# The Netherlands in Transition

# The Planning of Low Carbon, Sustainable and Liveable Cities in the Utrecht Region

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*Figure 1: The Netherlands has centuries of experience in harvesting wind energy. The traditional wind mill from 1897, now a national monument, originally drained the Eemspolder and is the most northern situated windmill on the mainland of the Netherlands. Its name, 'The Goliath', suggests that, in its time, this windmill was a huge building. Nowadays this windmill is dwarfed by contemporary windmills. Photo: Sake Elzinga*

# Introduction

The Netherlands is world renowned for the way in which urban planning, infrastructure, ecology and the environment form an integral part of the practice of spatial planning and urban design. The country has a vigorous and open economy, an entrepreneurial society with its metropolis situated on a compact delta which is vulnerable to climate change. The Netherlands has four layers of public administration, the State (central government), the provinces and the municipalities which, together with the regional water boards, are responsible for spatial planning and the future development and structure of the Netherlands' cities, infrastructure and national landscape. At the start of 2011 and following a change of government the responsibilities of each of the three tiers of government and how they can work together was re-evaluated and set out in the 'Administrative Agreement 2011-2015'[1]. Central government, the provinces and the municipalities are almost constantly working on strategies, policies and plans for the development and redevelopment of low carbon, sustainable and liveable city regions and cities for the coming decades.

All three tiers of government are charged with the task of making Dutch cities ready to face the future: less dependent on fossil fuels, with reduced emissions of greenhouse gases, and able to cope with the expected rise in sea level and climate change. Policy and targets in the area of reducing $CO_2$ emissions and energy transition are more likely to succeed when they become an essential part of spatial policy and planning. The Province of Utrecht and the larger cities in this region, in particular, are taking major steps in this area. This article describes how the newly elected central government, the Province of Utrecht and the six larger towns in Utrecht are turning their climate and energy targets into spatial policy, strategy and physical planning. This stands in sharp contrast with the situation as reported in the ISOCARP Review 05 Low Carbons Cities[2], especially in the way the responsibilities between the state, provinces and municipalities are redefined and redivided.

# The Administrative Agreement

The Netherlands faces a major challenge: cutting government spending while at the same time strengthening the economy. The Administrative Agreement between the State, provinces, municipalities and regional water boards is supposed to help to create a government apparatus which is lean and efficient with a clear division of tasks between the four levels of administrative authority. The underlying principle of the Dutch Government apparatus of the last decade 'decentralize whatever can be, centralize whatever has to be' is put into practice. This means that, wherever possible, the implementation of tasks is devolved to the municipalities or provinces. Central government is responsible only for national concerns such as national defence and foreign policy, but is also involved, alongside other levels of administration, in the spatial economic structure, public health, flood defences, the nation's unique landscape features and cultural heritage, plus the national and international transport networks. Central government set out this vision in the draft National Policy Strategy for Infrastructure and Spatial Planning[3].

The core tasks of the provinces will lie in spatial development and the physical surroundings. The provinces will act as regional coordinators for the development of integrated development strategies, the interplay of interests as well as promoting and safeguarding complementarity between the cities and city regions within the province. The municipalities will be responsible for creating a safe and pleasant environment in which to live and work, and their tasks will lie in the social, economic and spatial domains. In the spatial domain this will be spatial planning in the widest sense, in which it will be important to find the right balance between the environment, nature, water, the economy and housing, etc. This policy will be laid down in policy strategies and zoning plans. The task of the regional water boards is to manage water quality and quantity in the regional water systems. As part of this task the water boards are responsible for the flood defences and for ensuring that there is sufficient clean water.

The Administrative Agreement states that the public authorities will work together to ensure coherent spatial policy and task allocation across the administrative layers and levels of scale in the areas of housing, water, mobility, economic activity, the climate, energy, the environment and cultural heritage. This spatial policy must ensure that the Netherlands:

- Can develop further economically, so that investing in the Netherlands continues to be attractive to national and international businesses;

- Continues to be accessible by land, water and air;
- Puts its energy supply in order and ensures that energy is available for the future;
- Is protected against flooding and surplus water, and continues to be safe even under climate change;
- Is a pleasant, healthy and attractive place to live and work, where people can enjoy nature, culture, and recreation, with a good balance between all these functions[4].

# Energy Report 2011

The Administrative Agreement refers to the goals set out for economic innovation and making the energy supply more sustainable as formulated in the Energy Report 2011 published by the Netherlands Ministry of Economic Affairs, Agriculture and Innovation. Central government continues to work towards achieving the EU climate target, reducing 80 - 95% of $CO_2$ emissions in 2050 by comparison with 1990. The provincial authorities, municipalities and water boards too are dedicated to creating more sustainable energy and achieving climate targets. Based on their own goals and resources, they are continuing to work towards energy conservation and increasing the share of sustainable power generation. The provinces and municipalities are adjusting the spatial criteria for this, while fostering economic innovation and change. The underlying principle of the Energy Report is a form of energy management which is more sustainable and less dependent on increasingly scarce fossil fuels. The state wants to benefit from the strength of the Dutch energy sector. This will bring growth, jobs and revenue. The energy policy has three main concerns: transition to a cleaner energy supply, the economic outlook for the energy sector and the need for a reliable energy supply[5].

The Energy Report sets out the aspiration of achieving a low carbon economy by 2050. It indicates that the best way of doing this will be through an international climate agreement and it will be necessary to make the transition to a more sustainable form of energy management. This transition should be good for the Dutch economy. Under the motto of "not 'green' or growth, but 'green' and growth" the Energy Report advocates capitalising on the strength of the energy sector and encouraging cooperation with research institutes and industry in the development of new energy technologies. This is the only way that the Netherlands will be able to further develop renewable energy and maintain its international position as an energy producing country. This will bring growth, jobs and revenue. The Energy Report further assumes a balanced mix of national and international green energy and grey (i.e. fossil) energy. It describes the present reality which, for the time being, means that Europe will continue to be dependent on fossil fuels and that the Netherlands' position as a gas producer and world leader in the technological field of capturing and storing $CO_2$ will be important for the Dutch economy. It further assumes that, in the near future, the Netherlands will also need nuclear energy because this will help to further diversify energy sources and does not lead to $CO_2$ emissions. The Energy Report sets out five main pointers for the future:

- A modern industrial policy based on innovation, the development and commercial viability of renewable energy technologies, the positioning of the Netherlands as a knowledge-based economy and as a gas exchange for North-West Europe. This will not only create jobs and economic activity, but also help to safeguard supply;
- Increasing the share of renewable energy, provided that the energy supply becomes more sustainable, in a way which is economically viable and that renewable energy

becomes a standard part of the internal European energy market;
- Keeping all energy options open as we move towards a low carbon economy in 2050 with a balanced mix of green and grey energy in an integrated energy market together with $CO_2$ reductions brought about through an increased share of renewable energy, energy conservation, and nuclear energy, together with $CO_2$ capture and storage;
- Based on the principle of 'green growth', making a 'Green Deal' with society with the aim of taking real steps towards a sustainable society. A sustainable society will not happen by itself, it is a joint process involving both society and government. Energy conservation and renewable energy will be important elements in the Green Deal;
- Investing in a properly functioning European energy market with an adequate infrastructure which facilitates cross-border integration of national grid operators. An adequate energy infrastructure is vital for an energy supply which is clean, secure and affordable.

The Energy Report clearly shows that the built environment and transport take up a very large proportion of the total energy consumption in the Netherlands and that these constitute a major source of $CO_2$ emissions. There is also considerable potential for savings in both these sectors. Policy and targets in the area of reducing $CO_2$ emissions and energy transition are more likely to succeed when they are made an indispensable part of spatial policy and planning. However the Energy Report does not go much beyond the development of intelligent transport systems, promoting electric cars, and improving the energy labelling of new and existing buildings.[6] The Energy Report keeps all the options open when it comes to green, grey and nuclear energy, and makes no credible choice. The Energy Report therefore falls short when it comes to formulating adequate and effective policy on the necessary changes to be made in the built environment.

