The Green Heart Region up to 2050

Three scenarios for the Green Heart Region
March 2001
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Introduction

The three scenarios for the Green Heart Region described here each focus on developments up to 2050. These scenarios have resulted from the Visions for the Green Heart project, which constituted, in turn, part of the project ‘Integrated Visions for a Sustainable Europe’ (European Commission, DGXII, Science, Research and Sustainable Development) in accordance with contract ENV4-CT97-0462 (RIVM-project S/408505/02).

The Green Heart region is first briefly introduced here to act as a starting point for the three scenarios and answers two questions: *What has happened in the Green Heart area in the past centuries?* and *What are the main problems and threats for the Green Heart area?* The introduction is followed by a presentation of the three scenarios of which the main characteristics are described in Table 1.

**Table 1: Main characteristics of the Green Heart scenarios**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Technology Rules</th>
<th>Europe Leading</th>
<th>Water Guiding</th>
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<tr>
<td>Demography</td>
<td>High level of immigration, little greying</td>
<td>Average immigration level and greying</td>
<td>Low level of immigration, much greying</td>
</tr>
<tr>
<td>Economy</td>
<td>Strong growth</td>
<td>Stagnation and growth</td>
<td>Growth</td>
</tr>
<tr>
<td>Institutions</td>
<td>Local</td>
<td>European and local Small</td>
<td>National and local Average</td>
</tr>
<tr>
<td>- Government</td>
<td>Large</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Influence of NGOs and enterprises</td>
<td>Liberal, scattered buildings (park landscape)</td>
<td>Compact and concentrated building policy</td>
<td>Most compact</td>
</tr>
<tr>
<td>Spatial Planning Policy</td>
<td>Rapid and very strong development</td>
<td>Strong development</td>
<td>Average development</td>
</tr>
<tr>
<td>Technology</td>
<td>Individual modes of transport (road, air, etc.)</td>
<td>Circular railway</td>
<td>Individual modes of transport; road and water</td>
</tr>
<tr>
<td>Transport and infrastructure</td>
<td>Dual society</td>
<td>Average level</td>
<td>Low/average level</td>
</tr>
<tr>
<td>Social quality</td>
<td>Small parts of the Green Heart flooded</td>
<td>No space for water</td>
<td>Large parts of the Green Heart flooded</td>
</tr>
<tr>
<td>Water in the Green Heart</td>
<td>Global warming</td>
<td>Cooling</td>
<td>Extreme global warming</td>
</tr>
<tr>
<td>Climate</td>
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Introduction to the Green Heart

Historical background
The Green Heart is located in the west of the Netherlands (Figure 1). The region covers approximately 182,677 hectares, which is about 5% of the total area of the Netherlands. The Green Heart originated as a spatial planning concept. The 'green heart' and the Randstad concepts, the Randstad being the urban agglomeration area in the west of the Netherlands comprising Amsterdam, Rotterdam, The Hague and Utrecht, arose from the geological state and the historical developments.

The Green Heart and the Randstad consist of a ring of high ground which surrounds an area of marsh fens. Towns were built on the higher ground and, as a result, the land in the middle has remained fairly open. The concept 'Green Heart' implies an open area meant to serve as a large, central and agricultural land mass, where urbanisation is prevented as much as possible. The Dutch Government wants to achieve this aim through a restrictive policy on housing and employment, and since 1982, an active policy for enhancing the ‘green’ functions, such as agriculture, nature and recreation.

Figure 1: The Green Heart.

Developments in and pressures on the Green Heart
Figure 2 shows the main categories of land use in the Green Heart (1996). Agriculture is by far the largest land-use category, occupying 75% of the available space. The built-up area (including infrastructure) and water each occupy about 10%. So, only 5% is left for forest, nature and recreational areas.

In the 1993-1996 period, 1000 hectares of agricultural land were put to other land uses. The main part, about 720 hectares, was converted to built-up area and infrastructure. This means an increase of almost six percent in only three years. Almost 200 hectares went to forest, nature and recreation.

Figure 2: Land-use in the Green Heart, 1996.
Demography
Despite the restrictive policy, the number of inhabitants in the Green Heart more than doubled between 1950 and 1994, from 330,000 to 681,000. Also, the pace of building houses in the Green Heart was above the Dutch average.
The Dutch population is expected to increase up to 2010 (approx. 16 to 17 million) and ageing will also set in. These demographic developments are likely to result in an increase in urbanisation, which will, due to the high density of the Netherlands, intensify pressure on the Green Heart.

Economy
In general, the Dutch economy is flourishing and the Randstad plays an important role in this. It is an attractive environment for companies in competitive terms due to the favourable location, infrastructure, culture, overheads and highly educated employees. The economic development of the Randstad has extended into the Green Heart, especially along the main motorways where companies want to settle in the green environment.
Furthermore, future European agricultural policy will impact on the vitality of the agricultural sector in the Green Heart, which is currently one of the key actors in keeping the Green Heart open and green, notwithstanding the negative environmental pressures associated with agriculture. Agriculture in the Green Heart depends heavily on dairy farming, a sector that is strongly influenced by the European Agricultural Policy.

