Another 30 charging points for private cars will be added in Nijmegen early in 2016.

**10. Eco innovation and sustainable employment**

**10A. Current situation**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>Year of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of electric vehicles owned by the municipality</td>
<td>2</td>
<td>Number</td>
</tr>
<tr>
<td>Number of electric vehicles owned by the municipality (as % of all cars owned by the municipality)</td>
<td>3</td>
<td>%</td>
</tr>
<tr>
<td>Number of charging points available for privately owned cars.</td>
<td>40</td>
<td>Number</td>
</tr>
</tbody>
</table>

**Eco innovations: use of material, circular economy and jobs**

Nijmegen is a testing ground for progress of eco-innovation. Essential is realising a breakthrough to the continued development phase. The municipal government plays a different role in each development phase (figure 1): launching customer, green procurer, contractor. Nijmegen shares its successes with Dutch cities and cities in England (Polis network), Flanders and Finland.

![Eco-innovation process](image)

**Figure 1: Eco-innovation process**

Nijmegen sees the role of the authorities as follows:
1. Aligning licences and preservation to innovation. This results in an acceleration, provided that there is timely consultation with civilians and stakeholders. Example: Kronenburger Forum (www.westenweurt.nl).
3. Creating a good business climate and using assets. Example: Novio Tech Campus

In 2010 the city of Nijmegen became the national role model for ‘Green Public Contracts’ thanks to its concession Regional Public transport 2012-2022 (260 buses) and electric transport at transport company Cornelissen. The Nijmegen region has the Netherlands’ greenest public transport concession with 17 grams CO2/traveller/kilometre (CROW 2014). This meant a breakthrough for boosting eco-innovation and flywheel for reinforcing networks in the bio-economy and sustainable mobility. Thanks to the created demand for biogas, companies and knowledge institutes are developing business cases for bioenergy and biorefinery at five hotspots (industrial estates with bio-based clusters) in the region. There is also collaboration with Arnhem companies on hydrogen technology and battery trolleybus (electric trolley 2.0).
Nijmegen’s industrial estates are investing in sustainable energy and closing cycles:

- TPN-West is working on energy neutrality, together with ARN BV (waste incinerator plant), which is developing into a raw material plant and is investing in the reuse of waste streams. Collected biodegradable waste is converted into biogas for local buses.
- GDF Suez is transforming its coal-fired power plant into Green Delta (sustainable energy park).
- Walk of the World (45,000 participants, 1.5 million visitors) are working on closing cycles: Plastic cups and urine are collected/reused; food waste is being prevented.
- Regional Nijmegen Centre for Circular Economy (RNCCE) is stimulating companies to reuse energy, water and raw materials.
- Approx. 5,700 people currently work in the EMT sector in Nijmegen.
Training and awareness, green skills
Radboud University, HAN University of Applied Sciences (HAN) and ROC offer studies in sustainability, for instance, for excellent students the ‘bio-based economy’ programmes. Secondary school students are writing papers on sustainability for the SME profile.
Nijmegen’s educational institutes are seriously investing in sustainable energy, sustainable construction and closing cycles. Entrepreneurs, students & science are united to help market sustainable start-ups. Nijmegen is also entering new subjects such as urban agriculture and locally organised food supply chains on the agenda.

Contracting out and purchase: Green public procurement
The city of Nijmegen is favouring regional, sustainable products and services, and has developed the Nijmegen Sustainability Ladder as sustainable purchasing instrument together with local companies. Part of this is social return: contractors have to offer jobs or traineeships to people who are distanced from the job market.
The city acts as launching customer (for instance: local bicycle courier service). Saving energy in its own buildings by cleverly redistributing costs: investing now for future savings. The city of Nijmegen is co-investor for investment fund SUMSeed, geared towards students & social enterprises: development of The Green Cockpit Tool.

Social innovation/participation
As part of Power2Nijmegen companies, knowledge institutes, local authorities and civilians cooperate on projects to make Nijmegen energy neutral (figure 4).

Figure 4: Overview projects Power2Nijmegen
Nijmegen has a strong citizen's movement “Nijmegen Deelstad” (Nijmegen Sharing City). In 2013 they built the “Huis van Overvloed” (House of Abundance) from free materials and services. Meanwhile, there is now a sharing shop and numerous initiatives in the field of sharing economy such as sharing cars, goods, services, food, gardens and knowledge.

