Summary | October 2019

Impact Report
NRW Sustainability Bond #5

Analysis of the Sustainability Bond #5 issued in 2019
by the German State of North Rhine-Westphalia (NRW)

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 2019 - October 2019

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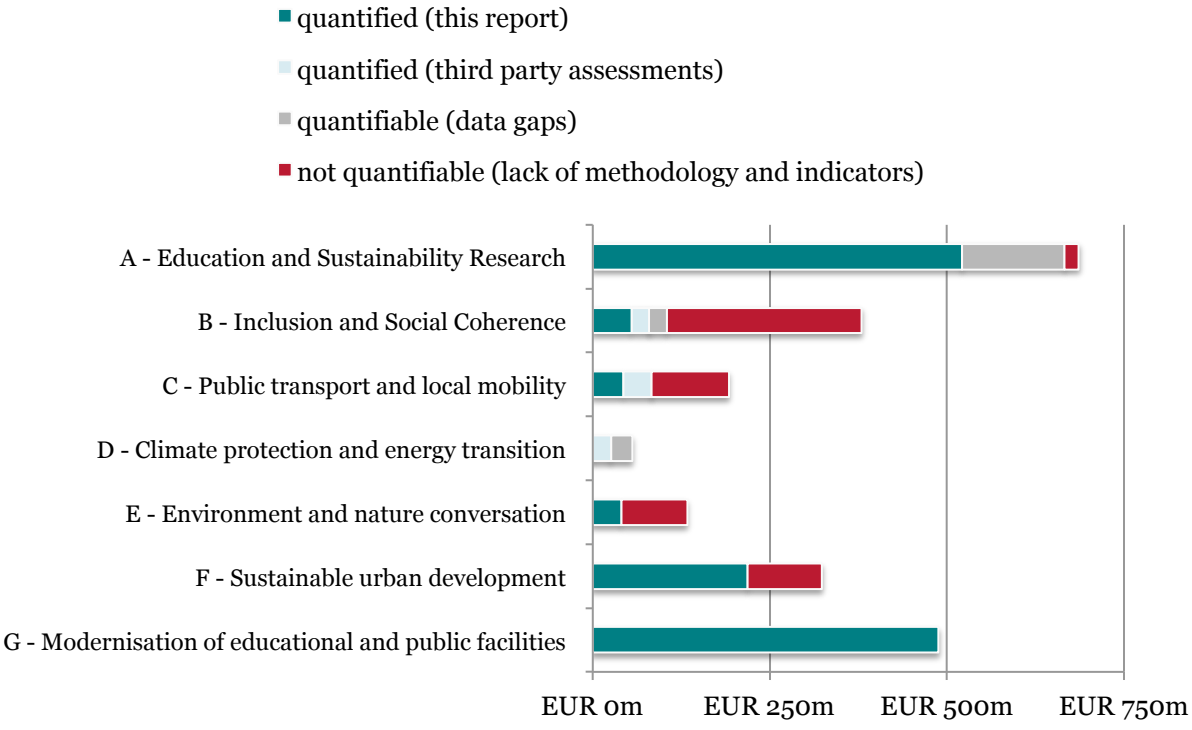
General Overview

The Wuppertal Institute conducted an impact analysis of the NRW Sustainability Bond #5 of 2019 on behalf of the State Government of North Rhine-Westphalia (NRW). The most recent bond has a volume of EUR 2.25 bn, a term of 15 years and consists of 52 eligible projects from the State's 2018 general budget (sustainable value-added was confirmed in a second party opinion by ISS-oekom[1]). 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 four bonds (NRW Sustainability Bond #1 to #4).

The impact report at hand is based on data that was collected until September 2019 and is published in advance of the full report. Any changes in data until October 2019 will be documented later in the full report.

Figure A shows the project categories in the bond and quantifies the shares that could be directly associated with either environmental or social impacts. 60.5% or EUR 1,365m of the overall investments could be directly quantified in the paper at hand. Additional EUR 91m (4.0%) has been assessed by third parties and is also reported in this briefing. The remaining EUR 601m (35.5%) could either not be quantified due to lack of data or are not quantifiable at all within existing scientific frameworks.