The aim of moving towards a low carbon economy and society in 2050 will require a revolution in the area of smart public transport and an entirely different way of organising and planning urban regions and cities.

## National Policy Strategy for Infrastructure and Spatial Planning

In the spring of 2011 the Dutch Government presented its draft National Policy Strategy for Infrastructure and Spatial Planning. The subtitle 'Keeping the Netherlands competitive, accessible, liveable and safe' already indicates something of the document's nature and goals. After its adoption, this Policy Strategy will replace the Spatial Planning (2006) and Mobility (2004) Policy Documents and the Randstad 2040 Structural Vision (2008) in order to provide room for the provinces, municipalities, citizens and businesses to take the initiative and continue to develop economically. Central government has made it clear that it cannot and does not wish to continue to do and control everything. The Policy Strategy specifically notes that the spatial differences in the Netherlands are widening. The rapid population growth in previous decades is now behind us. In the next 25 years perhaps another one million or so Dutch citizens will be added to the cities, mainly in the west of the Netherlands. More than half of the country's municipalities will soon start to feel the effects of a shrinking population and an ageing one. In most areas the demand for more offices, industrial estates and residential areas will be much less than it has been in recent decades. As a result, obsolescence and vacancy levels will become an increasingly apparent problem.

In many respects, especially in the way the responsibilities between the state, provinces and municipalities are redefined and redivided, the draft National Policy Strategy for Infrastructure and Spatial Planning constitutes a break with the past and with the policy of the last few decades. Central government is focusing on strengthening the international position of the Netherlands and promoting the interests of the country as a whole. These interests concern the main networks for the transport of passengers and goods, energy and the environment, flood defences and environmental quality (air, noise, soil, water and external security) and the protection of world heritage sites such as the Waddenzee (Wadden Sea), and the Nieuwe Hollandse Waterlinie (New Waterline defences). These three main goals have been subdivided into 13 themes of national importance and included in national commissions for seven designated so called MIRT regions under the Long-Term Programme for Infrastructure, Spatial Planning and Transport, along with the North Sea coast. The seven MIRT regions are North-West Netherlands including the Amsterdam metropolis region (the northern wing of the western conurbation known as the Randstad), the southern wing of the Randstad, the South Western delta, Brabant-Limburg, East Netherlands, Utrecht and North Netherlands. In this way central government has indicated what it is responsible for and the results it wants to achieve. While at the same time, the state gives the provinces and municipalities room to act in response to their own regional and local situation, make their own decisions and tailor their activities accordingly.[7]

It should be noted that developing low carbon, sustainable and liveable cities and regions will mainly become the concern of the provinces and municipalities, possibly in concert with one another. The stated ambitions and themes of the Energy Report 2011, such as a low carbon economy by 2050 and entering into a

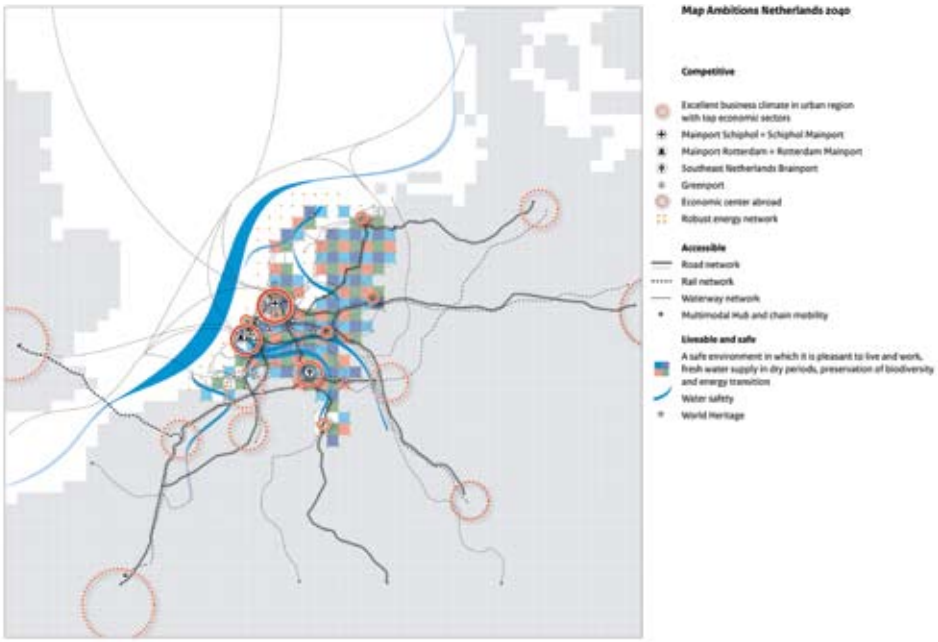


*Figure 2: The subtitle 'Keeping the Netherlands competitive, accessible, liveable and safe' of the National Policy Strategy for Infrastructure and Spatial Planning is represented in the Map Ambitions Netherlands 2040*
*Source: Draft National Policy Strategy for Infrastructure and Spatial Planning*

"Green Deal" with society are hardly, if at all, reflected in the draft National Policy Strategy for Infrastructure and Spatial Planning. It is recognised, however, that the transition to more sustainable fuels will take up more space. To ensure that the Netherlands sets aside enough land for wind energy, central government, together with the provinces, has designated preferred areas for large scale wind farms. Alongside this, international energy relations will be strengthened and the energy infrastructure made more suitable for decentralised electricity generation.[8]

The ex ante evaluation of the National Policy Strategy for Infrastructure and Spatial Planning by the Netherlands Environmental Assessment Agency (PBL) advocated careful steering of the energy transition. The evaluation further emphasized that the built environ-