Institutions
There is no single legislative body for the Green Heart. Most of the policy for the Green Heart came originally from the national government. The three provinces in which the Green Heart is located (Noord-Holland, Zuid-Holland and Utrecht) translate the national policy to the regional level. Finally, municipalities are responsible for the real implementation of the policy. In the 90s, a so-called Steering Group for the Green Heart (Stuurgroep Groene Hart) was formed to coordinate the policy for the Green Heart region. It consists of policy makers from various governmental bodies (ministries, provinces, municipalities) and interest groups like nature organisations.

Nature and environment
Developments in infrastructure have led to some fragmentation of the landscape and disruption of ecosystems. Other environmental problems are disturbances caused by light and sound due to transport and lamp standards. Airports and their related activities have direct environmental impacts on the Green Heart in the form of noise pollution and threats to air quality.
National government is trying to create new nature areas in the Green Heart. Two examples are De Ronde Venen, development of wet nature area, and the Bentwoud, a forest development plan.
Climate change and especially global warming are big issues on the global scale. As a consequence it is generally expected that water levels will rise. This may cause a water surplus increase in the polders of the Green Heart.

Transport and infrastructure
The Green Heart has experienced a growth in infrastructure, both in terms of roads (such as the construction of the A2, A4 and A27 motorways), and of rail infrastructure (such as the Schiphol line and Flevoline).
At the moment the Randstad is coping with severe congestion problems. Since 1986, the number of hours spent in traffic jams in the Netherlands has increased
by almost 70%. The Green Heart’s road network is often used as a short-cut to escape these congestion problems.

For the last 14 years the national airport, Schiphol, has experienced a yearly increase of 8% in the number of passengers and is expected to expand even further.

With regard to rail infrastructure, a High Speed Line (HSL) is planned between Amsterdam and Brussels, and along the Betuwe Route, between Rotterdam and its hinterland. Both rail trajectories will go through or pass alongside the Green Heart.

**Figure 3: Main rail and road infrastructure.**

**Spatial planning policy**

The national government tries to preserve the Green Heart as an open and green area. To do so, it follows a policy in which new residential and industrial areas are limited to and concentrate on the vicinity of existing towns. Called the restrictive policy on expansion in the Green Heart, this policy is written down in the so-called Policy Document on Spatial Planning.

**Water**

Water is a critical issue in the Green Heart. Water management, and particularly the management of the water level, are important for the opportunities offered by nature and agriculture. The requirements, however, differ: a high water level is preferred for nature, but agriculture prefers a low water level. Other aspects of water management are the creation of sufficient natural flood areas and an increased use of the water meadows for water runoff.

Water problems already occurring in the Green Heart are eutrophication; salination and drying of the soil; pollution of the water from industrial plants, sewage and water from other areas (esp. via the Rhine); pollution of river and lakebeds.

**Recreation/Culture**

The Green Heart plays an important role in the recreational needs of the inhabitants of the Randstad (cycling, walking, etc). The Green Heart has many sites of cultural-historical importance, for example, the windmills at Kinderdijk, which have been nominated for a place in the UNESCO World Heritage List.

**Summary**

The Green Heart can be characterised as an open and green area of large scenic, cultural-historical and environmental value. The challenge for the future of the Green Heart is, despite the pressures, to maintain and strengthen the different aspects of its quality, i.e. quality of life, scenic and cultural-historical quality, environmental and nature quality, and accessibility and economic vitality.
Scenario A: ‘Technology rules’

In this scenario, the economic growth continues; technological innovations in the ICT field, bio- and nano-technology take off; the influence of the national government wanes; more is left to the market forces, where businesses and NGOs become important players; the income gap between social groups widens; there is a spatial division between the affluent and the less well-off in society.

The period up to 2020

Technological developments in the field of science (mathematics, chemistry, etc) make alternative energy sources more attractive. This makes it possible to switch from fossil fuels to natural energy sources like wind and solar energy. Techniques for more environmentally friendly modes of transport are investigated. Alternatives to traditionally fuelled cars, are electric or hybrid propulsion cars/vehicles and new techniques for the reduction of emissions.

### Technological innovations

The reliability of solar collectors has improved and a large increase made in the performance of the (electrical) battery. By using new materials a battery from the same weight may now have 5 times as much energy as before.

In the upcoming decades major breakthroughs are realised in the field of genetically modified organisms. However, society rejects these products because of the lack of information on safety issues: will the modified products cause toxic side-effects? What about ecological balance? And what are the limits: only vegetables or animals or even human beings too?

The surplus energy paves the way for continuing economic growth. The economic climate is favourable for all economic sectors. Agriculture, industry and commercial and non-commercial services all flourish. The high economic growth of the last decade continues and even increases for specific sectors producing goods of high quality, like luxury goods and food. In agriculture a shift is noticeable towards biological products, caused by increased demand from consumers (health mania) and resellers. In industry, especially technological research companies flourish.