Nijmegen has 339 companies in the EMT sector (5,620 jobs).

Eco-innovation and sustainable employment

With 218 buses using biogas and 45 trolley buses using green electricity, the city region Arnhem-Nijmegen has had the greenest public transport concession in the Netherlands, with a ten year duration and a volume of €10 billion (see figure 6 and 7). The total cost of ownership of several types of fuel was compared in the Green Hub project. Biogas turned out not to be more expensive than diesel. This led to stricter environmental norms in the award criteria.

City budget

Other EMT is stimulated with the Nijmegen Entrepreneur Fund (2014 €600,000). In the city budget, an annual amount of €2,000,000 was selected for ‘Sustainability’, as of 2015, €2,500,000.

Fleet

Municipal fleet: 68 cars (55 biogas, two electric, three petrol, diesel). The waste company, which the municipality co-owns, partly has biogas vehicles. Public transport buses use biogas (218 in city and region; plus 45 electric trolley buses in neighbouring city Arnhem).

10B. Past performance objectives

The Arnhem-Nijmegen region has the greenest public transport concessions of the Netherlands. This is the result of a successful cooperation and sustainable ambition of market parties and local authorities, which has led to stringent environmental requirements for tenders. All buses in Nijmegen use biogas. We want to generate all fuel in the region and stimulate the regional economy as of 2015. In 2013 Nijmegen had 339 companies in the EMT sector (5,620 jobs).
The Green Hub project contributes to the bio-based economy through biogas production from waste flows for local transport. Cooperation led to market investments and avoiding CO2-emission:

- Estimated investments through the business: €50 - €70 million;
- Employment: increase of 40 FTE;
- Added value to the local economy: €5 million/year;
- Saving 31,000 tonnes CO2/year by using biogas (75% less emission of CO2 than diesel). By far the most sustainable concession in the Netherlands, with 17 g CO2/traveller kilometre.

Figure 6: Nijmegen bus using biogas

Figure 7: CO2 emission public transport City region Arnhem-Nijmegen
Over the last few years, ARN BV (waste processing company) has increasingly become more of a raw material /energy supplier. It produces green electricity for municipalities, CO2 for horticulture, slags for foundations in construction/infrastructure, steam for high-grade processes and heat for the district heating system. Plastics, glass and metals are reused as raw material. ARN BV has built a fermentation plant for regional biodegradable waste (production capacity 2.5 million m3 biogas/year). This biogas is used for local buses. The CO2 residue is used for transport refrigeration. In subsequent composting scarce raw materials, such as phosphate, are recycled.

Figure 8: The laying of the district heating system

With partners (Alliander, Nuon, ARN, province of Gelderland) the municipality is investing €150 million in the urban district heating system (figure 8), currently with 4,500 connections, later 35,000. Connected homes are emitting 70% less CO2 than with gas heating.

GDF Suez is closing its coal-fired power plant in Nijmegen in 2015. The location offers, partly due to its proximity to the river, good opportunities for various sustainable forms of energy (Green Delta). The company is working on a conversion to solar energy, wind energy, LNG refuelling station, district heating system, biorefinery and biomass hub. The solar park will already be built in 2015.

Thanks to Radboud University spin-offs are forming in the city, among others by students who are setting up small-scale sustainable businesses. Facilities are available for this, where students can rent spaces, such as the recently opened Novio Tech Campus that offers business spaces and laboratory facilities to start-ups (in a specially converted factory of NXP Semiconductors).
Apart from a clean fleet, Nijmegen is also investing in new train stations at residential-work locations, high-grade clean public transport and high-grade cycling routes in the city. We were the first Dutch community to receive the Lean & Green Award for combining logistical services in 2011.

**Sustainable purchasing**

The Nijmegen purchasing policy is stricter than the national norm. Nijmegen will be contracting out the 2018 energy purchase with 20 regional partners so that energy use (gas and electricity) is generated in the region. The city of Nijmegen wants to work sustainably and use sustainable products. Also in public space. Nijmegen has got together with a regional group of pioneering concrete manufacturers, suppliers, principals and advisers in the Netwerk Betonketen. The scoring methodology BRL was developed to assess the sustainability of concrete in tenders. New paving material can use a lot more concrete rubble and worn paving material than is happening until now. This can save a lot of energy, CO₂ and primary raw material.