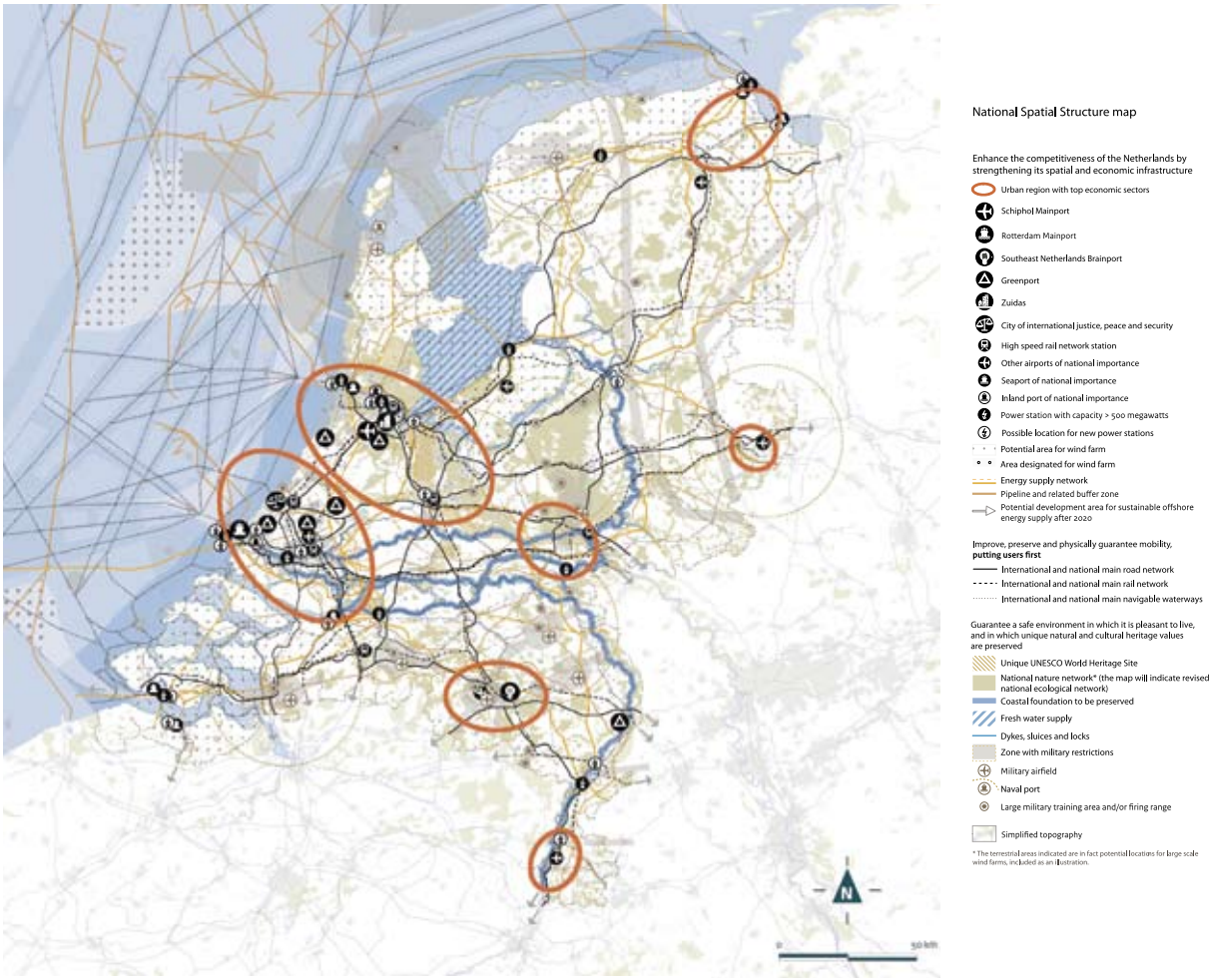


*Figure 3: The National Spatial Structure Map from the (draft) National Policy Strategy for Infrastructure and Spatial Planning illustrates the way that the Netherlands is enhancing its competitiveness by strengthening its spatial and economic infrastructure. Source: Draft National Policy Strategy for Infrastructure and Spatial Planning*

ment can contribute to the energy targets. The heating and cooling of buildings demands a great deal of energy and a lot can be saved by connecting the heat flows between individual buildings, and using waste heat from industry. There is also an enormous benefit to be gained through better insulation of existing homes and commercial buildings, because a large proportion of the buildings that will be standing in 2050 have already been built. This means that it is vital to look at the restructuring of the existing building stock in order to meet energy targets. In other words, it is a matter of improving the heat management in towns and cities in innovative ways, with information and clear rules, such as energy labelling for buildings, and by linking projects, for example, in heating networks.[9]

# The Utrecht 2040 Mission

With 1.2 million inhabitants, the Province of Utrecht is one of the most densely populated and at the central point of the Netherlands. It forms part of the northern wing of the Randstad, one of Europe's strongest economic centres. Utrecht lies at the centre of one of the country's largest metropolitan networks which will drive economic and social developments over the next few decades. It is here that the motorways, railway connections and waterways converge which connect other parts of the Netherlands with one another. In this way it acts as a logistical hub for the major

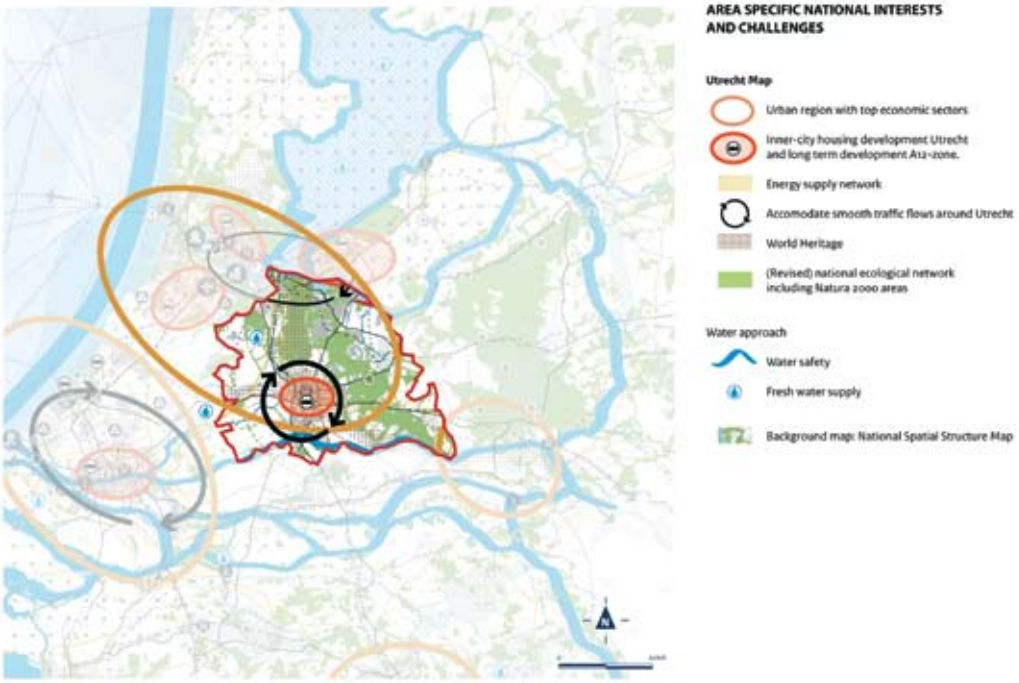


*Figure 4: The Utrecht Region is part of the Amsterdam metropolis region. The (draft) National Policy Strategy for Infrastructure and Spatial Planning states that the proper functioning of the Utrecht region as the Dutch 'hub' with its complex intersection of road, rail and waterways is one of the primary tasks of national importance*
*Source: Draft National Policy Strategy for Infrastructure and Spatial Planning*

development axes along the A1, A12 and A2 motorways. With the trend from 'main ports' to 'brain ports', the Utrecht region is increasingly becoming a meeting point for know-how and creativity. Utrecht owes this opportunity to the three mainstays of the region: its leading position in terms of knowledge-based activities and culture, its central position, and the quality of the cities and surrounding landscape.

In its strategy and mission 'Utrecht 2040: sustainable and attractive', the Province of Utrecht states that it intends to be a province which does not shift the burden to other places on earth and later generations. Making choices with a view to the consequences elsewhere and later is seen as a moral duty and a strategic task. Within the overall picture of maintaining and strengthening the three mainstay qualities of the region, six goals are set; these indicate where the major societal issues and spatial tasks will lie in the coming decades. The Utrecht 2040 strategy is the prelude to the draft policy strategy for the period 2013-2025 and describes a province:

- Where there is for room for a good quality of life (housing, work and nature);
- With an innovative knowledge-based economy;
- Which is accessible by car, bike or public transport in a better environment;
- Which is climate neutral and able to cope with climate change;
- Where everyone counts and can participate at school, in their neighbourhood and in their profession;
- With more diversified nature and an attractive landscape.[10]

The economic strength of Utrecht lies as much in its central location as in its highly educated population, the knowledge-intensive sectors (such as Utrecht University, the Royal Dutch Meteorological Institute (KNMI) and the National Institute for Public Health and the Environment (RIVM) research institute) as well as the creative sectors, business and financial services and the life sciences (Utrecht Science Park). The particular features of the surrounding landscape, including key areas of the National Ecological Infrastructure (EHS) and the presence of cultural heritage features in the form of the 'Roman Limes', representing the border line of the Roman Empire at its greatest extent in the second century AD, and the Nieuwe Hollandse Waterlinie which are candidates for the list of World Heritage Sites, also contribute to this strength. On the edge of the Randstad, Utrecht acts as a buffer zone between the metropolitan dynamism on the one side and the peace and spatial tranquillity of the East Netherlands on the other. This position gives the region the relaxed urban atmosphere and quality of life which makes the area so attractive. These are its past and future critical success factors.[11]

In the 2011-2015 Coalition Agreement of the Provincial Council of Utrecht, the provincial executive designated as its core tasks economic and spatial development, nature and the landscape, accessibility, as well as cultural and historical heritage. Sustainability forms an integral part of these core tasks. The Province of Utrecht is well aware of its position and responsibilities as a hub and its central position in the Netherlands. Policy tasks include restructuring and making more intensive use of existing work sites in combination with energy conservation and reducing $CO_2$ emissions, together with inner city development and strengthening the quality of the rural area, as well as the flood defences, energy transition and accessibility.