<table>
<thead>
<tr>
<th>‘Iceland Company’ switches to organic products</th>
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<tbody>
<tr>
<td>In July 2000, Iceland Company, a UK specialist in frozen food, bought 40% of the world’s organically produced vegetables. This enables them to sell solely organic vegetables in their 560 stores. Organic food is made from ingredients produced without the use of artificial pesticides, artificial fertilisers, growth-promoting hormones or genetic modification. Organic producers also have to follow strict animal health and welfare standards and use natural farming methods such as crop rotation to avoid pollution and help preserve the environment.</td>
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Unemployment rates are very low; only 2% of the active population can not find a suitable job. At the same time, there are many vacancies in the service and industrial sectors.

Meanwhile, national government is reducing its role in the provision of services. More and more collective services are privatised. The best example is public transport; bus,
tram, metro and train services are being slowly handed over to free market. But also services in the field of energy and water supply are being sold to national and foreign companies, giving companies and businesses more influence on politics.

In reaction to the retreating national government and the increasing influence of businesses on everyday life, more and more NGOs are formed: nature conservation organisations, consumer organisations, etc. Their power increases thus mainly to the increased support of inhabitants, who feel that by organising themselves and supporting NGOs they can influence politics.

The economically favourable ‘climate’ and security attracts people from poorer regions, especially Africa and the former East European countries. In 2005 a wave of economic and political refugees starts moving in from this region. The Netherlands faces an increasing influx of about 200,000 refugees a year. Most of them go to the West of the Netherlands, the Randstad cities, looking for a job. This leads to an increased pressure on the housing market.

In a reaction to the overcrowding of the Randstad cities, some people want to leave the cities and opt for the Green Heart. Because of the restrictive housing policy for the Green Heart, a house is not cheap. Therefore, only the more affluent population from the cities can afford a house in the Green Heart. Many older people move even further away, like to southern Europe in search of the sun, the sea and the peaceful and quiet surroundings. This brings about a selective population profile in the Green Heart: people above 50 (the empty nest generation) and those with young children leave the cities, creating a shortage of people between 18 and 30 in the Green Heart. The increased demand for housing in the Green Heart puts great strains on the maintenance of the restrictive housing policy.

**Integration of immigrants**

A social programme is initiated to integrate the refugees into Dutch society. A great part of this group finds a job in the service sector. But some become illegal immigrants and fall into poverty.

Most of the immigrants live together in neighbourhoods where housing is cheap. Some of these neighbourhoods get very overcrowded and deteriorate.

In the beginning of the century, population growth was slowing down. But now, because of the influx of immigrants and their high birthrate, the population grows at a higher rate (increase in fertility rate).

**ICT development**

The developments in ICT move at a rapid pace. High-speed information lines, like ADSL, cable and satellite internet services, create new possibilities. Information can be accessed from every location. There is a shift towards more working and shopping at home.

Society becomes more individual. Companies become more footloose and less dependent on face-to-face contacts.

The Bentwoud, a forest development plan, and the RondeVen Venen, a nature development plan from the beginning of this century, offer the desired green living environment for the rich. The development of new lakes is partly in reaction to the increased demand for recreational areas. But another important aspect is the effect of the changing global climate. Global warming confronts the lower parts of the Green Heart with the need for increased measures to prevent flooding. Dikes are reinforced and flood areas designated.
New transport systems start to develop, like the interesting option of (underground) pipeline transport for the goods sector. The first cautious investments are made here, partly financed by the national government. A good example is the underground transport of flowers from the flower auction in Aalsmeer to Schiphol Airport (National Dutch Airport). This pilot project is realised in 2005.

Despite the ICT developments and the opportunity to purchase goods from the internet shops, transport is growing. More scattered dwellings in the Green Heart cause an increase in personal car use. People travel to and from work in the cities and the inhabitants of the cities move to the Green Heart in the weekends for leisure purposes. The delivery of goods (purchased via the Internet) necessitates more small-scale and tailor-made transport of goods from warehouses directly to the consumer (in contrast to the former mass deliveries to stores). These developments lead to more local traffic on the small roads in the Green Heart area, causing more congestion. Congestion on the highways and main traffic arteries is identical to that at the beginning of the century; more people working at home causes traffic decrease which levels out with the increase in the transport of goods.

Public transport (rail, bus, tram and metro) is falling into private hands (different companies). As a consequence only the more profitable trajectories remain and forms of mass transport (mainly busses) start to disappear from the remoter parts and smaller villages and towns in the Green Heart. The train is the alternative to the car for intercity travel in the Randstad. The train can compete with the car due to increased speed and safety, and shorter stop and acceleration times.

The train does not play a major role in goods transport, despite the realisation of the Betuwe railway line (‘Betuwelijn’) in 2010. It never meets up to the high prognoses due to the more flexible needs of distribution and the much cheaper and environmental friendly transport using ships.

