

Summary | February 2019

# Impact Report

## NRW Sustainability Bond #4

Analysis of the Sustainability Bond #4 issued in 2018  
by the German State of North Rhine-Westphalia (NRW)

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This report is based on the results of a study conducted on behalf of the State Government of North Rhine-Westphalia. The authors are responsible for the content.

**Project Duration:** August 2018 - February 2019

**Authors:**

Jens Teubler, Lena Hennes and Katrin Bienge

**Scientific Advisor:**

Prof. Dr. Oscar Reutter

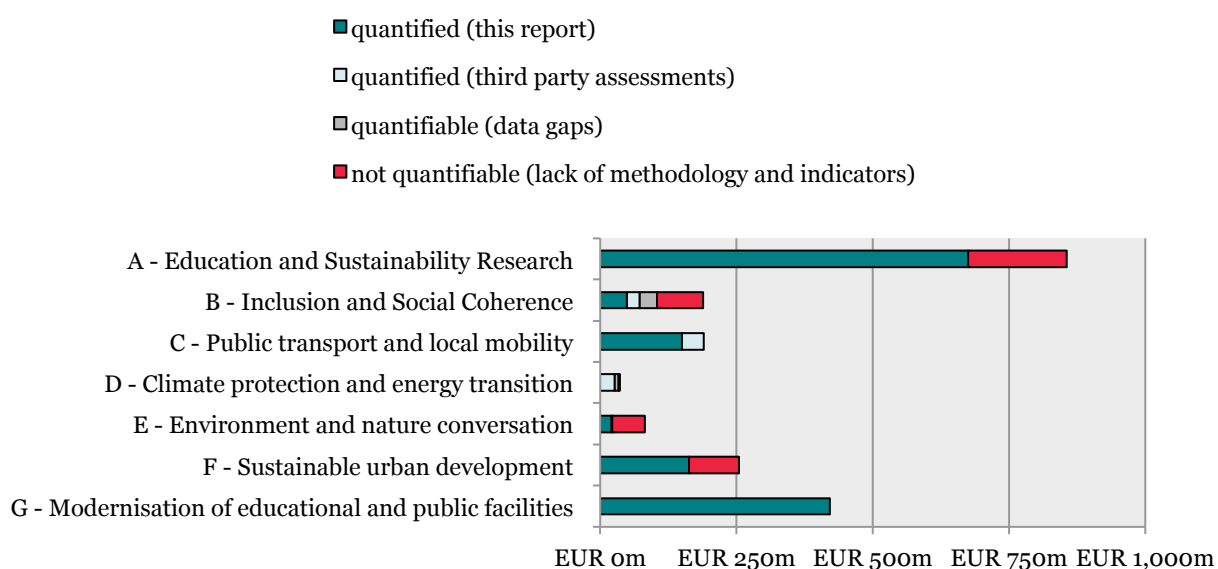
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## General Overview

The Wuppertal Institute conducted an impact analysis of the NRW Sustainability Bond #4 of 2018 on behalf of the State Government of North Rhine-Westphalia (NRW). The most recent bond has a volume of EUR 2.025bn, a term of 10 years and consists of 52 eligible projects from the State's 2017 general budget (sustainable value-added was confirmed in a second party opinion by oekom research<sup>1</sup>). This report analyses the contribution of the bond to climate mitigation, sustainable land use and social impacts. It also includes information on the impacts of the previous three bonds (NRW Sustainability Bond #1 to #3).

Figure A shows the project categories in the bond and quantifies the shares that could be directly associated with either environmental or social impacts. 73.0% or EUR 1,479m of the overall investments of EUR 2,027m could be directly quantified in the paper at hand. Additional EUR 90m (4.4%) has been assessed by third parties and is also reported in this briefing. The remaining EUR 458m could either not be quantified due to lack of data (EUR 40m or 2.0%) or are not quantifiable at all within existing scientific frameworks (EUR 418m or 20.6%).

**Figure A: Share of quantified investments in the Sustainability Bond #4**



source: own calculation based on methods and data depicted in the full report

## Co-Benefits of projects in the bond

Some projects induce positive environmental and social impacts alike. The refurbishment and construction of university clinical buildings for example is quantified as part of the measures that reduce GHG emissions. The intended purpose however is to prevent health hazards, improve research capabilities and patient care. The same is true for over EUR 130m invested into public transportation for pupils and students (of which only EUR 20.0m were directly allocated to tickets for students and their climate mitigation effect), as additionally financed improvements into public traffic systems are beneficial to all citizens. These types of co-impacts are often not quantifiable in all their dimensions.