Figure A: Share of quantified investments in the Sustainability Bond #5



source: own calculation

[1] see https://www.nachhaltigkeit.nrw.de/fileadmin/download/5._Nachhaltigkeitsanleihe_SPO_LandNRW_final.pdf

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 129.8m invested into public transportation for pupils and students (of which only EUR 21.0m 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. The Wuppertal Institute plans to look deeper into this kind of effects in the future and for up-coming NRW Sustainability Bonds.

Further Information: NRW Sustainability Strategy

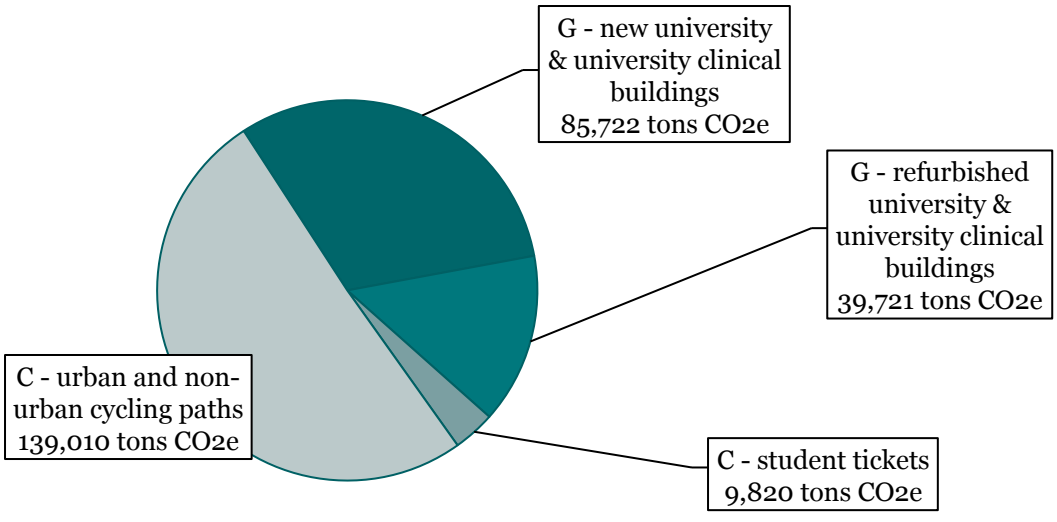
The NRW Sustainability Bond #5 is part of the *Sustainability Strategy NRW*, which aims to improve the sustainable development of the whole State of NRW. It comprises almost 70 indicators, which relate to the 19 fields of action in the strategy and to the 17 Sustainable Development Goals by the United 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 the future, aligning the methodology more closely with the federal Sustainability Strategy of 2017.

Environmental Impacts

Quantified GHG Savings in NRW Sustainability Bond #5

The estimated avoided GHG emissions in the bond can be traced back to investments of EUR 362m for 7 different measures. 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, the measures are expected to save ca. 274,300 tons of CO_2 equivalents (CO_2e) over their lifetime (see Figure B).

Figure B: Quantified GHG savings (over lifetime) in the NRW Sustainability Bond #5



source: own calculation

Results for each measure range from 122 tons CO2e per year to 9,820 tons per year (see Table A). All of these measures, with exception of student tickets, are likely to save emissions beyond the 15-year term of the Sustainability Bond.