The Coalition Agreement also addresses how to make sustainable energy possible in the spatial context. The accommodation of wind power is thought to be constrained by landscape quality considerations. The preliminary draft Provincial Spatial Planning Policy Strategy 2013-2025 document nevertheless includes wind energy sites. If accepted by

the municipalities and if the market takes the lead, the plans for wind energy could be further developed. However, other forms of sustainable energy are preferred, such as solar energy, waste heat, thermal energy storage, geothermal energy, biomass and farm energy, which have less impact on the quality of the landscape.[12]

The draft National Policy Strategy for Infrastructure and Spatial Planning states that the proper functioning of this Dutch 'hub' with its complex intersection of road, rail and waterways is the primary task of national importance. Other tasks in the draft Policy Strategy include building and maintaining the flood defences along the Lek and Lower Rhine rivers and the freshwater supply via the main water system, implementing and protecting the (revised) National Ecological Infrastructure (EHS), including the Natura 2000 areas, making the main energy network robust and complete and accommodating the exploitation of geothermal energy and thermal energy storage in the region. The redevelopment and urbanisation of the A12 zone in the urban landscape between the towns of Utrecht, Nieuwegein and Houten is also designated as a task of national importance. The Utrecht region experiences considerable pressure on its space because of the heavy demand for housing in combination with the limited space available for this.

The economy and the number of households in Utrecht is expected to continue to grow until 2040. Until 2040 there will be continuing demand in the Utrecht region for more than 100,000 homes, alongside the need to replace some 20,000 homes. Given the complexity and scale of the inner city task and the relationship between this task and the function of the 'Utrecht hub', central government and the region have reached agreements about this. They have furthermore agreed that, in principle, some of the demand for housing in the Utrecht region (15,000 homes) will be met in Almere.[13]

## Box 1: Definitions and Ambitions

The following three ambitions are often voiced in the Netherlands: $CO_2$ neutral, climate neutral and energy neutral. These terms are often used interchangeably as if they mean the same thing, though this is most certainly not the case. $CO_2$ neutral is understood to mean: a situation where fossil energy consumption (and related $CO_2$ emissions) measured throughout a year is no more than zero and no energy is consumed that is not put back into the system from a renewable source. Climate neutral refers to a situation where the above definition of neutrality encompasses all greenhouse gasses. Energy neutral goes one step further because in this case the total energy requirements of a company or a whole area must come from renewable sources and the storage of $CO_2$ in new forestry areas or underground is not permitted.

*Figure 5: Wind energy is important in preventing climate change. Photo: Sake Elzinga*

# Third Industrial Revolution

For the further development of the task set out in the Utrecht 2040 strategy as well a climate-neutral and climate resilient province which is dependent only to a limited extent on fossil fuels, the Province of Utrecht in 2010 called in the US economist and energy strategist, Jeremy Rifkin. In his report Rifkin outlines a path in which economic development and the realisation of climate goals go hand in hand. Rifkin expects that, given the finite nature of fossil fuels, in the longer term a worldwide energy transition will start to take place, together with a huge demand for all kinds of products and services. Rifkin, who is also an advisor to the European Commission, makes a clear link with the economy and for his reports and recommendations draws on a large network of people in the private sector, such as Philips, Cisco and Kema. Rifkin's recommendations, with the grand title *'Utrecht Roadmap to a Third Industrial Revolution',* provides building blocks for a clean economy in 2040. These involve the consistent pursuit of an energy conservation policy and the application of new, sustainable energy sources. Rifkins '*Third Industrial revolution*' is based on five principles:

- Energy efficiency;
- Use of renewable energy resources;
- Use of buildings as power plants;
- Development of hydrogen and other energy storage technologies;
- Shift to smart grids and electric plug-in vehicles.[14]

According to Rifkin, it will be impossible to end $CO_2$ emissions in Utrecht completely within 30 years. This is because a large proportion of these emissions are related to the old housing and building stock and the infrastructure. Only at extremely high cost would it be possible to become completely climate neutral within 30 years for heating and other purposes. In addition, many new technologies would have to be applied and a new generation of technicians and engineers would be necessary to manage them. This is not something which can be achieved in one generation. To become climate neutral it will therefore be necessary to find compensation elsewhere.[15]

In his report Rifkin makes an important link between the energy transition and the economic opportunities which this offers. He even calls it an 'Economic game plan'. This is precisely the approach adopted by the Province of Utrecht. It is not a separate programme in which the province will steer the energy transition, but one linked to the economic policy of the Province of Utrecht. In the economic policy plan for the province of Utrecht three essential elements are identified: life sciences, the creative industries and economic sustainability. The last theme is still in its infancy, but with such centres of knowledge as the University of Utrecht, the University of Applied Sciences Utrecht, the Utrecht Sustainability Institute (USI), KNMI, RIVM and TNO, the Province of Utrecht has a lot to offer in terms of a starting point for an economic sustainability cluster. The focus of the province in the coming period will be mainly on creating the right conditions to strengthen this cluster, for example, by combining demand and creating economic added value by encouraging innovation. This means that the province intends to take steps to reduce $CO_2$ emissions in the restructuring of commercial estates and make sustainability and quality of life a visible part of the inner city task. Through the Ontwikkelingsmaatschappij Utrecht (OMU – Utrecht Development Agency), the Province of Utrecht will take part in projects to break the impasse surrounding these tasks. When it comes to the energy issue, the province supports initiatives with a team of energy experts that delivers first aid for technical, financial, legal and organizational bottlenecks. Other examples in which the

## Box 2: Remco van Lunteren, Provincial Executive for Mobility, Economy and Finance

"For a Provincial Executive, these are exceptional and exiting times to work on the transition towards a more sustainable society in the Netherlands. The framework in which the State, the provinces, municipalities and water boards work together on the governance and the future of the Netherlands is very fast and dramatically changing. The challenges of today and tomorrow require these administrative authorities, businesses and knowledge institutes to cooperate together in working on experimental projects, new funding models and pave the way for innovations. Governments have less to spend, that is why we need to get rid of the usual means of grants and subsidies and to become more creative. I am convinced that the future approach of becoming a more sustainable province of Utrecht needs to be quite different than before. Climate is important, but not the only issue that is at stake. We need to recognise it much more as an economic opportunity, if not economic necessity, based upon the reality that fossil fuels will be quickly run out and thus more expensive. Thanks to the "Roadmap" we know very well how difficult this task is and which opportunities can be capitalised upon. As a province we have the task to facilitate the transition towards a sustainable economy and liveable spatial environment. In the Provincial Spatial Planning Policy Strategy we explicitly focus on working together with the municipalities in the Utrecht region in order to reserve space for sustainable energy as well as to intensify the inner cities, transform the A12 zone and improve and develop the light rail connections."

*Figure 6: Remco van Lunteren, Provincial Executive for Mobility, Economy and Finance*

province is involved are knowledge and innovation in the area of deep geothermal energy, facilitating biogas hubs to support transport and supply of biogas, project management group for smart grids and administration for a guarantee fund.