<sup>1</sup> see [https://www.nachhaltigkeit.nrw.de/fileadmin/download/New\\_oekomSPO\\_LandNRW\\_2018.pdf](https://www.nachhaltigkeit.nrw.de/fileadmin/download/New_oekomSPO_LandNRW_2018.pdf)

<sup>2</sup> see also <https://www.efre.nrw.de/efre-programm/what-is-efre/op-erdf-nrw/>

<sup>3</sup> see <https://www.landtag.nrw.de/Dokumentenservice/portal/WWW/dokumentenarchiv/Dokument/MMD17-717.pdf>

## Further Information: NRW Sustainability Strategy

The NRW Sustainability Bond #4 is part of the *Sustainability Strategy NRW*, which aims to improve the sustainable development of the whole State of NRW. It comprises almost 70 indicators, which relate to the 19 fields of action in the strategy and to the 17 Sustainable Development Goals by the United Nations (SDGs). The first indicator report of this strategy was published in 2016. Regular updates of the results are also presented on a dedicated website (<http://www.nachhaltigkeitsindikatoren.nrw.de/sdgs>).

The Sustainability Strategy NRW (including the indicator report) is going to be updated in 2019, aligning the methodology more closely with the federal Sustainability Strategy of 2017.

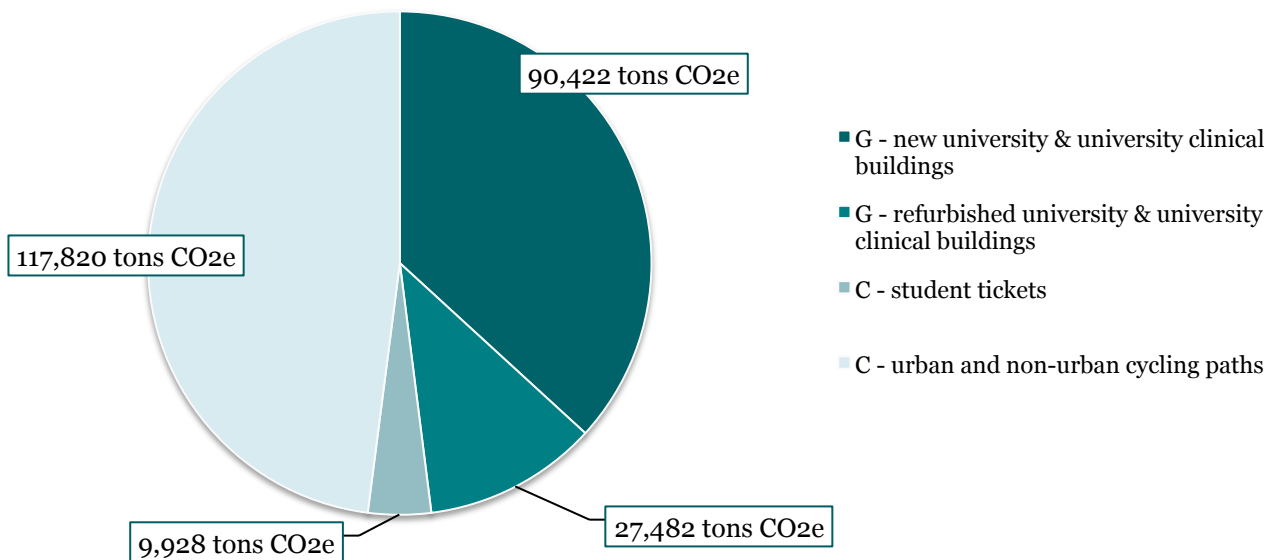
## Environmental Impacts

### Quantified GHG Savings in NRW Sustainability Bond #4

Climate protection is affected by 7 different measures within the bond and EUR 421m of investments. 82.7% or EUR 348m of these investments help to avoid GHG emissions. The measures are part of investments in category C (student tickets, urban cycle paths and non-urban fast cycle paths) and G (new and refurbished university and university clinical buildings).