The increased economic welfare causes an increase in air traffic. The number of passengers on Schiphol Airport has grown from 39 million in 2000 to 61 million a year in 2020. But this also means more flights and more disturbances in the surroundings of the airport, including the people living in the Green Heart despite several technical innovations to reduce the noise and air pollution.

The period from 2020 to 2050

The economy is still growing but at a less rapid pace. The role of industry is diminishing. The service sector, commercial and non-commercial, is still increasing. New companies and expansions of existing ones are situated next to the main infrastructural arteries, like motorways and railways. Farmers remain in the Green Heart, close to the majority of the consumers.

<table>
<thead>
<tr>
<th>Technology</th>
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<tbody>
<tr>
<td>Investigations and discoveries in the field of nano technology make it possible to realise more powerful computers of the same size every year. Information is widely available but people are ever more questioning the reliability of the different sources. Society has become more familiar with genetically modified products and choices are made: vegetables and meat products are accepted; others are rejected.</td>
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</table>

Social differences are growing. Jobs are becoming rare and unemployment in some sectors is evident.
The rich people in the Green Heart no longer want to live in ‘new town’-like neighbourhood next to the cities like Woerden or Gouda. So they move to open space and villages in the Green Heart. They buy a piece of land and build (or have built) their own villa with a big lawn and fence surrounding it. One could say, a ‘park-like’ urbanisation is taking place, with big and little villas scattered around the green environment. Private security firms guard their new property.

### Park-like urbanisation

The average number of villas is 3 per hectare. That is 10 times less then in neighbourhoods like Leidsche Rijn, where the average housing density is 30 tot 35 houses per hectare.

The Green Heart develops gradually into an exclusive residential area for the more affluent population.

Around 2030 the influx of immigrants has come to a halt. But this does not mean that the refugees want to go back. They like living in the Netherlands and have adapted to and become a part of Dutch society. The former immigrants have set up shops of their own, with their own products; they have become self-supporting. Population growth is levelling off and the number of older people compared to younger people is increasing; the population is greying.

The European Community is further expanding to include the former East European countries. At the same time more legislation and power (e.g. nature and social) is being transferred from the national to the European level.

Companies and NGOs play a major role in politics and influence public opinion. NGOs are most active in the fields of defending the rights of the socially weaker and are active in the nature and environmental protection.

As national government leaves more and more to the free market, the rich inhabitants of the Green Heart fear a loss of protection of their exclusive residential living environment (due to the lifting of the restrictive policy for the Green Heart). To prevent this they organise themselves into a powerful lobbying party. The threat of losing their precious living environment brings people closer together and in this way the development of a Green Heart identity among the inhabitants is strongly stimulated. By 2030 this results in the proclamation of a self-governing body for the Green Heart (see also the textbox on the next page).
The consumption of space is enormous: space for trade areas, space for dwellings, space for recreation and for natural areas, space for windmills and solar energy panels. Collective values, like preservation of landscape and care for nature and environment, are under severe pressure. The new restrictive policy blocks expansion in this area. So, with the ‘island-thinking’ spirit of the times, the island-in-the-sea option is chosen to fulfil the need for extra space. All sorts of islands are constructed for special purposes: residential, work and energy.

Aeroplanes have become smaller and can take off vertically.

In the last decade the shops for consumer products have become redundant and have almost all disappeared. They are converted to sniff-and-look places on the Internet. These are sites where people can choose their product, display it as a hologram, so they can walk around it and at the same time get familiar with the associated smell and feel of the product. After they have made their choices the product itself is delivered directly to the consumers home by means of pipeline transport.

By 2050 the transport of goods is exclusively underground. The only traffic above the ground is now passenger traffic. Personal air transport forms like hot air balloons and zeppelins have not yet broken through on a mass scale. The traditional car with four wheels is still around in the Randstad and Green Heart area, but drives completely emission-less using electric and hybrid power. Most people only use the car for leisure purposes or for the weekly face-to-face meetings at work.
In the Green Heart all forms of mass transport have disappeared. Mass transport by train is still used to take people to and from the residential and working islands.

Climate change is no longer an issue. By the year 2040 the water level and temperature are no longer increasing. The reasons for this sudden change are not all clear to scientists. Some say it is because of the measures taken in the past decades (reduction of the emission of greenhouse gases, introduction of stabilising chemicals in the atmosphere, etc); others say it is pure luck and has nothing to do with any human intervention.

Towards 2050 unemployment has risen from 5 to 10%. Because a part of the more affluent 'average' populations have left for the residential islands, the socio-economic status of the population living in the cities has further decreased.

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**Noise reduction using Anti-sound**

With this technique, noise is reduced by generating a cancelling anti-noise signal that is equal to, but 180° out of phase with, the noise. This anti-noise is then introduced into the environment such that it matches the noise in the region of interest. The two signals then cancel each other out, effectively removing a significant portion of the noise energy from the environment.

