate innovative and energy-related companies. And Alkmaar is working with business, and research and educational institutes, on an energy knowledge and innovation cluster with an international reputation. The focus is on gasification technology – of a kind that is unique in the Netherlands – for the conversion of biomass into green gas, green chemicals and green fuels.

InVesta, Expertise Centre for Green Gas

InVesta was launched in 2016 and it facilitates business accommodation and knowledge development, and sets up research and

development programmes for green and renewable energy sources. Companies can now realise their innovations in biomass gasification and related technologies.

In the context of this initiative, two demonstration plants are being developed at this location for producing green gas from dry and wet biomass. The available expertise and grade facilities mean that companies and start-ups can get to work quickly, efficiently and economically on the construction, testing and demonstration of test arrays. The knowledge cluster is receiving support from an alliance of,



among others, ECN, InHolland, Energy Valley, Taqa, the City of Alkmaar, the Province of Noord-Holland, and Ontwikkelingsbedrijf NHN.

Ambigo

An innovative plant – Ambigo – will be installed in 2018 for the extremely efficient conversion of biomass (such as waste wood) and other residual flows into green gas that can be used in homes and at business premises, in industry and for passenger transport. The green gas is transported through the existing mains network and it will therefore be a sustainable alternative to natural gas. Ambigo is a research and demonstration project. The technology has been tested in the laboratory and it is now being upgraded to the industrial scale (4 MW) for the first time to show the world what this technology has to offer.

SCW

SCW Systems has developed another gasification technology: Super-Critical Water Gasification. This technology converts wet biomass (such as manure and sewage sludge) into gas at high temperatures and under high pressure. The technology produces not only green gas but also hydrogen and valuable minerals. It can also contribute to solving the problem of excess manure. The company is building 10 units with a total capacity of 20 MW at the Energy Innovation Park. Plans are being developed for a second phase involving scaling up to 100 MW.

NXT fuelling station

The NXT fuelling station on the Boekelermeer estate supplies clean fuels. In this way, the transport sector is working on improvements to air quality and the climate. There are good alternatives for petrol and diesel but there is room for improvement in terms of availability.



NXT is the concept for reducing the burden of transport on the environment: fuels are supplied locally in accordance with regional requirements. In Alkmaar, this primarily means LNG: Liquefied Natural Gas. LNG is a clean and quiet alternative to diesel. It reduces emissions of particulate matter, sulphur and nitrogen. Bio-LNG and Hydrogen produced at InVesta and the demonstration plants will also be available here in the future.

Infra Energy Innovation Park: opportunities for a smart grid

- The Boekelermeer estate has a unique energy infrastructure with a low-, medium- and high-voltage electricity grid, a high- and low-calorie gas grid and a district heating.
- Energy is produced by wind turbines, solar panels and by the incineration of household waste and biomass (HVC). Energy is also produced from landfill gas.
- Syngas will be produced at the InVesta Expertise Centre and then developed into green gas or bio-LNG which is then fed into the grid.
- The Boekelermeer estate is also home to a number of production companies that use heat and electricity.
- Supply and demand for gas, electricity and heat are increasing in response to the plans of established companies and newcomers.

Knowledge, Innovation and Entrepreneurship

The energy transition requires technologically advanced and bold innovations in the field of the circular economy, renewable energy, energy savings, and using big data and data science. This challenge will require new business models that will have to be rendered feasible by means of regional collaboration between businesses and government authorities.

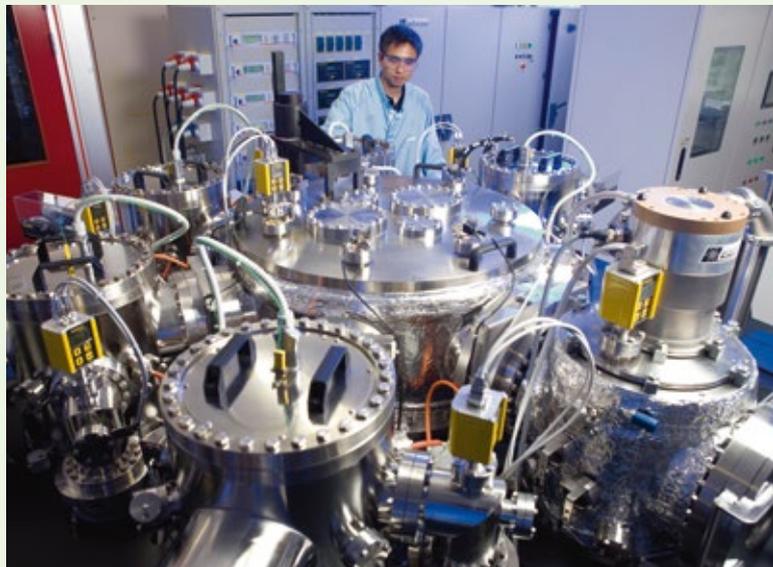
IDEA: Incubator for Sustainable Energy Alkmaar