As a result, EUR 421m help to induce savings of 246,000 tons of CO<sub>2</sub> equivalents (CO<sub>2</sub>e) over the lifetime of the measures (see Figure B).

**Figure B: Summary of assessed and quantified GHG savings in the NRW Sustainability Bond #4 (over average lifetime of measures)**



source: own calculation based on methods and data depicted in the full report

Results for each measure range from 65 tons CO<sub>2</sub>e per year to 9,928 tons per year (see Table A). All of these measures, with exception of student tickets, are likely to save emissions beyond the 10-year term of the Sustainability Bond.

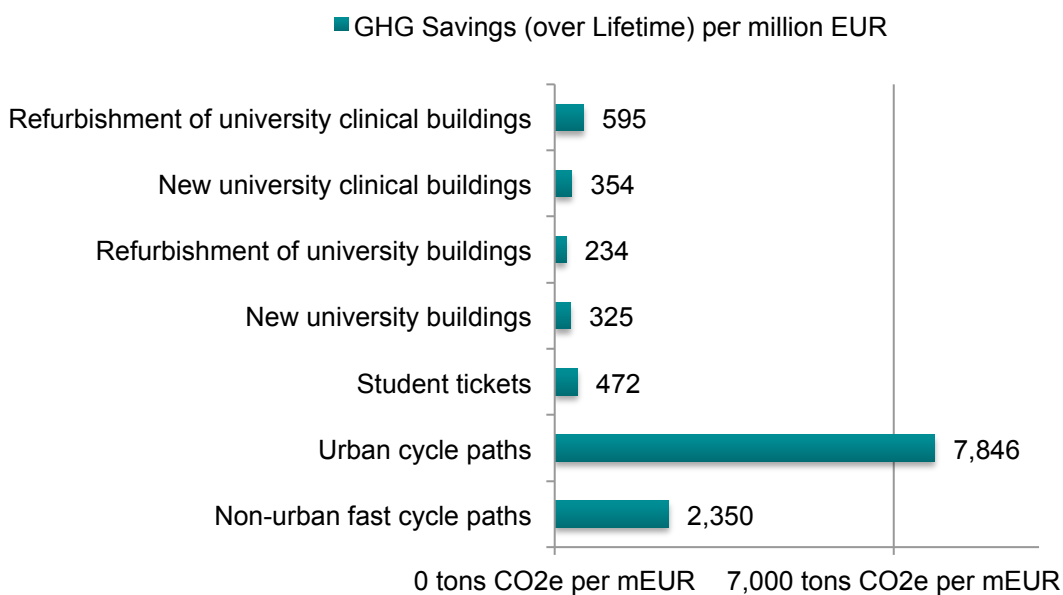
**Table A: GHG savings of measures in categories C (Public Transport and Mobility) and G (Modernisation of Educational and Public Health Facilities)**

Measure	GHG savings per year	GHG savings over Lifetime	average Lifetime (assumption)
	<i>tons CO<sub>2</sub>e per year</i>	<i>tons CO<sub>2</sub>e in total</i>	<i>years</i>
<b>Non-urban fast cycle paths</b>	580	17,387	30
<b>Urban cycle paths</b>	3,348	100,433	30
<b>Student tickets</b>	9,928	9,928	1
<b>New university buildings</b>	129	6,473	50
<b>University buildings (refurbishment)</b>	65	1,290	20
<b>New university clinical buildings</b>	1,272	83,949	66
<b>University clinical buildings (refurbishment)</b>	1,310	26,192	20

source: own calculation based on methods and data depicted in the full report

Figure C also depicts the normalised efficiency of the different measures for climate protection (GHG savings over life time per EUR 1m). The highest efficiency measured can be attributed to the construction of cycle paths, in particular to cycle paths in urban areas.

**Figure C: Efficiency of climate protection measures for quantified investments**



source: own calculation based on methods and data depicted in the full report

## Overview on GHG savings (NRW Sustainability Bond #4)

Table B summarizes the results for potential GHG savings from the bond.