This technology is already in use in the year 2000. For example:
- Active Mufflers - Reduce exhaust noise from e.g. internal combustion engines
- Quiet Zones - Silent Seats and Cabin Quieting to provide comfortable workstations for equipment operators.
- Active Headsets - Extend hearing protection beyond passive ear defenders to include low frequencies. Active headsets can also be selective to allow communication and improve workplace safety.
Scenario B: ‘Europe leading’

Europe plays a dominant role: legislative power is transferred from the national to the European level (EU); the EU is expanding with inclusion of former East European countries; EU environmental policy is intensified; European agricultural support decreases. Agriculture disappears from the Green Heart. The Green Heart becomes more and more fragmented due to a weakening of the restrictive policy for the Green Heart. A European revitalisation program has to turn the tide.

The period up to 2020

Despite the restrictive building policy for the Green Heart, towns like Gouda, Woerden and Alphen a/d Rijn are expanding. New residential, industrial and trade areas have been built. In the new residential areas the average number of houses per hectare is 30 to 35 (‘VINEX neighbourhoods’). Because of the still growing population these developments do not result in a lower demand for houses in the Randstad cities. The young people want to live in the cities because of its innovative character and high number of cultural activities.

The Dutch government has made a start with the realisation of the Betuwe route and the HSL, despite protests from inhabitants and environmental organisations. After a long planning period, the HSL is completed surprisingly fast, being completed by 2007, with one small change: instead of running through an expensive tunnel the HSL crosses the Green Heart above ground, cutting off the left part of the Green Heart.

Planners are adopting the ideas of scientists for the making a Circle Rail Way (CRW) connecting the four main cities of the Randstad: Amsterdam, The Hague, Rotterdam and Utrecht. But history has taught us that it will take a long time before ideas result in building activities. Depending on the power of government and the number of protests this can take up 10 to 15 years.

More and more power is handed over to the EU (European Union). The European Community is pulling the strings of environmental policy. In the last decade of the 20th century all countries agreed to a large reduction in CO2 and NOx levels. With regard to nature measures they agreed on the implementation of the so-called habitat and bird guidelines, both part of Natura 2000, the European Ecological Main Structure. Parts of the Green Heart too are designated as habitat and bird-guideline areas. This restrictive policy makes it difficult for farmers and companies to expand in these areas,
so the pressure on the remaining area increases.

Farmers face another drawback. To meet the European requirements on reduction of the use of animal fertiliser (the nitrate directive), Dutch government decides that it is necessary to reduce the number of livestock on each farm by 30%. These measurements are an extension of the existing, more voluntary, policy on reduction of livestock. For the farmers in the Green Heart (mostly dairy farmers) this means a reduction of the number of cows. Farmers are only partially compensated for this loss in terms of money. This means a big setback in income and capital for the farmers.

In 2005 the European Union is expanding to include Eastern European countries (like Bulgaria, Hungary, etc.). This means that these countries now have unlimited access to the European market. As a result, the internal European market is saturated with cheap agricultural products like potatoes and beets. Horticultural products remain in the hands of the Western European countries.

By 2010 the costs of the EC agricultural policy have risen sharply, due to the support of farmer incomes. The EU is no longer able to give full financial support to farmers. It is decided to reduce the subsidies on income, despite large protests from farmers. European or national government is not able to compensate this loss of income. Some try to keep their incomes up to standard by switching from cattle to hog farming, leading to so-called hog flats here and there in the landscape. But because of the low price of pork and the high investments needed, this is only possible for a few of them. Other farmers take up extra activities in the field of recreation. However, some land is unavoidably laid fallow and farmers face difficult times.

Around 2000 the Dutch economy was flourishing. But eight years later the economic tide is changing; one of the causes is a drop in the value of the Euro compared to the dollar and the economic growth is slowing down. This causes serious problems for the already weakened Dutch agricultural sector. Export increases, but most of the food for livestock (maize, tapioca) is imported from countries outside the EU, like the USA and countries in South America. Because of the low exchange rate these products become very expensive.

The other economic sectors also feel the tiding turning. Products and raw materials from outside the EU are relatively expensive, so the price of consumer products is rising sharply. As a consequence, consumption (of luxury products) decreases.

Plans for the CRW are slowed down because of the economic turning of the tides.

The restrictive policy for the Green Heart, for decades an anchor point in Dutch spatial planning, is loosened. This is the result of the transfer of power from the national to the

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Reduction of livestock

In 1999, Dutch government introduced the so-called Regulation to end livestock breeding enterprises (Regeling beëindiging veehoudersjakkken'). Goal is to achieve a reduction in the amount of manure and slurry produced in the agricultural sector by reducing the total number of livestock. This legislation offers farmers the opportunity to obtain financial compensation if they completely stop raising animals meant for the production of meat. Farmers in the so-called concentration areas in the east and south of the Netherlands can even get a compensation for the destruction of their stables.
European level; local government (municipalities, etc.) did not fill this gap. They are more concerned with the local situation. As a result towns are slowly expanding with inclusion of new living and working areas.

Only the habitat and bird-guideline areas remain strictly protected. All development is prohibited here.