In his report Rifkin also makes another import link between the issue of the energy transition and its spatial impact. He has made a rough estimate of what would be required to achieve a climate neutral region by 2040: importing 120,000 freight vehicles a year carrying bio-


*Figure 7: This diagram of a smart grid illustrates in which way local energy sources, buildings and electrical vehicles are interconnected. Source: Utrecht Roadmap To a Third Industrial Revolution*

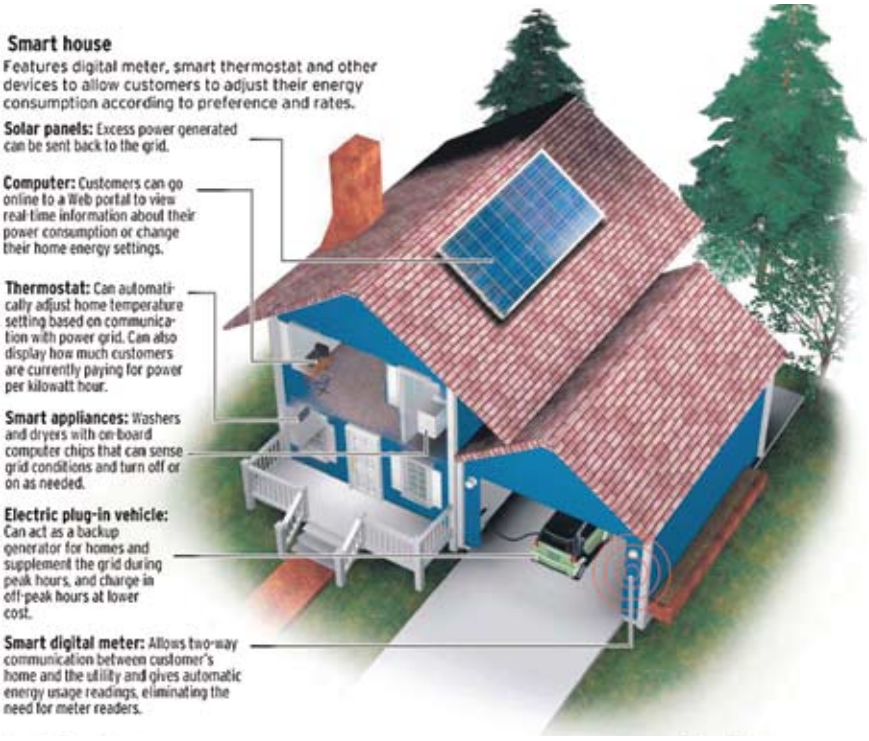


*Figure 8: The common situation of a house that is connected to the power grid only to consume energy might be outdated in the near future. A smart home connected to the smart grid will be able to upload, store and download energy in a way similar to the internet. Source: Utrecht Roadmap To a Third Industrial Revolution*

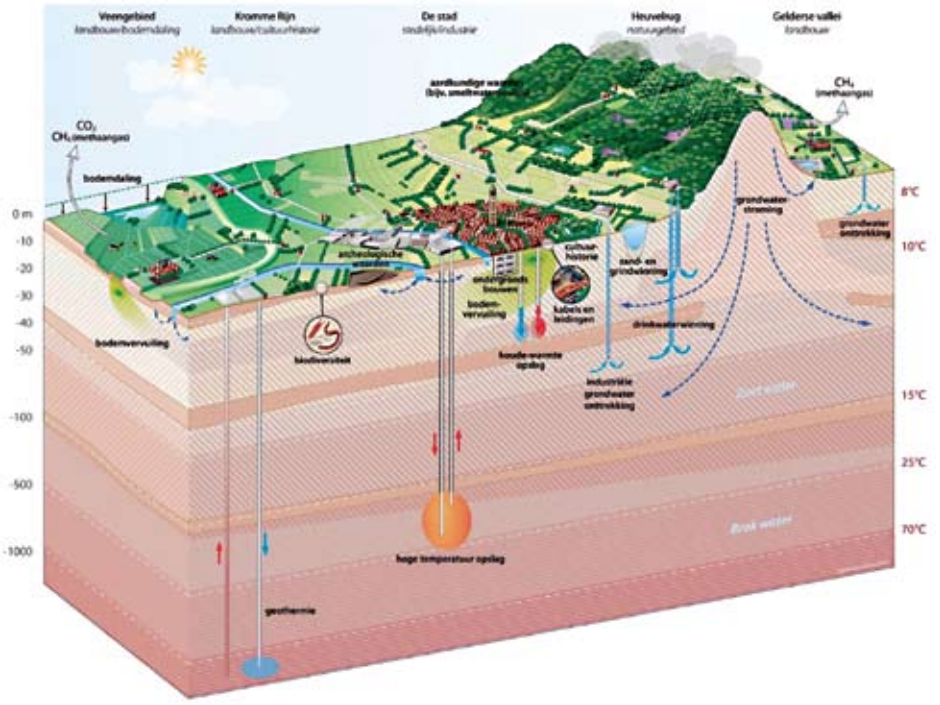


*Figure 9: According to Rifkin, geo-thermal energy is one of the renewable energy resources necessary for a clean economy in the Utrecht Region 2040. Source: the Utrecht 2040 Mission*

mass or 1600 large-scale wind turbines in the beautiful open landscape. Given the spatial complexity of the Province of Utrecht previously referred to (densely populated intersection of road, railway and waterway network, nature/landscape) this is not a realistic prospect. But providing the room for energy and other forms of innovation and for large scale generation of sustainable energy is probably the most important pre-requisite in relation to the province's core task in the spatial domain. The province itself cannot develop any sustainable or conventional energy projects. It will be the market players, such as project developers, power generation companies, housing associations and groups of residents who will do that. The task of the province will be to provide clarity at an early stage for these parties regarding where they can develop their initiative. This is what the Provincial Spatial Planning Policy Strategy is intended to do.

# Utrecht's Spatial Planning Policy Strategy

The preliminary draft of the Provincial Spatial Planning Policy Strategy sets out spatial policy for the period 2013-2025. This document centres around the question of how to ensure that the region remains an attractive place to live and work and for recreation, while maintaining the balance between people, the environment (planet) and the market (profit). The spatial planning policy strategy sets out three main development themes: a sustainable residential environment, bustling villages and towns and an attractive rural area. These themes will contribute most to the attractiveness, liveability and spatial quality of the province.

With the development of a sustainable environment in which to live, the province is preparing for climate change. The spatial planning policy strategy restates the province's goal of being a climate-neutral province and climate-resilient by 2040. To achieve this goal the province already needs to take this into account in its spatial planning. Part of this will include increasing the share of sustainable energy sources. This is desirable not only to achieve this aim, but also from the point of view of becoming less dependent on fossil fuel sources. To cope with climate change it is important that the soil, water system and flood defences are sustainable and robust. Where water levels are too high, the excess has to be safely channelled away and the dikes are intended to further reduce the likelihood of flooding. The Province of Utrecht wants its towns and cities to continue to be attractive, healthy and safe places to live and work and recognizes that a sustainable living environment is also a factor in the decision where to locate a business, one which is expected to become even more important in the future[16]

Sustainable energy is considered to be a 'provincial concern'. This means that the province can address this concern in various ways. The goal of making the territory of the Province of Utrecht climate neutral by 2040 not only involves reducing $CO_2$ emissions but also achieving a situation where the province is no longer dependent on the finite supply of fossil fuels. The spatial task here is to provide space for the sustainable generation of energy and the facility to bring together those functions which supply or demand heat or energy. For this purpose the Province of Utrecht will aim for energy self-sufficiency in its regional development. The province will ask the municipalities and developers to include a section in spatial plans on how the plan takes energy conservation and the application of sustainable energy sources into account. The province also intends to stimulate the use of all forms of sustainable energy: wind energy, biomass, deep geothermal energy, thermal energy storage, solar energy, hydropower and the use of waste heat. Spatial frameworks have been drawn up for wind energy and biomass. The basic principle here is that, in view of the spatial impact of wind turbines, preference will be given to other forms of sustainable energy. Besides the Spatial Planning Policy Strategy, the province will also draw up a strategy on the theme of the subsoil which looks at the opportunities for and threats to thermal energy and geothermal energy storage.