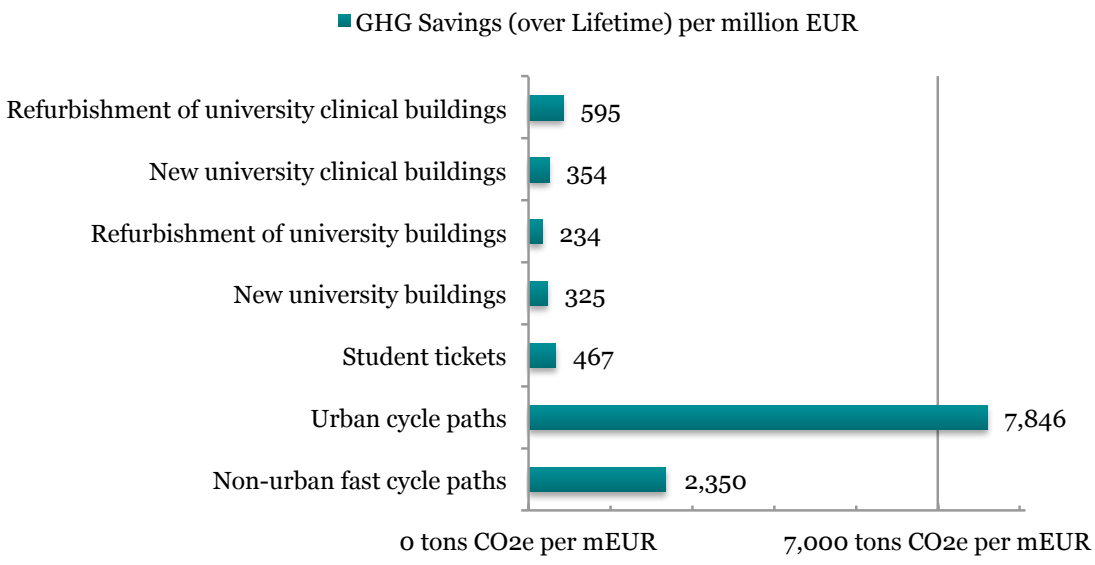
Table A: GHG savings of measures in categories C (Public Transport and Mobility) and G (Modernisation of Educational and Public Health Facilities)

	GHG savings per year	GHG savings over Lifetime	average Lifetime (assumption)
	tons CO2e per year	*tons CO2e in total*	*years*
Non-urban fast cycle paths	501	15,038	30
Urban cycle paths	4,132	123,972	30
Student tickets	9,820	9,820	1
New university buildings	245	12,269	50
University buildings (refurbishment)	122	2,445	20
New university clinical buildings	1,113	73,453	66
University clinical buildings (refurbishment)	1,864	37,276	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 date depicted in the full report

Overview on GHG savings (NRW Sustainability Bond #5)

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

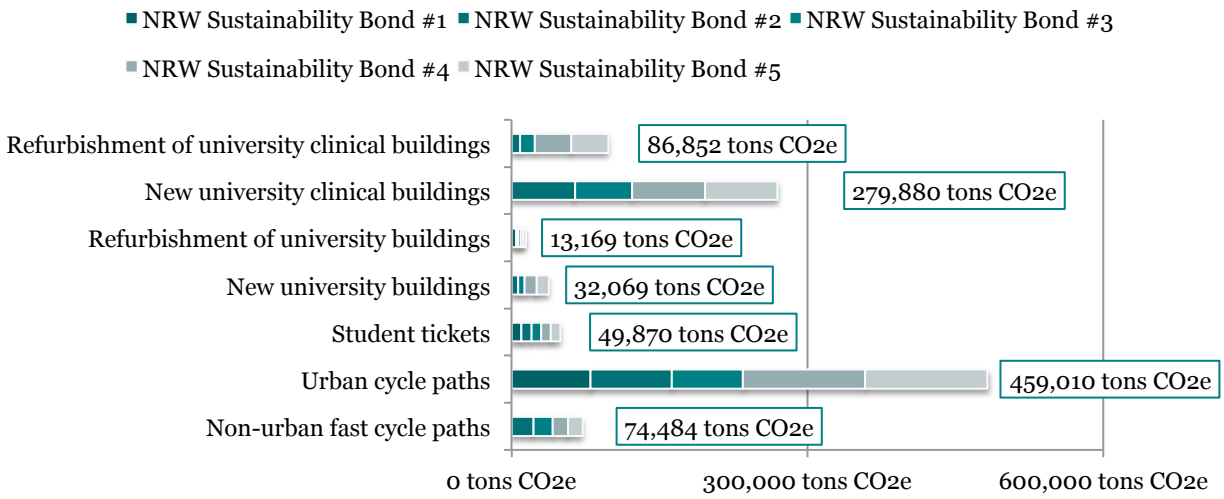
Table B: Results on GHG savings according to ICMA framework 2015[2]