**Table B: Results on GHG savings according to IFC framework 2015  
(Green Bonds -- Working Towards a Harmonized Framework for Impact Reporting)**

Energy Efficiency (EE)	Signed Amount	Share (of investment)	Eligibility for green bonds	EE Component	Annual energy savings		Annual GHG emissions avoided	
Project name	million EURO	%	% of signed amount	% of signed amount	GWh/a		in 1,000 tonnes of CO <sub>2</sub> -equivalents	
					100%	financed	100%	financed
New university buildings	45.6	100	100	43.6	0.6	0.6	0.13	0.13
University buildings (refurbishment)	21.4	100	100	25.8	0.3	0.3	0.07	0.07
New university clinical buildings	262.8	100	100	90.3	5.7	5.7	1.27	1.27
University clinical buildings (refurbishment)	91.0	100	100	48.4	5.9	5.9	1.31	1.31
Low Carbon Transport (LCT)	Signed Amount	Share (of investment)	Eligibility for green bonds	LCT Component	Annual savings of car km		Annual GHG emissions avoided	
Project name	million EURO	%	% of signed amount	% of signed amount	million passenger km/a		in 1,000 tonnes of CO <sub>2</sub> -equivalents	
					100%	financed	100%	financed
Student tickets	21.0	9.1	100	100	765	70	108.7	9.93
Urban cycle paths	12.8	100	100	100	23.6	23.6	3.35	3.35
Non-urban fast cycle paths	7.4	100	100	100	4.1	4.1	0.58	0.58

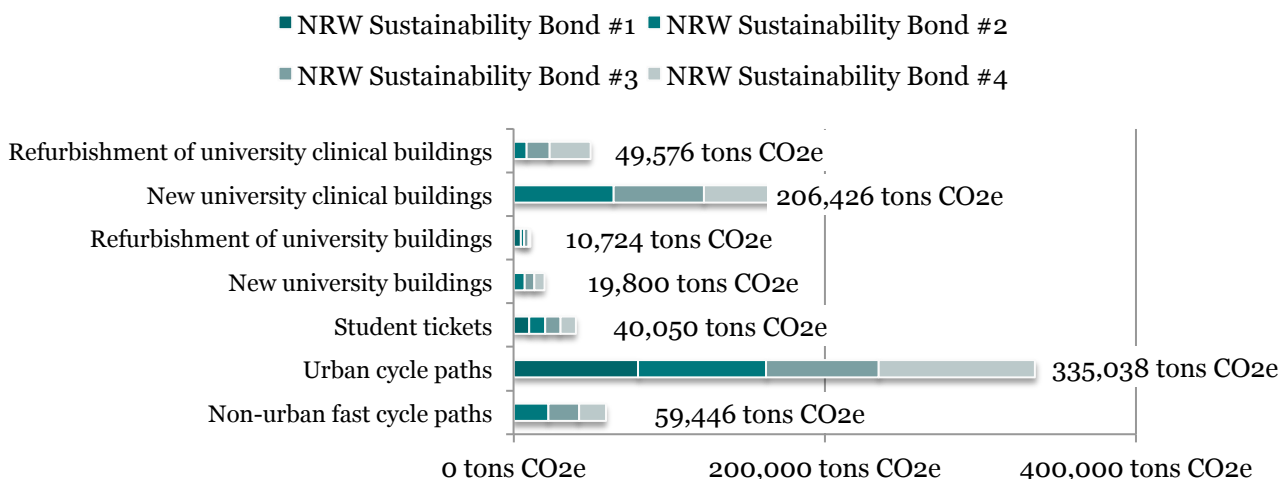
source: own calculation based on methods and data depicted in the full report

## Quantified GHG Savings for NRW Sustainability Bonds #1 to #4

All of the quantified categories for climate protection in the Sustainability Bond #4 were also already part of the Sustainability Bonds #3 (2017), #2 (2016) and #1 (2015). They can therefore be aggregated to a four-year portfolio (see Figure D). This was not possible for singular measures like solar thermal energy generation (Bond #3) or co-generation of heat and power (Bond #2).

In total, EUR 926m were invested over four years (2014 - 2017) that help to induce GHG savings of over 721,000 tons CO<sub>2</sub>e over the assumed lifetime of measures.

**Figure D: GHG savings over lifetime of projects from 2014 to 2017 in the portfolio for NRW Sustainability Bonds**



source: own calculation based on methods and data depicted in the full report (as well as previous reports)

## Additional environmental impacts for NRW Sustainability Bonds #1 to #4 (third party assessments)

The NRW Sustainability Bonds also include EUR 150m investments into other projects that improve ecological developments over the course of four years (2014-2017). These projects not only help to mitigate GHG emissions by e.g. additional capacities for renewable energies or by improving energy efficiency. They also contain measures to increase resource efficiency or waste avoidance in companies. The State's funding within the Sustainability Bond facilitates investments from other actors, thus creating leverage for joint efforts to reduce environmental impacts in these areas.