Besides low carbon and fossil fuel independence, a territory which has been organised to be climate-neutral by 2040 has the added benefit of better air quality. It further provides opportunities to maintain and even improve the quality of the physical surroundings. Energy conservation and the generation of sustainable energy also offers opportunities in relation to Utrecht's sustainable economy. To attain climate neutrality the task is to greatly reduce energy consumption through conservation and innovation on the one hand, and to generate the energy that is needed in a way which is

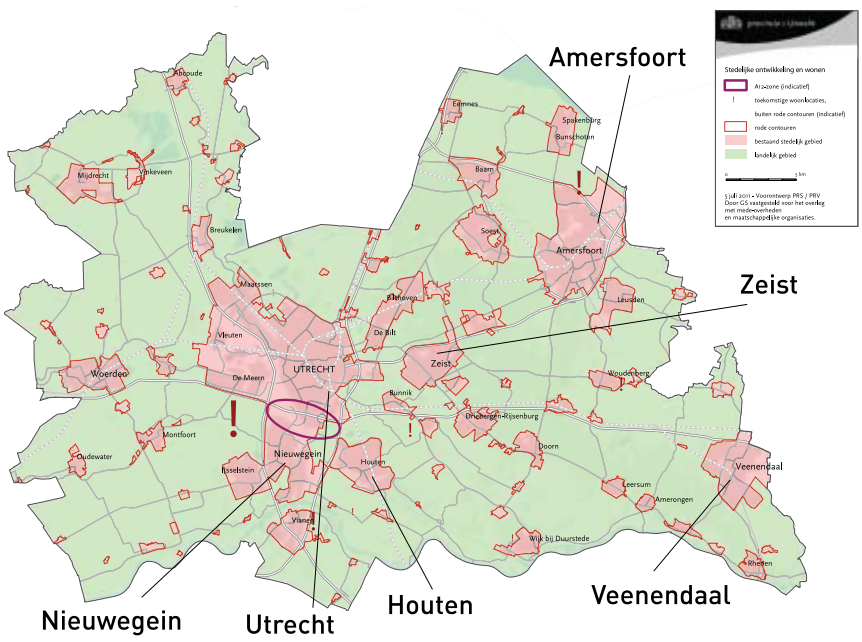


*Figure 10: the Utrecht Region - Amersfoort, Veenendaal, Utrecht, Houten, Nieuwegein, Utrecht and Zeist*
*Source: the preliminary draft of the Provincial Spatial Planning Policy Strategy*

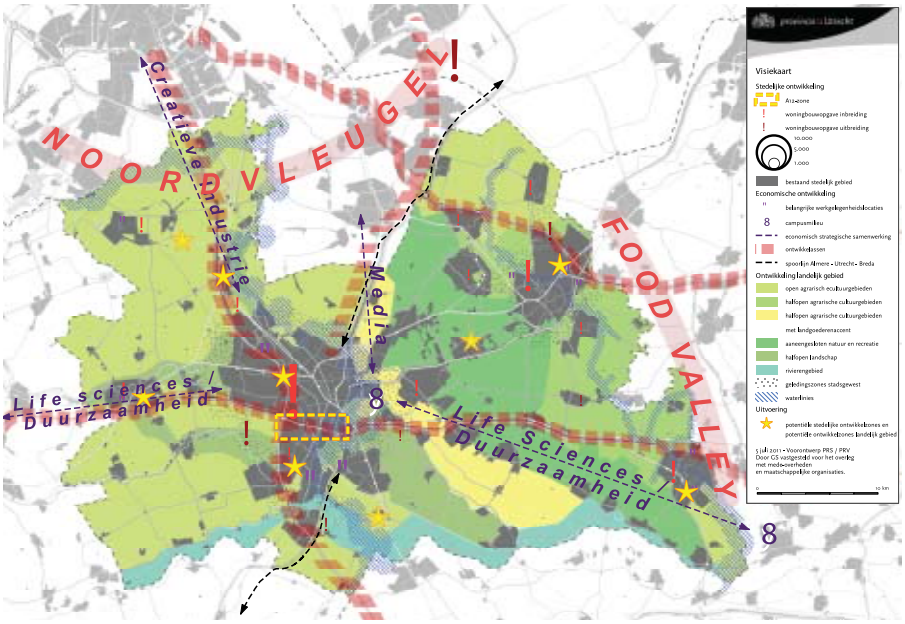


*Figure 11: The preliminary draft of the Provincial Spatial Planning Policy Strategy sets out spatial policy for the period 2013-2025. The strategy identifies three main development themes: a sustainable residential environment, bustling villages and towns and an attractive rural area*

sustainable on the other. This relates to both central power generation of large amounts of energy as well as bringing together various functions which demand heat and energy and can supply heat and energy. The province has estimated the spatial capacity for the production of sustainable energy until 2020. If all the realistic options for biomass, solar energy, geothermal energy, etc. were to be used and the province achieves the nationally agreed goal of 50 MW in wind energy, then this will provide for the sustainable generation of 10% of the Province of Utrecht's energy needs. This means that the province will not meet the goal of 20% of sustainable energy generation as intended in the Spatial Planning Framework. The transition to a sustainable energy supply is expected to progress slowly during the period of the Policy Strategy document (2013-2025). The Province of Utrecht does not expect that this will influence the objective for 2040 to be climate neutral. A characteristic of a transition is a slow start with several small scale innovations, followed by a 'take off' and acceleration phase where visible structural changes take place. In the period between 2025 - 2040 the province expects the many innovative initiatives and projects that already take place, to develop into a fully grown sustainable economy that is independent from fossil fuels.

The Province of Utrecht does not consider wind energy to be the most suitable option in this transition. The goal in itself and the related sites for wind energy are limited essentially to the agreement made with central government to provide for 50 MW of wind energy on land. When it comes to biomass the province is much more generous. Considerations such as fitting the necessary plant into the landscape and the effect of increasing traffic are, of course, also critical factors. The province wants to make the processing of biomass spatially possible based on a positive land use ratio. In the urban regions the responsibility will rest mainly with the municipalities and the same goes for energy conservation and the application of sustainable energy. [17]

# Plans and Initiatives in the Larger Towns and Cities of Utrecht

More than half the residents of the Province of Utrecht live in the six larger towns and cities of Utrecht (311,250 inhabitants), Amersfoort (146,500 inhabitants), Veenendaal (62,250 inhabitants), Nieuwegein (61,000 inhabitants), Zeist (61,000 inhabitants) and Houten (49,000 inhabitants). Utrecht and Amersfoort are the larger and older cities with a historic centre. Nieuwegein, Houten and Zeist are satellite towns of Utrecht and the town of Veenendaal is more closely linked to Ede and Wageningen in the Province of Gelderland.