**Conversion of European and national policy measures on a municipal level**

European directive 33 (2009) is used in the tendering of public transport and the purchasing policy. Nijmegen has converted the European and national policy objectives in the field of the environment and sustainability into its own policy documents. From the early 1990s, the city has been drawing up environment plans, which flesh out the national policy. Together with Arnhem and the German cities of Duisburg and Düsseldorf we, anticipating a European legislation, are investigating soot (EC) and drawing up a norm. This is written in the coalition agreement.

**Publicising reports**

Nijmegen has been publicising its Environmental Report since 2002, with information about the environmental situation, environmental measures taken, its effects and (policy) plans. The first Climate Plan was drawn up in 2004. In 2011 the Sustainability Agenda Nijmegen 2011-2015 was laid down for the integral municipal sustainability policy. Several municipal departments are involved: Economic Affairs, Environment and Urban Development. In 2013 Sustainability in Execution 2013-2017 was determined with the programmes for the next few years. Governance proposals of the executive board of the municipality include the paragraph to be completed ‘Climate & Sustainability’: these aspects have to be considered and worded for each administrative proposal. The municipal budget and annual account annually lists the main spearheads and results, including sustainable economy.
Innovation in infrastructure and traffic flows
The new urban bridge over the Waal (2013) decreases traffic pressure of the old Waal bridge. To convert the traffic around the city as much as possible and to promote flow, a Green Route was laid, where clever use is made of current traffic data and ICT. Just north of the Waal bridge, Park & Ride Waalsprinter was laid, where car drivers can park cheap and take the bus to the centre. Nijmegen has a high-grade public transport, for instance, from and to Radboud University. High quality means fast, frequent and reliable. The ‘Slim uit de Spits’ (Smart in Rush Hour) programme (started in 2013) stimulates car drivers to travel by public transport or by bike during rush hour. This successful initiative began in Nijmegen with 6,000 participants. This is part of the provincial programme “Beter Benutten” (Better Use), geared towards making better use of the existing infrastructure. In 2014 Nijmegen had 186 shared cars (111 shared cars for every 100,000 residents), making it the eighth municipality in the Netherlands.

Our flagship of eco-innovation in the city
Cycling is sustainable and healthy and improves flow and air quality. Nijmegen invested a lot in making cycling in and around Nijmegen more attractive. In cooperation with surrounding municipalities a regional cycle superhighway network was laid between 2012 and 2017 (now 43 km, later 80 km). Shelter options for bikes in the centre (now 5,200) and railway station (now 8,700) have been extended. A subsidy arrangement was set up for electric bikes, with which 630 new e-bikes were bought, and every week, 46,620 km less is covered by car, motorbike or scooter. Arrangements have been made with large companies for drawing up a traffic management plan and stimulating employees to go to work by (electric) bike.

The percentage of Nijmegen residents who cycle to work has increased from 54% to 64% between 2005 and 2013. Simultaneously, the percentage that takes the car has dropped from 34% to 22% (figure 10).

The percentage of Nijmegen residents that visit the city centre by bike or on foot has increased.

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2007</th>
<th>2009</th>
<th>2011</th>
<th>2013</th>
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<td>6%</td>
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<td>anders</td>
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<td>2%</td>
<td>4%</td>
<td>4%</td>
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</tbody>
</table>

[car, bicycle, public transport, on foot, other]

Figure 10: Mode of transport Nijmegen residents who work in Nijmegen

10C. Plans for the future

The Nijmegen slogan “Always Nijmegen” refers to its long history and the aim for a sustainable future. This is why our mission is: Nijmegen always towards a socially inclusive and circular economy

Eco innovation clusters
The city pursues an active policy of boosting green economy, through interactive licencing, experimental space for new initiatives, business climate for start-ups and entrepreneurs. We are launching customer, sustainable buyer and contracting authority.
Existing networks such as Power2Nijmegen and the Green Hub are being broadened with subjects like circular economy and bio-based economy. There is close cooperation in a variety of areas between the local authority and the business world: when realising green energy plants at industrial estate De Grift (windmills citizens initiative) and at the site of GDF Suez Green Delta (with local companies). As a contracting party, a letter of intent was signed with parties in the region on extending the district heating system up to 90,000 households by connecting the district heating system of Nijmegen to that of Arnhem (figure 11).
With clusters of companies, we are collaborating on organising financing (for example via EFRO) to valorise local innovations and marketing this on the region. Power2Nijmegen gets €100,000/year to boost small-scale innovations and tests in the field of EMT. Rabobank Rijk van Nijmegen and the Regional Nijmegen Centre for Technology (RNCT) help SMEs with company scans. Nijmegen was selected to organise the national circular economy boosting camp in 2015, a three-day event during which entrepreneurs, young talent, scientists and civil servants aim to realise breakthroughs towards a circular economy.