The „Effizienz Agentur NRW“ (efa+) and „Ökoprofit“ provide consulting services for companies that want to reduce their energy consumption, resource throughput and GHG emissions.

EFRD is a European fund for regional development. One of the main goals of EFRD-sponsored projects is to facilitate efforts to reduce GHG emissions. Its priority axis 3 uses 25% of the overall funding of EUR 2.42bn (including EU funds) almost exclusively to this purpose<sup>2</sup>.

While the projects themselves are beyond the scope of this analysis, some of their results are reported here in form of third party assessments. Table C shows the State's investments into such projects from the bond category D (Climate Protection and Energy Transition), in addition to investments from private, municipal, federal and European funds.

**Table C: Third party assessments and quantified effects in category D**

Type	State funding (NRW Bond #1 to #4)	Investments outside the Sustainability Bond (budget years 2014-2017)	Environmental Savings (2014 to 2017)*
<b>Effizienz Agentur NRW efa+</b> (as part of resource efficient economy)	circa EUR 14m	EUR 46.6m in the scope of resource efficiency (validated)	<ul style="list-style-type: none"> <li>■ 60,157 tons of CO<sub>2</sub>e</li> <li>■ 9,807 tons of material resources</li> <li>■ 401,795 m<sup>3</sup> of water</li> </ul>
		EUR 372.1m in the scope of financing (validated)	<ul style="list-style-type: none"> <li>■ 120,211 tons of CO<sub>2</sub>e</li> <li>■ 13,048 tons of material resources</li> <li>■ 200,763 m<sup>3</sup> of water</li> </ul>
<b>Ökoprofit NRW</b> (as part of resource efficient economy)	circa EUR 1m	EUR 59.7m for 2,922 measures	<ul style="list-style-type: none"> <li>■ 84,231 tons of CO<sub>2</sub>e</li> <li>■ 5,979 tons of waste</li> <li>■ 495,995 m<sup>3</sup> of water</li> </ul>
<b>EFRD (2014-2020)</b> (priority axis 3 on CO <sub>2</sub> reduction)	EUR 76.5m	circa EUR 530m	<ul style="list-style-type: none"> <li>■ 454,424 tons of CO<sub>2</sub>e</li> </ul>
*Different methods were used to calculate the ecological impacts of the projects. The results are not summable. These numbers refer to the most recent reporting in the projects (including retrospective adjustment of data).			

source: correspondence with related agencies for Effizienz Agentur NRW efa+ and Ökoprofit NRW; current (2018) implementation report for EFRD results in NRW

<sup>2</sup> see also <https://www.efre.nrw.de/efre-programm/what-is-efre/op-erdf-nrw/>

## Sustainable Land Use

EUR 81.4m of the NRW Sustainability Bond #4 can be attributed to the protection of natural resources. Measures in this project category E aim at nature conservation, flood protection, animal welfare or sustainable farming and land use. The latter could be directly associated with investments in the bond. EUR 20.9m or 26% of the investments in this category promote an area for sustainable land use of 295,425 ha (see Table D).

Some of the other subcategories also partly promote sustainable land use such as areas for biotopes within nature conservation or flood protection areas. For these subcategories, however, it was not possible to directly allocate investments to individual measures with a corresponding land reference.

**Table D: Results of the quantification of the subsidised sustainable land use**

Subcategory	Investment volume (2017)	Area supported per year (2017)
Agro-environmental measures	EUR 4.9m	39,018 ha
NRW Rural Area Programme - state share	EUR 16.0m	256,407 ha
<b>in TOTAL</b>	<b>EUR 20.9m</b>	<b>295,425 ha</b>