The two larger municipalities in the Province of Utrecht, in particular, are highly ambitious when it comes to the areas of climate, reducing $CO_2$ emissions and the energy transition. The municipality of Amersfoort has laid this down in a Climate Action Plan[18] and the policy document 'Amersfoort: a city that cares about the future'[19], while the Utrecht municipality has this in its planning and implementation programme 'Utrecht's Energy'.[20] These include the goals to make the municipality of Amersfoort a $CO_2$ neutral municipality by 2030 and Utrecht a climate neutral municipality by 2030 (see Box 1). These goals have not been plucked from the air, but are the result of preparatory policy and research over the years. The programmes of the two councils (last elected in 2010) see $CO_2$ reduction and sustainability not only as a necessity but also as an opportunity for the economy and a way to improve the environment we live in. The two programmes emphasise largely the same things, specifically the building and renovation

*Figure 12: The tower of the Utrecht Dom with a red shawl is the symbol of the energy efficiency of the historic centre of the City of Utrecht. Source: Municipality of Utrecht*

of existing and new residential areas and commercial estates in a way which is $CO_2$ neutral, intensive use of space, the sustainable and local generation of power, clean air through sustainable mobility and creating a green and pleasant living environment.[21]

The planning and implementation programme 'Utrecht's Energy' is solid and full of such aims and policies. Given that 80% of $CO_2$ emissions come from the cities, the programme assumes that the emphasis of the drive to reduce $CO_2$ emissions will lie in the existing stock of housing and industrial buildings, in the private sector and in mobility in the cities. Major $CO_2$ reductions can be achieved by improving the relatively old stock of housing, offices and commercial premises. In mobility too, there are general opportunities for $CO_2$ reduction: in a compactly built city like Utrecht, those opportunities are even greater. The distances involved are small as a result of which quieter, cleaner, safer and more sustainable mobility options (e.g. bicycle, public transport, electric transport) would appear to be the more natural choice.[22]

Thus, there is all the more reason to get to work at the urban level. This can be done, among other things, by improving and extending the district heating which started being laid as long ago as 1923, partly in the historic centre, and in 2005 provided for a quarter of the city's heating needs. The heat supplied is the waste heat from two power stations in the city, combined with auxiliary (stand-by) district heating plants. This results in a reduction of 50% of $CO_2$ emissions compared with

traditional individual heating systems in every building. The heating network has branches not only into the post-war residential areas of Kanaleneiland and Overvecht but also extends to the neighbouring municipality of Nieuwegein and the eastern part of the Leidsche Rijn urban development.[23] By adding biomass as source of energy in the two power stations, the district heating network becomes more sustainable.

Another key objective is to reduce energy consumption in the extensive historic inner city of Utrecht, where there are over 4.500 large and impressive historic buildings like churches, museums and university faculties. The municipality is investigating the feasibility of deploying a combination of interventions to reduce energy consumption without damaging the historic cityscape and the listed buildings. For the time being, the focus is on renovation and careful insulation, together with smart building services, smartly utilizing the district heating network and the use of thermal storage in the ground. In this way the municipality considers not only individual buildings but also looks at connected parts of the extensive historic inner city. [24] It is working on a number of key sustainable projects, such as the Science Park on the Uithof university campus, the station area and the Rijnenburg urban development district with 7,000 homes, the master plans for which provide for them to be made more sustainable. These projects also derive to some extent out of the strategy policy for the period 2015-2030 drawn up by the municipality in 2004.[25] This strategy sets out tasks such as optimizing and intensifying

*Figure 13: Artist impression of the redevelopment of Utrecht Central Station. The ambition is to become the most sustainable railway station in Europe. Source: Municipality of Utrecht.*

*Figure 14: Artist impression of the redevelopment of Utrecht Central Station connecting the historic city of Utrecht*
*Source: Municipality of Utrecht*

the use of the urban space and making the urban water system more sustainable, although measures related to the areas of climate, reducing $CO_2$ emissions and energy transition are more recent innovations.

Amersfoort municipality has a policy strategy for 2030 in preparation in which sustainability constitutes one of the important themes. Indeed, under the course which the municipality has set for itself, sustainability will be the guiding principle in the further development of this bustling city. Moreover, it is one of the main tenets of the 2010-2014 Coalition Agreement. This concerns the interpretation of the broad term sustainability: the coherence between socio-cultural, environmental and economic measures (people, planet and profit), such that the effects elsewhere and on later generations are recognized. The positioning and strength of the city of Amersfoort is at the heart of its ambition to further develop into a vital and sustainable city as part of the northern wing of the western conurbation known as the Randstad, with a central role for the Amersfoort region. Another related task is the renewal and more intensive use of the existing urban area.[26]

The Steering Document which provides the essential starting point for the Amersfoort Spatial Policy Strategy 2030 sets out eight spatial planning goals and looks more closely at the context and dilemmas which will arise in drawing up the policy strategy. One of the eight spatial planning goals, a specific

response to climate change, aimsto facilitate a $CO_2$ neutral city as far as is spatially possible by 2030. The municipality is fully aware of the scale of this task. To achieve this goal energy consumption will have to be reduced as far as possible. Realistically, however, the likely gains in that area will be limited. Most can be achieved in the built environment and through sustainable mobility. This is why an energy transition is needed, i.e. switching from the use of fossil fuels to the generation of sustainable energy. All promising forms of sustainable energy must be utilized in order to meet this goal. Examples include solar roof panels, energy storage in the ground, utilizing biomass and wind energy. It is important to create the right conditions to ensure that optimum use can be made of these opportunities. Some forms of sustainable energy, such as wind turbines, are at odds with other spatial planning goals, such as the aim to create an attractive green city which is a pleasant place to live in. [27]

*Figure 15: The masterplan for the future residential area Rijnenburg. As the Province of Utrecht has set goals in order to reserve space for sustainable energy as well as to intensify the inner cities, transform the A12 zone and improve and develop the light rail connections, it is unlikely that this residential area will be built in the near future. Source: Municipalities of Utrecht and Juurlink and Geluk Urban Planning and Landscape Architecture*

*Figure 16: One of the experimental low energy houses in Nieuwland in Amersfoort, built in the early 1990s, demonstrated all kinds of techniques and systems Source: Wissing Town Planning and Urban Design*

*Figure 17: The sustainable residential area Nieuwland in Amersfoort consists of 4,500 houses. One thousand of them are covered with solar cells Source: Wissing Town Planning and Urban Design*

In recent decades, Amersfoort has made a name for itself with its Nieuwland sustainable residential district with 4,500 homes. This residential area is one of the first of its kind in the Netherlands, where the principles of sustainability have been applied right down to the smallest details. The Nieuwland district was built in the period 1995-2002 and is the world record holder in the area of active solar energy. The electricity generated by some 12,500 $m^2$ of solar panels on more than 1,000 homes and other buildings is enough to meet 40% of the total demand of the households living in those 1,000 homes [28]. The experience gained in Nieuwland was then applied to Vathorst, the urban district currently in development with roughly 11,000 homes and all attendant facilities, such as healthcare, education, sport, culture, shopping centres

*Figure 18: The city of Houten is a classical example of Transit Oriented Development (TOD). The urban lay out of Houten is designed for cyclists and pedestrians. Houten is well connected by train Source: Municipality of Houten*

*Figure 19: Artist impression of the redeveloped railway station of Houten. Immediately under the platforms a free parking for bicycles is situated. This underlines the principle of Transit Oriented Development in new town Houten. Source: Municipality of Houten.*


*Figure 20: Nieuwegein has renovated its town centre. The energy supply for heating and cooling for the town hall, theatre, library, housing and retail outlets is largely provided by heat pumps, together with underground thermal storage*
*Source: Municipality of Nieuwegein*

*Figure 21: In the Policy Strategy for Spatial Planning 2030 of Nieuwegein, sustainable development is one of the leading ambitions. It shows the main pipeline routes of the district heating network with a connection to neighbouring Utrecht, and the areas around the stops and corridors of public transport that are to receive more intensive housing*
*Source: Municipality of Nieuwegein*

and its own train station. The focus over the coming years and decades will be on completing Vathorst and on the sustainable re-development of existing residential districts such as Soesterkwartier and Bergkwartier.[29]

The four other major towns in the Province of Utrecht, the municipalities of Houten, Nieuwegein, Veenendaal and Zeist each have specific climate programmes and ambitions.[30] These municipalities' goals in the area of climate, energy conservation and reducing $CO_2$ emissions are less ambitious and far-reaching than those of the Amersfoort and Utrecht municipalities. Nevertheless, all four of these municipalities have realised remarkable projects worth following or have such in preparation. The municipality of Houten is a world renowned new town, one of the satellite towns of Utrecht to meet the needs of the growing Utrecht region. From the start, in the 1970s, Houten is a classic and successful example of Transit Oriented Development (TOD). The urban design of Houten is entirely oriented towards cycling. The car infrastructure has been made subordinate to this. The new centre is closely linked with the modern transport hub for passengers by train, bus and

taxi, and readily accessible too by cyclists and pedestrians. Its TOD role will be further reinforced by the track widening along part of the railway link between Utrecht and 's-Hertogenbosch.[31] The new town has already started to retrofit its oldest residential neighbourhoods in order to make 8,000 houses more energy self-sufficient and healthier.