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 CO2-equivalents	
					100%	financed	100%	financed
New university buildings	86.4	100	100	43.6	1.1	1.1	0.25	0.25
University buildings (refurbishment)	40.6	100	100	25.8	0.5	0.5	0.12	0.12
New university clinical buildings	230.7	100	100	90.0	5.0	5.0	1.11	1.11
University clinical buildings (refurbishment)	130	100	100	48.2	8.4	8.4	1.86	1.86
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 CO2-equivalents**	
					100%	financed	100%	financed
Student tickets	21.0	9.0	100	100	765	70	109.1	9.82
Urban cycle paths	15.8	100	100	100	29.1	29.1	4.13	4.13
Non-urban fast cycle paths	6.4	100	100	100	3.5	3.5	0.50	0.50

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

Quantified GHG Savings for NRW Sustainability Bonds #1 to #5

Figure D: GHG savings over lifetime of projects from 2014 to 2018 in the portfolio



source: own calculation

[2] The authors of the ICMA framework recently published an update. The changes to the result table could not be integrated in the impact analysis at hand, but will be in upcoming reports. This will include reporting on the overall absolute emissions where possible (see also https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/June-2019/Handbook-Harmonized-Framework-for-Impact-Reporting-WEB-100619.pdf).

All of the quantified categories for climate protection in the Sustainability Bond #5 were already part of the Sustainability Bonds #4 (2018), #3 (2017), #2 (2016) and #1 (2015). They can therefore be aggregated to a five-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 1,287m were invested over five years (2014 - 2018) that help to induce GHG savings of over 995,329 tons CO2e over the assumed lifetime of measures.

Additional environmental impacts for NRW Sustainability Bonds #1 to #5 (third party assessments)

The NRW Sustainability Bonds also include ca. EUR 250m investments into other projects that improve ecological developments over the course of four years (2014-2018). 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.

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. As the current EFRD report was not available at the time of the impact report, investments and effects still refer to the timeframe from 2014 until 2017.

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

Type	State funding (NRW Bond #1 to #5)	Investments outside the Sustainability Bond (budget years 2014-2018)	Environmental Savings (2014-2018)*
Effizienz Agentur NRW efa+ (as part of resource efficient economy)	circa EUR 25m	EUR 53.1m in the scope of resource efficiency (validated)	65,313 tons of CO2e
			12,819 tons of material resources
			467,211 m^3 of water
		EUR 492.2m in the scope of financing (validated)	145,358 tons of CO2e
			20,719 tons of material resources
			200,763 m^3 of water
Ökoprofit NRW (as part of resource efficient economy)	circa EUR 1.3m	EUR 63.5m	90,061 tons of CO2e
			9,034 tons of waste
			504,602 m^3 of water
EFRD (2014-2020) (priority axis 3 on CO2 reduction)	EUR 96.3m	only for budget years 2014-2017 (no report for 2018 as of yet)	
		circa EUR 530m	454,424 tons of CO2e
**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

Sustainable Land Use

EUR 133.2m of the NRW Sustainability Bond #5 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 40.2m or 30% of the investments in this category promote an area for sustainable land use of 457,710 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. However, these types of investments are currently under investigation for additional quantification and reporting in future NRW Sustainability Bonds.

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

Subcategory	Investment volume (2018)	Area supported per year (2018) (estimates)
Agro-environmental measures	EUR 8.9 m	72,438 ha
NRW Rural Area Programme - state share	EUR 31.3 m	385,272 ha
in TOTAL	**EUR 40.2 m**	**457,710 ha**

source: own calculation based on methods and data depicted in the full report for NRW Sustainability Bond #5

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[3]. 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.