![Image](image.png)

**Figure 11: Expansion and connection of district heating systems in Arnhem and Nijmegen**

**Eco innovations**

With Nijmegen company ENKI, network administrator Alliander and hotel chain Scandic Sanadome we are working on eco-innovations where energy use is reduced through new techniques in energy management and converting organic waste streams of companies into biogas, heat and electricity on the spot. The ENKI bio-fermenter can convert kitchen waste with a very high output into biogas. We are now going to use this bio-fermenter in flats and combine it with a fuel cell that immediately converts the biogas into heat and electricity.

In cooperation with the city region Arnhem-Nijmegen and the province of Gelderland there was a tender for charging points for electric cars. NXP in Nijmegen is testing in-car technology to promote traffic flow. Smart ICT is used to inform car drivers.

At industrial estate De Grift there will be five wind turbines as a result of civilian initiative “WindpowerNijmegen”. This initiative came into being after a previous plan (of an energy company) was dropped at the Council of State in 2012. In the co-creation network Power2Nijmegen the partners concluded that wind projects need the support of locals and that these locals therefore need to be able to participate. This led to the establishment of cooperation Windpower Nijmegen by several motivated citizens together with the Gelderland Nature and Environment Federation.
Participation in green business networks, cooperation and covenants

Major cooperation with companies, research institutes and other authorities are a crucial success factor in the transition to a sustainable economy. The municipality of Nijmegen is involved in various collaborations that lead to, among others, more transfer of knowledge and sustainable market investments (figure 12).

<table>
<thead>
<tr>
<th>Samenwerkingsverband</th>
<th>Onderwerp</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Economische Raad</td>
<td>Advisraad, die bestaat uit bestuurders van de gemeente, kennisinstellingen en grote Nijmeegse bedrijven, die adviseert over economische deelgebieden waar de regio Nijmegen sterk is en over samenwerking in strategische projecten</td>
</tr>
<tr>
<td>Nijmeegs Energie Convenant</td>
<td>Afspraken tussen gemeente en grote Nijmeegse bedrijven om jaarlijks 3% energiebesparing te realiseren</td>
</tr>
<tr>
<td>Bedrijventerrein TPN West</td>
<td>Samenwerking aan een energieneutraal bedrijventerrein</td>
</tr>
<tr>
<td>Economisch Collectief Nijmegen</td>
<td>Bestuurlijk overleg tussen 5 grote werklocaties in Nijmegen om de economische ontwikkeling van Nijmegen in de ruimste zin van het woord te bevorderen</td>
</tr>
<tr>
<td>DeLAND</td>
<td>Samenwerking met de Euregio voor gezamenlijke inzameling en duurzame verwerking van biomassa uit landschapsbeheer</td>
</tr>
<tr>
<td>De Groene Kracht</td>
<td>Samenwerkingsverband van de 23 gemeenten in de stadsregio Arnhem Nijmegen voor o.a. groene energie, energieneutraal bouwen, duurzame economie en duurzame mobiliteit</td>
</tr>
<tr>
<td>De Groene Hub</td>
<td>Regionale samenwerking op duurzaam vervoer en bio-based economy</td>
</tr>
<tr>
<td>Hortusoverleg</td>
<td>Structureel overleg met universiteit en bedrijven over duurzame economie</td>
</tr>
<tr>
<td>KiEMT</td>
<td>Samenwerkingsverband van Oost Nederland om innovaties en 'new business' in de EMT te bevorderen</td>
</tr>
<tr>
<td>Power2Nijmegen</td>
<td>Co-creatieproces voor een energieneutraal Nijmegen in 2045</td>
</tr>
</tbody>
</table>