source: own calculation based on methods and data depicted in the full report

## Social Impacts

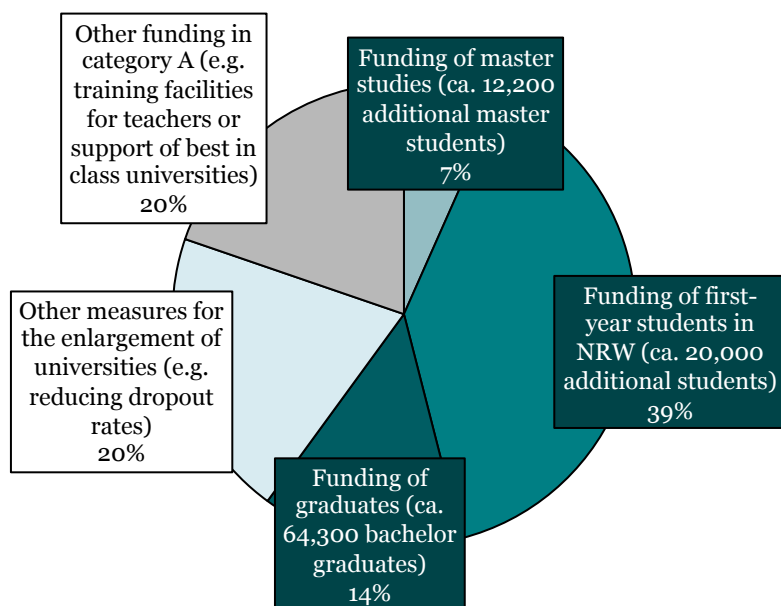
A large portion of the social impacts from investments in the bond cannot be directly quantified due to lack of data or appropriate methodologies. Numerous projects benefiting education, inclusion, social cohesion as well as co-benefits of projects in other areas are therefore not part of the impact assessment. Social tickets (part of category C) for example enabled the social integration and increased mobility of approximately 300,000 people in 2015<sup>3</sup>. The funding of student tickets on the other hand was quantified for this report in terms of GHG savings, while in fact also improving the universal access to education for roughly 600,000 students.

## Enlargement of Universities

The enlargement of universities is part of the State's funding into education and sustainability research (bond category A as part of e.g. the Bund-Länder-Covenant for the expansion of universities). Out of EUR 856.3m, 79% or EUR 675.2m were invested to finance additional student capacities, reward universities for graduates or to reduce the number of dropouts. Based on current State grants for universities, these investments supported 20,000 additional first-year students, 12,200 additional master students and the graduation of 64,300 bachelor students in 2017 (see also figure E).

<sup>3</sup> see <https://www.landtag.nrw.de/Dokumentenservice/portal/WWW/dokumentenarchiv/Dokument/MMD17-717.pdf>

**Figure E: Allocation of funding in category A (total of EUR 856.3m)**



source: own calculations based on methods and data depicted in the full report

### Job Creation, Funding and Qualification

The NRW Sustainability Bond #4 investments dedicated to *Inclusion and Social Coherence* total EUR 188.3m. Some of this funding in category B was used to create new jobs for people with disabilities and social workers in schools. These social workers support the State's efforts to school success and cultural participation for disadvantaged children. By relating the available funding for these two projects, it can be quantified that the Sustainability Bond NRW #4 provides at least 125 new jobs for people with disabilities (newly created jobs) and 725 jobs for social workers in NRW (costs for material and salary per year). Both projects also show how investments into social development can also lead to an improvement of economic indicators (job creation).

Additional third party assessments allowed estimating that the Bond helped 2,000 people suffering from social and economic disparities (the majority under 25 years old) to improve their long-term job qualification and integration. These funds are part of the European Social Fund and therefore co-funded by the EU, the Federal Government and private investors. Table E shows the allocated investments of the Bond and their effects in this category.

**Table E: Impacts for Integration and Social Cohesion**

Inclusion and Social Cohesion	Sustainability Bond NRW #4 funding	Type of quantification	Social Impact
<b>Employment opportunities for persons with disabilities</b>	EUR 2.5m*	direct	<b>job creation:</b> 125 to 250 new jobs
<b>Social School Work</b>	EUR 47.0m	direct	<b>job funding:</b> 725 jobs
<b>European Social Fund</b>	EUR 23.0m	3 <sup>rd</sup> party	<b>job qualification and integration:</b> 2,000 participants

\* The EUR 2.5m are only part of the EUR 6.6m that is used to provide employment opportunities.

source: own calculation based on methods and data depicted in the full report



## Broadband Expansion

A majority of the investments for urban development (63% of category F) is used to sponsor the telecommunication infrastructure in NRW in form of broadband connections with 50 Mbits/s and more, in particular for areas that lack a market-based expansion. The programme aims to improve social and economic access by households and businesses alike, while also providing opportunities for a green economy (e.g. reducing work-related traffic with help of home-office solution or even enabling the settlement of companies in rural areas in the first place).