Meanwhile, despite the realisation of the Betuwe route and the HSL, there has been no large shift from road transport to other forms of transport by rail, water or air. Most of the time, passenger traffic and freight transport is by road.

**Zeppelins as an alternative mode of transport?**

In 2010 the first ideas and prototypes of Zeppelins for the transport of containers were a fact. In the meantime this form of transport has not become more common. At this point in time there are 25 of these zeppelins. But the increasing congestion is bringing this form of transport more into focus.

National government tries to spread out and reduce the mobility of the inhabitants with a system of roadpricing. But measures are not efficient enough to really reduce mobility. As a consequence, congestion in the Randstad region is a growing problem at the beginning of the 21st century; traffic completely jams up and the Green Heart’s accessibility decreases.

The increased mobility causes more noise and disturbance and creates large barriers for animals. Nature areas are completely isolated and all but quiet. The habitat and bird-guideline areas are conserved but completely surrounded by highways and built-up areas.

Despite the economically poor investment climate, small ICT and technological research companies (1 to 5 persons) are popping up and flourishing. They are mostly located in the city centre or in small business parks around the infrastructural nodes or next to the villages in the Green Heart.

Around 2010 population growth is slowing down and the population is greying. Immigration is almost zero, partly due to the less prosperous economy and partly to a new policy for immigration that makes it more difficult for people to settle in the Netherlands.

The developments in the period up to 2020 have led to fragmentation of the Green Heart. The loosened restrictive policy has caused towns and villages in the Green Heart to expand by creating new housing and small industrial and trade areas located along the infrastructural arteries through the Green Heart. One could call it a clustered form of urbanisation. As a consequence the open character of the Green Heart is lost.

**The period from 2020 to 2050**

Agriculture no longer plays an important role in the Green Heart. Most farmers have given up their agricultural activities in the Green Heart. Because of this, the character of the landscape, which is largely formed by its agricultural use, is no longer properly maintained. Some farmers initially received a subsidy from the national government to maintain the land, but the earnings for the farmers were too little to live on.

People start leaving and some had already left the Green Heart and the Randstad cities. The reasons are obvious. In the first place, the Green Heart is no longer the attractive green area it used to be. It is heavily
fragmented by road infrastructure. The open and unspoiled character is lost because of the scattered buildings that loom large on every horizon.

Besides these aspects there is another good reason. The population in the Green Heart is getting older, the percentage of older people is increasing, i.e. the population is greying. The elderly need special services that are not available in the Green Heart itself, only in the surrounding urbanised area. So these people have to move to the cities. The younger and wealthier part of the population living in the Green Heart moves to the east of the Netherlands in search of a more attractive living environment and to be near their place of work. These people follow the companies that left the Randstad region because of the congestion problems mentioned earlier. What is left in the Green Heart is a relatively impoverished population: a high number of unemployed people and/or people with a low income.

Around 2020, the first calls are heard for a revitalisation programme for the Green Heart region, and government asks local and international experts to start with the development of a comprehensive programme. This is due to the European Union being on its own. Due to the unfavourable exchange rate between the dollar and Euro, products from outside the European Community are still relatively expensive.

In 2021, in advance of the rehabilitation programme, the decision is taken to start with the realisation of the Circle Rail Way.

Around 2025 Europe takes the lead in a comprehensive stimulating programme, both to stimulate the economy and to improve living conditions in general. This program consists of several elements:

- stimulating European-made products (protectionism)
- investments in infrastructure (CRW and airport)
- concentration of population on the Randstad ring
- skill selective immigration policy, varying per EU region
- new environmental policy.

The production of products made in Europe is stimulated and subsidised. In this way it becomes attractive for businesses and farmers to use and produce European-made products.

Infrastructure focuses on the Circle Rail Way as a main component. The CRW is completed in 2028. Another main infrastructural project is a new Euro-airport on an island in the Canal between France and Great Britain. Participating countries are France, Great Britain, Belgium, The Netherlands and Germany. For the Green Heart region this means that Schiphol becomes a smaller regional airport. This reduces noise levels and hazard, and simply improves living in the Randstad and Green Heart region.

Circular Rail Way (CRW)

- The CRW connects the four main cities of the Randstad ring: Amsterdam, The Hague, Rotterdam and Utrecht via Gorinchem.
- It uses part of the existing rail infrastructure of the HSL and Betuwe route.
- It travels at an average speed of 150 km/h.
- It stops at regular intervals of 20 km or every 10 minutes, depending on what comes first.

To create a regular supply of passengers for the CRW, a policy is followed which tries to concentrate the population in the Randstad ring. At the same time, expansion of the built-up area in the Green Heart is again prohibited. Vacant buildings (houses, factories and offices) in the
Green Heart and surrounding cities are demolished. Especially the built-up areas from the 1990-2010 period are vacant and will be demolished.

A skill-selective immigration policy is issued to fill special job vacancies. The skills needed vary among the different European regions. For the Green Heart two types of people are needed. Due to the greying population, the first group consists of people who provide the necessary (health) care for the elderly. The second type needed are those with technology-related skills. Technology is the only flourishing sector and the main employer in the Green Heart region. These two groups of people also get a permission to stay permanently in the Netherlands.