The north of Noord-Holland is well aware of the importance of providing opportunities for more young, innovative companies, both inside and outside the region. The Alkmaar region very much wants to see these companies settle on the Energy Innovation Park (EIPA). IDEA contributes to the achievement of this goal. IDEA ensures that more innovative projects and ideas in the field of sustainable energy will reach the market and it also accelerates that process. This leads to more start-ups and more skilled jobs in the region. IDEA is a collaborative venture involving InHolland, ECN, ENGIE, Teamwork Technology, Ontwikkelingsbedrijf NHN, Energy Valley and the City of Alkmaar.

ECN

Companies worldwide choose to work with ECN. ECN is a world leading R&D institute from the Netherlands devoted to energy, renewable

and otherwise. Our innovative technologies and knowledge generates economic and business opportunities for industrial companies and government authorities. In order to meet the energy needs of the future, the world's energy system needs to become more sustainable.





How can ecn help you? Bio-energy

if you wish to be a front-runner in the bio-based economy, team up with ECN. In a sustainable bio-based economy, sustainable biomass plays a major role in the production of materials, chemicals, transportation fuels, power and heat. ECN is at the forefront of developing breakthrough technologies based on the thermochemical conversion of biomass and waste. Technologies which enable you to produce bio-based products such as green gas, torrefaction pellets, heat & power, and a range of biofuels and biochemicals. Our state-of-the-art knowledge and market-oriented approach, as well as close collaboration with our clients, have earned us a leading position in five areas: upgrading biomass to bio-energy carriers, heat and power generation, gasification-based production of SNG (Substitute Natural Gas or green gas) and other gaseous energy carriers, thermochemical biorefinery concepts and BECSS (Bio-based Energy or products with Carbon Capture and Storage).

Attractive r&d partner

ECN has built up a strong international position over the last sixty years in the fields of bio-energy, solar and wind energy, energy efficiency and policy studies. With around 500 professionals and multiple branches in Europe and Asia, ECN plays a prominent role in energy R&D and policy advice.

Proven track record

The excellent track record can be illustrated by the fact that over 60% of all solar modules in the world contain ECN technology. Moreover, plants have been realised with ECN's unique MILENA gasification technology for converting biomass waste into electricity or green gas with an unequalled efficiency of 70%. ECN's wind energy expertise is also a success: 80% of Europe's offshore wind farms have been built with ECN R&D and support.

Wind energy

the costs of wind energy must be further reduced. ECN is an enabler and catalyst for the industry to achieve this. We exploit our state-of-the-art techniques, knowledge and facilities to:

- increase profitability and efficiency for our customers;
- accelerate new technologies to the market;
- build upon cutting-edge R&D, allowing our customers to be one step ahead.

With our long years of experience, ECN has become a leading business partner in wind energy. Our customers include manufacturers, project developers, owners, operators, investors and governments/NGOs. We supply specialist and independent technical consultancy for industry to address the



challenges of today. For the new concepts to be applied tomorrow, we welcome collaboration and co-development partners.

Solar energy

The world of solar energy is undergoing revolutionary change. Prices have eroded enormously and profit margins have disappeared. This requires rapid action to reduce production costs and improve the efficiency of solar panels. We are therefore engaging in the joint development and implementation of improved processes and technologies. ECN, as a home to numerous breakthrough technologies, is ready to help industry to meet this challenge, both in crystalline silicon and in thin-film solar cells. ECN is a flexible partner in solar energy for industry, participating in joint development in various ways and in accordance with clients' wishes.

Policy studies

Policy and business decisions based upon our consultancy speed up the transition to a sustainable energy system. ECN provides independent expertise relating to the development of energy supply and consumption, drivers, barriers and regulation affecting energy markets. It advises solutions

for achieving strategic objectives. Analysis and consultancy for energy-related questions are our key expertise. Our policy experts work in multidisciplinary teams, drawing on the fundamental and applied knowledge of energy technologies, markets and policies. Our analyses clarify the implications of these factors for policymakers, businesses throughout the energy sector, and consumers in all sectors of the economy. We have successfully developed a wide range of modelling tools that support our work.

Data Science Alkmaar

Big data is regularly in the picture as a major technology trend that will generate enormous opportunities. The problem for many organisations is that they often lack the knowledge needed to start and to make the most of the opportunities. The City of Alkmaar, the VU-University of Amsterdam and De TelefoonCentrale have therefore launched an initiative to establish a research and innovation centre: Data Science Alkmaar. The main goals of this centre are:

- to encourage regional economic activity by bringing together knowledge and entrepreneurship;
- to help organisations and government authorities in the north of Noord-Holland to address issues relating to big data and data science;
- to create an entrepreneurial breeding ground for companies that want to develop new products and services;
- to develop, encourage and bundle knowledge and talent;
- to provide a platform for establishing connections and to create a network that makes all the participants stronger.