Other examples for indirect social impacts from funding in the bond are the exemption from parental contributions for the last year of day-care for children, supporting 54 municipal integration centres for migrants, and an overall increase of 24% in integration for children with special educational needs (learning together).

Some social impacts can be either estimated based on published data (with help of so-called lump sums for costs per impact) or at least reported in form of third party assessments (see the following section on the enlargement of universities and for job creation, funding and qualification). Improving and standardising methods for social impact reporting in the NRW Sustainability Bond is currently under investigation by the Wuppertal Institut. The findings will be integrated into future reports.

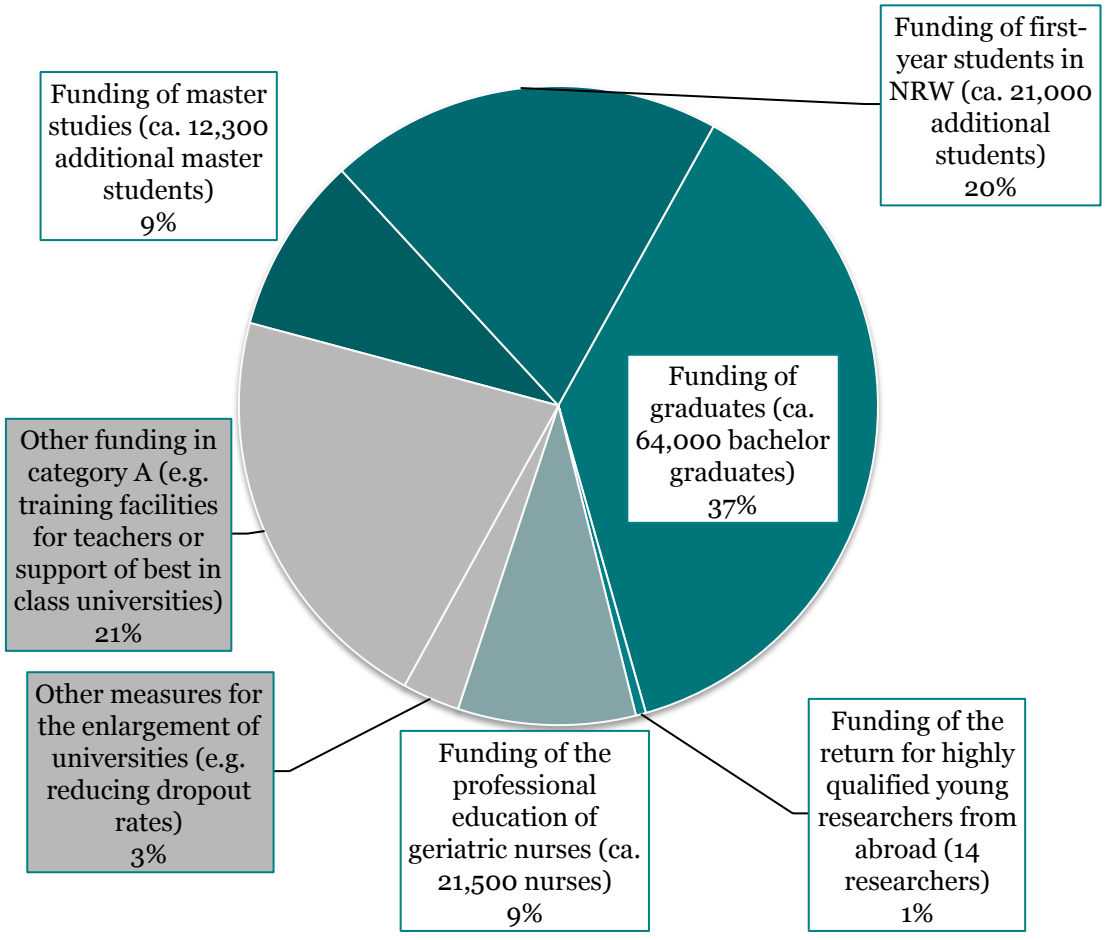
[3] see https://www.landtag.nrw.de/Dokumentenservice/portal/WWW/dokumentenarchiv/Dokument/MMD17-717.pdf