New complementary European environmental legislation is issued. Nature areas have to be better maintained and protected. For the Green Heart this means expansion of the cramped nature areas protected by the European Habitat and Bird-guideline legislation and at the same time new areas are designated.

A unique part of the social and environmental/nature programme is the allocation of garden allotments, one per family, for the less fortunate inhabitants of the Green Heart. Another section of the population, mainly former farmers, finds jobs in restoring and maintaining the original open character of the Green Heart. In this way, large parts are again turned into well-maintained grasslands.

Around 2040-2045 the local Green Heart economy is recovering from its initial dip. The living environment in the Green Heart has largely improved; transport is more balanced and congestion is almost zero; natural areas contain more species and are less fragmented; the elderly receive the needed (health) care.
Scenario C: Water guiding

Climate change, especially global warming, is responsible for rising water levels. Safety becomes an issue, companies and people leave the Green Heart area. Traditional measures to control the water are no longer effective. A solution has to be found in a new way of thinking: follow, not fight the water. Parts of the Green Heart are flooded, new forms of housing and infrastructure emerge, farming is replaced by fish-farming. However, unforeseen problems, e.g. vector-born diseases, arise.

The period up to 2020

Around 2005, climate change is much more a problem than ever foreseen. The effects of global warming are more evident every year: temperature increases, water levels rise, rainfall increases, summers are warmer, winter are colder, precipitation in winter increases, summers are dryer.

The effects for the Green Heart are obvious: more and more people in the lower parts of the Green Heart, especially the holms (‘waarden’) get ‘wet feet’. This is caused by a combined effect of soil lowering due to settling (‘inklinking’), and the rising water levels in the sea and rivers. Groundwater level rises and seepage (‘kwel’) increases. In some places seawater intrusion causes grasslands to become brackish. Protection against flooding is more difficult every year and safety is no longer guaranteed.

Scientists are trying hard to develop new methods to prevent flooding of agricultural land and built-up areas. Government puts a lot of money into research and the development of new pumps. Government is also thinking about the use of overspill or retention areas along the rivers, which can be used in times of high water.

As time progresses, agriculture in the Green Heart becomes more difficult, especially for farmers keeping livestock. Some of them decide to give up their business in the Green Heart and move to the south and east of the Netherlands, others choose another job outside agriculture. Some change business to hydroponics (‘substraat-teelt’). This makes them independent of the soil conditions.

Because of higher risk of flooding, many companies, who would formerly have settled or expanded in the Green Heart region, now move to the Randstad cities and other parts of the Netherlands. This phenomenon is first seen in the holms (low-lying ground near rivers, e.g. Lopikerwaard, Alblasserwaard).

The politicians in The Hague (seat of Parliament) do not like the effects of companies leaving the Randstad area. They start up an advertising campaign promoting the advantages of settling in the Randstad. For this reason, the restrictive policy for the Green Heart is abandoned, which brings about a fierce reaction from the NGOs. They want the Green Heart to remain a restricted area, without new building sites and an emphasis on nature area development and a green living environment. But they also discourage the exodus of companies
and people to the other parts of the Netherlands.

Growth in ICT is undisturbed, giving people and companies new opportunities. Distances between home and work locations are becoming less relevant. People can work from their ‘office-at-home’ and companies no longer feel the need to be near pools of employees. Shopping can be done from behind the computer.

Some people in the Green Heart choose for safety and move to the higher parts of the Netherlands, outside the Green Heart area. The exodus from the holms is followed by people and companies from other parts of the Green Heart. People and companies in the cities are still relatively safe and have fewer reasons to move. But the government’s campaign to keep people in the western part of the Netherlands fails and the exodus increases.

Greying among the residents of the Randstad is also prominent. This is the result of a relatively low number of immigrants and a low fertility rate. People leaving the Green Heart are in most cases the younger people. The older people do not like to leave the place where they grew up, and decide to stay.

In the years shortly after 2000 the freedom to go by car from one place to another was almost zero. The roads were congested with cars and commuters had to begin their journey very early to arrive at work in time. Government decided to improve the infrastructure in the Green Heart. Public transport is now privatised. Travelling by public transport is now much cheaper and therefore more accessible to all. Nevertheless, people keep driving their cars and the number of cars is still increasing. New kinds of environmental friendly cars appear on the market.

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**Fuel Cell Vehicle**

Fuel cell cars look the same as conventional cars and can accelerate from 0 to 100 km/h in 10 seconds; they can travel up to 300 miles without refuelling. Fuel cell cars are driven by electricity. The electricity is produced in a fuel cell on board the vehicle from the catalytic oxidation of hydrogen.

Meanwhile, the prestigious High Speed Train (HSL) project, which has been in operation for a couple of years, literally falls into the water. The tunnel (7 kilometres in length) suffers from water intrusion. In the past five years the tunnel flooded a few times. The salt water caused corrosion of the tunnel and weakened the construction. Safety for the passengers can no longer be guaranteed so the train connection is stopped. Engineers think the solution has to be found in building a bridge instead of the tunnel.