Sustainable sports facilities

Alkmaar has many varied, and large, sustainable sports facilities. Sustainable sports venues generate many benefits. Not only are they good for the environment, they are also financially advantageous. They cut energy bills and sustainable clubs score well with members and sponsors. In addition, sports associations are often at the heart of society, and so making sports facilities more sustainable also helps to raise levels of knowledge about practical sustainability measures.



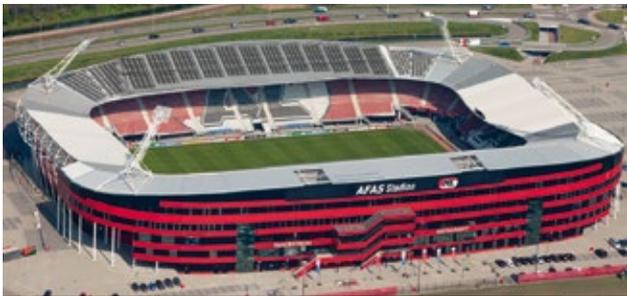
AFAS Stadium

The football club AZ Alkmaar puts Alkmaar on the international map. It was League Champion in 2009, and it is at the top of the table now. In combination with the large number of international matches and the enthusiastic fans, there can no longer be any doubt that sports are an important factor in promoting the city of Alkmaar. AZ has extensive expertise in the field of talent development and it is open-minded when it comes to sharing that expertise with the outside world.

Sustainability is also on the agenda of sports clubs. For example, on the roof of the AFAS Stadium, home to the football club AZ, there are 1,725 solar panels that generate 250,000 kWh annually. That is comparable to the energy needs of 125 households in Alkmaar. The project saves 142 tonnes of carbon emissions.

De Meent Ice Rink and Sports Complex

Most sports facilities, buildings and locations in Alkmaar are managed and operated by Alkmaar Sport NV. Sustainability is high on the agenda



of Alkmaar Sport, which works on making its facilities more sustainable. The showpiece is the De Meent Ice Rink and Sports Complex. The innovative, modern and sustainable building is home to many sports facilities and it can also accommodate elite and grassroots sport events, concerts and fairs.

There are almost 1800 solar panels on the roof of the De Meent Sports Complex. Vincent Thijssen, the director of Alkmaar Sport NV.: 'Not only do the panels result in a significant lowering of our energy bill, there is also a major reduction in carbon emissions. In addition, this investment contributes to the energy awareness of young people, athletes and visitors who use the complex.' The solar panels are one of the sustainable initiatives at De Meent. Other include the energy-efficient ventilation, the LED lighting and the use of residual heat from the ice rink's cooling plant to heat the complex.

Hoornse Vaart

The Hoornse Vaart is a pool complex with six swimming pools, including a unique 50-metre pool for training, competitions, and serious swimmers, a wave pool, a 25-metre pool, a teaching pool, a water playground and an outdoor pool. The complex is connected to the HVC district heating and so it contributes the equivalent of about 6,500 solar panels in terms of reducing carbon emissions. That is the same as 5.5 million car kilometres. Every year, approximately 400,000 bathers enjoy water in the pools and under the showers that is now heated much more sustainably.



City Service Desk for Sustainable Building

Free and independent advice for making homes more sustainable

The Service Desk for Sustainable Building is the City of Alkmaar's Energy Service Desk. Raoul Santibanez and Roy Langedijk, who were born and bred in the city, founded the service desk in 2011 with the aim of: providing home-owners with free information and independent advice about how to make their homes more sustainable and energy-efficient. The City of Alkmaar thought their initiative had potential and it entered into an alliance as one of the first municipalities in the country. The success of the Service Desk for Sustainable Building has not remained unnoticed and 104 municipalities have now teamed up with the desk.

All homes to be energy-neutral by 2050

The city teamed up with the Service Desk for Sustainable Building against the background of the duties assigned to it by the national government. All homes must be energy-neutral by 2050 and they have to be disconnected from the natural-gas grid. In practical terms, this means that all homes have to be properly insulated and heated using energy without natural gas. Energy consumption for individual homes will have to be covered by sustainable energy generated by individual systems. So home-owners have a lot to do. The City of Alkmaar is happy to help its residents by granting them free access to the Service Desk for Sustainable Building.



Free and independent Energy Service Desk

The Service Desk for Sustainable Building will guide home-owners through the entire process of making their homes sustainable.

The people of the city can go to the website www.duurzaambouwloket.nl for free information about sustainability systems, subsidy schemes and reliable companies that can install the systems. They can get in touch with independent consultants directly by calling +31 (0)72 7433956 or sending an email to info@duurzaambouwloket.nl.

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