[Cooperation, Subject
Cooperation with companies
The Economic Board: advisory board consisting of administrators of the city, knowledge institutes and large Nijmegen companies that offers advice on sub-areas the region of Nijmegen is good at and on cooperation in strategic projects
Nijmegen Energy Covenant: Arrangements between the municipality and large, Nijmegen companies to realise 3% energy savings annually
Industrial Estate TPN West: Cooperating on an energy-neutral industrial estate
Economic Collective Nijmegen: Administrative consultation between five major work locations in Nijmegen to promote Nijmegen’s economic development in the broadest sense of the word
Cooperation with local authorities
DeLAND: Cooperation with the Euregion for joint collection and sustainable processing of biomass from landscape management
The Green Power: Partnership of the 20 municipalities in the city region Arnhem-Nijmegen for, among others, green energy, energy-neutral construction, sustainable economy and sustainable mobility
Cooperation with local authority, entrepreneurs and research institutes
The Green Hub: Regional cooperation on sustainable transport and bio-based economy
Hortusoverleg: Structural consultation with university and the business world on sustainable economy
KiEMT: Partnership of Eastern Netherlands to promote innovations and new business in the EMT
Power2Nijmegen: Co-creation process for an energy-neutral Nijmegen by 2045]

Figure 12: Partnership of the city of Nijmegen in the field of sustainability and sustainable economy
Raising awareness on the green economy
Green Hub is a partnership for green companies. The Sustainability café is an initiative of Radboud University, local conservation movement, Arthouse LUX, the city of Nijmegen and Newspaper De Gelderlander. Here, sustainability subjects are treated from an economic perspective in an interactive way. Departing from Power2Nijmegen (250 representatives of approx. 75 companies/organisations) network meetings have been organised since 2012. The Regional Nijmegen Center for Circular Economy takes energy scans from Nijmegen companies. The RNCCE organises heavily frequented symposiums for SME entrepreneurs.

The city of Nijmegen organises international events, including the Walk of the World (4 Days - 45,000 walkers) and the Seven Hills Run (35,000 runners). These events pay a lot of attention to sustainability. Together they attract more than 1.5 million visitors annually and have a wide reach for promoting sustainability and awareness. The organisation of the Seven Hills Run and that of the Vierdaagsefeesten are inspired by cradle to cradle ideas. Via a subsidy contribution of the Seven Hills Run, 13 schools in Nijmegen placed more than 1,500 solar panels on their roofs. This was linked to an educational programme (figure 13).

The sustainable relay race started during participation in the European Green Capital Award 2016. Now the Sustainable Baton goes from one sustainable project to another in Nijmegen (figure 14).

Figure 13: With the relay race ‘pass on the Sun’ a sun was rolled from school to school by 800 pupils to create awareness among pupils in a playful way.
Figure 14: The Sustainable Baton is passed on during the Nijmegen Energy market

Flagship for eco-innovation in Nijmegen
In the region, innovation hubs are being developed in a connected way and complement each other. Arnhem is developing a campus for Clean Tech on the Kleefse Waard, there will be an energy hub at InnofaseDuiven, a bio-based hub for fibre from the paper industry in Renkum and a bio-based innovation hub, including Green Delta GDF Suez, in Nijmegen-west.
We want to link existing networks for circular economy more intensively. Eco-innovation companies are going to cooperate more. The objective is preservation and energy neutrality of industrial estates in Nijmegen. We want to enter into a ‘Green Deal’ with the joint industrial estates and the national government, where we ask the latter to remove legal obstacles and enable experiments. With this ambition Nijmegen can be the guiding city in the Netherlands. Interest has also been shown in Estonia (Pärnu) and Poland (ministry).
10D. References

The Green Hub www.degroenehub.nl

Power2Nijmegen www.power2nijmegen.com

Environmental annual report http://www.milieujaarverslagnijmegen.nl/

Budget and annual accounts http://www2.nijmegen.nl/gemeente/belastingen__financiën/stadsbegroting_jaarstukken

Website municipality of Nijmegen www.nijmegen.nl


Sustainability in execution http://www2.nijmegen.nl/wonen/milieuenafval/klimaat

Nijmegen sharing city http://nijmegendeelstad.nl/ en www.deelwinkel.com


Novio Techcampus www.novioitechcampus.com

Transformation of coal-fired power plant to sustainable industry https://www.youtube.com/watch?v=IVMAnn8jvgc

Zevenheuvelenloop & solar panels: https://www.youtube.com/watch?v=5X0es6UGx9M Sustainable transport Polis network www.cleanvehicle.eu

Green cockpit, calculation to be used for sustainable public transport http://www.eltis.org/index.php?id=13&study_id=3722