Nieuwegein is situated next to Houten, but actually its opposite with an urban layout mainly planned around car use. But like Houten, the municipality of Nieuwegein would like to become much more of a cycling town. The most notable project is its renovated town.centre, This is made up of the town hall, theatre, library, housing and retail outlets. The energy supply for heating and cooling the town centre is largely provided by heat pumps, together with underground thermal storage. Sustainability, climate programmes and ambitions are well integrated in the Spatial Policy Strategy 2030 of Nieuwegein. Its plans show the main pipeline routes of the district heating network with a connection to neighbouring Utrecht, and the areas around the stops and corridors of public transport that are to receive more intensive housing.[32] Between Nieuwegein and the A27 motorway, there is to be a sustainable industrial district and a 13 MW windfarm, providing a quarter of the provincial target.

Sustainability is not specifically mentioned in either the Strategic Plan 2025 or the Spatial Policy Strategy 2025 of the Veenendaal municipality, although the documents do include the usual spatial planning goals and aspirations. [33] The Veenendaal urban development 'Buurtstede' with 1,250 homes, the first part of a larger development of 3,200 homes in Veenendaal East, is being built with a sustainable energy system which makes use of a combined heat and power plant, underground thermal storage at a depth of 85 metres and heat pumps. The heating or cooling is distributed to and from the homes via the pipes of the distribution system. The energy system also provides the necessary heat for warm tap water, together with the heating to five existing apartment blocks nearby. One innovative element is that the Veenendaal municipality, two local housing associations and two project developers have joined forces to establish a local energy company that runs the energy system. [34]

Zeist houses the office of the World Wide Fund for Nature (WWF) of the Netherlands. This renovated laboratory and office building dates from 1954 and in 2006 was converted to the first building in Europe that supposedly emits no $CO_2$. [35] In the recently produced Spatial Policy Strategy 2020 of Zeist, sustainability is one of the principal themes, but it lacks any relation with climate programmes and ambitions. [36] The main aims of the municipality are the sustainable redevelopment of the surroundings of the Driebergen-Zeist public transport hub [37] and the sustainable and energy efficient redevelopment of Kerckebosch, one of the older residential neighbourhoods with 1.250 houses. [38]

## The A12 Zone Connecting Utrecht, Houten and Nieuwegein

An overview and discussion of the most promising projects and activities in the field of sustainable spatial development and design across all the individual municipalities shows that these projects and activities surpass the administrative borders of the municipalities. The overview shows that a large proportion of these projects and activities is closely related to the central location and the national motorway, railway and waterway hub. To be able to accommodate the constantly growing de-

mand for mobility in the Netherlands and the Province of Utrecht, central government, the Province of Utrecht and the six major towns of Utrecht are investing in various forms of infrastructure to meet future needs. This involves building the A2 and A12 motorways underground, so that the now divided urban areas are better connected, as well as expanding the light railway between Utrecht, Nieuwegein, Leidsche Rijn and the Uithof, the university campus, and improving the areas around the stations in Amersfoort, Utrecht, Driebergen-Zeist, Houten and Veenendaal.

Within the foreseeable future the underground section of the A2 motorway (Eindhoven-Amsterdam) will provide a barrier-free connection between the existing city (Utrecht) and Leidsche Rijn situated to the west, the largest urban development area in the Netherlands with more than 30,000 homes and 80,000 inhabitants forecast for 2025. A more urban-style underpass is envisaged for the A12 motorway (Arnhem-The Hague) for 2025-2040. The zone on both sides of the A12 offers good opportunities to develop an essentially monofunctional, extensively used, urban fringe area into a multi-functional, dynamic commuter area at the centre of a continuous metropolitan region. An area which is no longer only easily accessible by car, but also by tram and bike. The zone makes a substantial contribution to the economic strength of the region in the centre of the country and its positioning as a culture and knowledge-based region. The area lends itself well to the planned demands of the future. It is expected that in 2040 people will want to live and work in mixed urban areas, with spaces to meet and with multimodal accessibility. Some 2,500 to 7,500 additional jobs will be created, and there will also be room for 10,000 to 20,000 homes and a number of regional facilities.


*Figure 22: The A12 zone in the Policy Strategy for Spatial Planning of the City of Nieuwegein. The A12 zone aims to link the municipalities of Utrecht, Nieuwegein and Houten. Source: Municipality of Nieuwegein*

*Figure 23: This visualisation of the A12 zone illustrates that this zone is multifunctional and focussed on urban living and urban lifestyles. This is in sharp contrast with the present situation with its outdated office buildings. Source: Stuurgroep A12 zone*

There are four guiding principles underlying the development of the A12 zone which is intended to link the municipalities of Utrecht, Nieuwegein and Houten. These are: Utrecht-like urbanity, meeting, sustainability and green/blue. Utrecht-like urban living represents the link with the essence of Utrecht, the qualities on which the success of the Utrecht region is based. Key concepts here include high density, mixed use, green corridors, the human dimension and meeting spaces. Meeting stands for the new way of working in the heart of the Netherlands. At the intersection of the A12 and the A2 between the urban centres in the region, in a compact and mixed urban area with tram, car and bike on the doorstep, a bakery in the neighbourhood and a pavement cafe around the corner. Sustainability is first and foremost about a more intensive and multifunctional use of existing locations, the choice of the location, the spatial planning and design of the zone, the economic basis as well as how the residents and visitors to the area act. The area will be designed such that users are continually invited to act in ways which are as sustainable as possible. Key concepts here are tram use, bike, $CO_2$ neutral, energy generation and climate resilience. As with sustainable economic growth, there is a new way of working and economic activity in low environmental categories. Green/blue refers to the specific features which make the region so attractive, such as the residential area and maximum use of the natural features already present in the A12 zone, the linking themes being the special elements of the Hollandse Waterlinie and the strength of the water corridors running through the area that were once flooded as defences. By connecting the Green Heart of the country with the greatly valued landscape features in a way which is environmentally-friendly, the green/blue concept can bring added impetus to the region.[39]

# Conclusion

The Utrecht region has made considerable steps in planning low carbon, sustainable and liveable cities. The Province of Utrecht and the six larger towns and cities in the Utrecht region are doing their very best in translating very tough climate and energy ambitions into special policies and a low carbon and sustainable build environment. The Province of Utrecht has wisely transformed climate issues into economic challenges and spatial policies. The cities of Amersfoort, Houten, Nieuwegein, Veenendaal, Utrecht and Zeist are doing the same, with smaller budgets and mixed success. The effort needed to meet the proposed reductions are greatly underestimated. Becoming a $CO_2$ neutral municipality by 2030, for instance, means an average reduction of 5% $CO_2$ every year. The Energy Report of the WWF demonstrates that this can be done and that by 2050 almost all the energy we need (95%) can come from renewable sources. The report shows that such a transition is not only possible, but also cost effective, providing energy that is affordable for all and producing it in ways that can be sustained by the global economy and the planet.[40]

Climate and energy ambitions have spatial impacts and consequences. In order to actually fulfil these ambitions, we need to plan and built our cities in a more compact way and more based on public transport and high speed trains than on cars. It is generally accepted that we require almost a complete retrofit of the build environment, a transformation of the energy infrastructure, carpeting roofs with solar cells, harvesting geothermal energy and building wind farms in almost every possible location. And planning low carbon, sustainable and liveable cities requires a transformation of the planning profession.

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