Quantifying the effect of funding for broadband connections is rather difficult though, as the costs of an access point increase exponentially with higher penetrations rates. Using data on NRW broadband expansion in the past (from an interactive website by the Federal Ministry of Transport and Digital Infrastructure<sup>4</sup>), it could be estimated that the funds of EUR 162.5m enable 81,000 broadband connections for households, institutions and industry.

## Social impact indicators for the Sustainability Bond NRW #4

Table F summarizes the scalable social impact indicators for the Sustainability Bond NRW #4, which are mainly based on fix lump sums in the different State programmes (e.g. such as refundable costs for social workers).

It is recommended to integrate appropriate literature and evaluation data when using these indicators in another context or further impact assessments of bonds.

**Table F: Social Impact Indicators for Sustainability Bond NRW #4**

Impact indicator	Scaling Factor	Metric
<b>First-year students</b>	EUR 18,000 per student	lump sum
<b>Graduates</b>	EUR 4,000 per graduate	lump sum
<b>Master student place</b>	EUR 10,000 per place over 2 years	lump sum
<b>Jobs for persons with disabilities</b>	EUR 20,000 per job created	maximum funding in programme
<b>Jobs for social school workers</b>	EUR 65,000 per job	lump sum
<b>Broadband connections</b>	EUR 2,000 per access point	factor based on cost sample for NRW

*source: own calculation based on methods and data depicted in the full report*

<sup>4</sup> see <https://www.bmvi.de/Foerdergebiete/karte.html>

## Methods and Data

GHG factors (without upstream) are drawn from the research centre for energy economics (FfE 2010), the balance of energy for German federal states (LAK 2017) as well as data by the Federal Environmental Agency (UBA) (UBA and TREMOD 5.63 2014).

The energy efficiency potentials for new buildings refer to the heat demand (electricity is not considered due to lack of data) of public buildings in the building stock of Germany from different years of construction (Deilmann et al. 2013). On average, 117 kWh per m<sup>2</sup> and year could be saved compared to average buildings in these sectors. It is also assumed that 52% of the State's funding is used for initial furniture and does not contribute to higher energy efficiencies. Costs for construction of university buildings and university clinical buildings are based on press releases on current and past construction projects by universities in NRW. The allocation of funding (new and refurbished buildings) was conducted with help of the State's budget plan (which includes individual plans for each university clinic).

The quantification of GHG savings for refurbished buildings required additional data on the share of construction measures for purposes of energy efficiency, the costs thereof and the reduced energy demand after refurbishment. They are based on two reference refurbishment measures at the university hospital of Munster and the university of Bochum. As a result, final heat savings of 3,156 kWh per bed (clinics) and 88 kWh per m<sup>2</sup> (gross area of usage for university buildings) were calculated.

GHG savings from Low Carbon Transport are based on avoided trips with cars. For bicycle paths, data from a feasibility study for the fast bicycle track RS1 was used: 177,719 km by car can be avoided for 22,439 ways per day in a conservative case (Regionalverband Ruhr 2014). While the costs of fast bicycle tracks were drawn from press releases, costs of urban cycle paths are based on statistics by the Ministry of Transport of the State of NRW. It is also assumed that urban cycle paths only avoid car emissions for ways up to 5 km.

Avoided car emissions for student tickets are based on an empirical study from 2011 by the Wuppertal Institute (Müller 2011): 1,242 car km per year and student could be avoided in Bielefeld. The allocation of the number of tickets in use, the costs of student tickets and their co-funding by the State of NRW are based on data provided by the Ministry of Finance of the State of NRW and a report on public transport in NRW (KCM NRW 2018).

In the case of sustainable land use and social impacts, data was provided by the relevant Ministry for Environment, Agriculture, Conservation and Consumer Protection and the Ministry of Culture and Science of the State of NRW. Additional data was drawn from publicly available data on funding (e.g. re-fundable lump sums in applications) within the related projects as well as evaluation reports (e.g. intermediate reports of the European Social Fund).

A full description of methods, data, assumptions and references can be found in the full report.