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 686m, 79% or EUR 475.6m 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 21,000 additional first-year students, 12,300 additional master students and the graduation of 64,000 bachelor students in 2018 (see also figure E). Furthermore the professional education of ca. 21,500 geriatric nurses was financed. EUR 3.5m was also used to bring back 14 researchers back to NRW as part of the "return programme for highly qualified researchers from abroad".

Table F lists the lump sums and quantification factors used for the estimation of these effects. Future impact reports will also investigate whether the number of teachers in training facilities can be estimated.

Figure E: Allocation of funding in category A (total of EUR 686.0m)



source: own calculations (number of bachelor graduates on the basis of 2017 as new statistics were not available at the time of publication)

Job Creation, Funding and Qualification

The NRW Sustainability Bond #5 investments dedicated to *Inclusion and Social Coherence* total EUR 379.3m. Some of this funding in category B was used to create new jobs for people with disabilities, fighting long-term unemployment or 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 three measures, it can be quantified that the Sustainability Bond NRW #5 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). All three projects also show how investments into social development can also lead to an improvement of economic indicators (job creation). A funding of EUR 5.1m is also used for programmes to fight long-term unemployment. Within the "Model project for the integration of long-term unemployed people in NRW" ca. 400 persons could be brought into employment. This project is used as an example to estimate a lump sum of EUR 34,400 per job resulting in 148 long-term unemployed persons that could be brought into employment through the funding of EUR 5.1m.

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 estimated effects in this category.

Table E: Impacts for Integration and Social Cohesion

Inclusion and Social Cohesion	Sustainability Bond NRW #5 funding	Type of quantification	Social Impact
Employment opportunities for persons with disabilities	EUR 2.5m*	direct	**job creation:** ca. 125 to 250 new jobs
Social School Work	EUR 47.2m	direct	**job funding:** ca. 725 jobs
Fighting long term unemployment	EUR 5.1m	direct	**job integration:** ca. 150 jobs
European Social Fund	EUR 25.0m	3rd party	**job qualification and integration**: ca. 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 reported data and calculated lump sumps for scaling

Broadband Expansion

A majority of the investments for urban development (68% 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[4]), it could be estimated that the funds of EUR 218,5m enable 109,336 broadband connections for households, institutions and industry.

Social impact indicators for the Sustainability Bond NRW #5

Table F summarizes the scalable social impact indicators for the Sustainability Bond NRW #5, 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 #5

Impact indicator	Scaling Factor	Metric
First-year students	EUR 18,000 per student	lump sum
Graduates	EUR 4,000 per graduate	lump sum
Master student place	EUR 10,000 per place over 2 years	lump sum
Funding of geriatric nurses	EUR 2,870 per student	lump sum
Jobs for persons with disabilities	EUR 20,000 per job created	maximum funding
Jobs for social school workers	EUR 65,000 per job	lump sum
Jobs for long-term unemployed persons	EUR 34,400 per job	lump sum (estimate)
Broadband connections	EUR 2,000 per access point	factor based on cost sample for NRW

source: own calculation

[4] see https://www.bmvi.de/SharedDocs/DE/Artikel/DG/breitbandatlas/breitbandatlas.html

Methods and Data

GHG factors (Global Warming Potential for 100 years without upstream) are drawn from the research centre for energy economics (FfE, 2010)(FfE, 2010), the balance of energy for German federal states (LAK, 2017) as well as data by the Federal Environmental Agency (UBA) (UBA & 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 m² 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 m² (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).

Data for social impacts in the area of the enlargement of universities and other training facilities are based on statistics on the number of students and graduates in NRW (IT.NRW, 2018) as well as data by Ministry of Culture and Science of the State of North Rhine-Westphalia (www.mkw.nrw).

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