The exodus from the Randstad has provided a large part of the solution to the problem of traffic congestion. Now traffic is evenly distributed over the whole country, and the ICT developments allow many people to work at home so they no longer have to commute on a daily basis.

Still, the main goal of the national policy is to try to reverse the ongoing exodus of people and companies from the Randstad. They decide, in contrast to their earlier decisions, to try to keep the Green Heart open and in its natural state, concentrating on recreation and nature development. The decreased pressure from the population and the economic sectors should make this possible.
The period from 2020 to 2050

The rising sea level makes a large-scale adaptation of the Green Heart water systems inevitable. The continually rising water level in the rivers increases the chance of floods. The water intrusion under the dikes makes the soil wetter every year and it takes a lot of effort to keep groundwater levels constant. A new way of thinking is adopted by the national government; 'Follow the water instead of fighting it'. The decision is taken to flood certain parts of the Green Heart, a controlled form of flooding, the lowest parts (the holms) first. These new lakes in former retention areas also function as large reservoirs of water, which can be used in dry summers.

Loss of nature

Because of the flooding of (agricultural) grassland in the Green Heart, the flora and fauna changes and some rare species become extinct. But other species return instead, most of them conforming to the international bird-guideline areas.

The NGOs support the idea of flooding parts of the Green Heart. They immediately start lobbying for a 'nature reserve' status for them; however, this status is not immediately given to the new water areas. Instead the Green Heart becomes a tourist attraction. Day visitors and foreign tourists later replace disaster tourists, who are only interested in seeing a few houses under water.

After a while the decision is taken to join the wet part of the Green Heart with the IJsselmeer and the Zeeuwse Delta up to the 'Blauwe Kamer'.

Around 2030, part of the Green Heart is declared a Nature Reserve, with special focus on the creation of marshes. Five years later this area gains the status of 'European Nature Conservation Area' (ENCA). A re-introduction programme is started up, in which animals that used to live in the turf areas are released into the fields.

National government follows a spatial planning policy in which the magic word is 'concentration'. New housing projects, mainly for the greying population, and business parks are only allowed in and near the Randstad cities. Because the controlled form of flooding is a success and safety can again be guaranteed, spatial policy also provides the opportunity to develop some exclusive living environments near the lakes (flooded areas).

The newly formed lakes and pools function as a large reservoir of fresh water, which is used to supply water to a large part of the Netherlands. Water is also exported abroad, providing a new branch of industry, next to the tourism, fishery and hydroponics.

The areas still accessible for tourists – besides the nature conservation areas - become more and more attractive to the rich. The tendency exists for them to return to the Green Heart, where specialised architects build a kind of 'water-house'. These houses float on the water like boats but cannot move. The building starts out on an

Scaling up tourism

The Tourist Information Centres are scaled up, allowing tourists to be recruited on a larger scale. The tourist industry flourishes: e.g. new water sports are invented, which in turn provides a new impulse for cities on the edge of the Green Heart. The Green Heart becomes as it were a recreational playground surrounded by an urban ring.
individual basis, but around 2040 some small water cities have come into existence. They can be compared in some way with the city of Venice in Italy, only on a smaller scale. Most of the time the people don’t leave the islands. They are pensioners, retired tradesmen or people who work from home. They can do their shopping by Internet and use it as well for their social contact. Products are delivered by special delivery services.

A start is made with the development of new infrastructure. The car is not the most obvious mode of transport in a water-rich environment. The existing infrastructure (mainly roads and railroads) in the flooded parts of the Green Heart is no longer maintained and deteriorates. Instead, inhabitants have their own boats, with which they can travel to the shore of the lakes where their cars are parked in big car parks. Or from where they can further travel with public transport in the form of small, high frequency rail-carts. The HSL connection is restored using a bridge instead of a tunnel.

But not everything is under control now. An unforeseen element comes into play. The created (nature) marshlands and higher temperature are enticing to insect plagues, making it possible for a water-related vector-borne disease to show up. These are diseases like malaria. People living on the islands are the first to encounter the effects. Medical science does not bring this disease under control and it spreads quickly, becoming national illness Number One. Life expectancy of the Green Heart residents drops rapidly.

Because of this development, another nature awareness aspect arises, making the trust in ‘primal’ nature no longer self-explanatory. This form of thought is strengthened by the collapse of global food production, leading to a renewed need for agricultural land.

Around 2045, all of this leads to the decision to revert the nature area in the Green Heart to agriculture. The nature reserve, especially the marshlands, are pumped dry again, but it will take a few years before the Green Heart will be able to support agriculture production.

Another measure is to keep the water flowing and to prevent it being stagnant for too long. To achieve this, pumps are installed to pump the water from one lake to another in a circular manner, preventing one lake from drying out while another is flooding.

This makes it possible for people to remain living on the islands. Since more and more ‘water cities’ arise, it becomes less exclusive.