Summary | February 2018

Impact Report
NRW Sustainability Bond #3

Analysis of the Sustainability Bond #3 issued in 2017 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.

Project duration: June 2017 - February 2018

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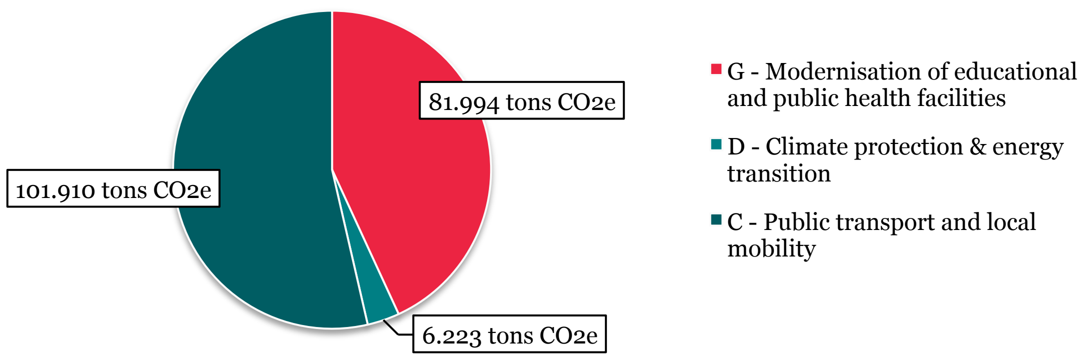
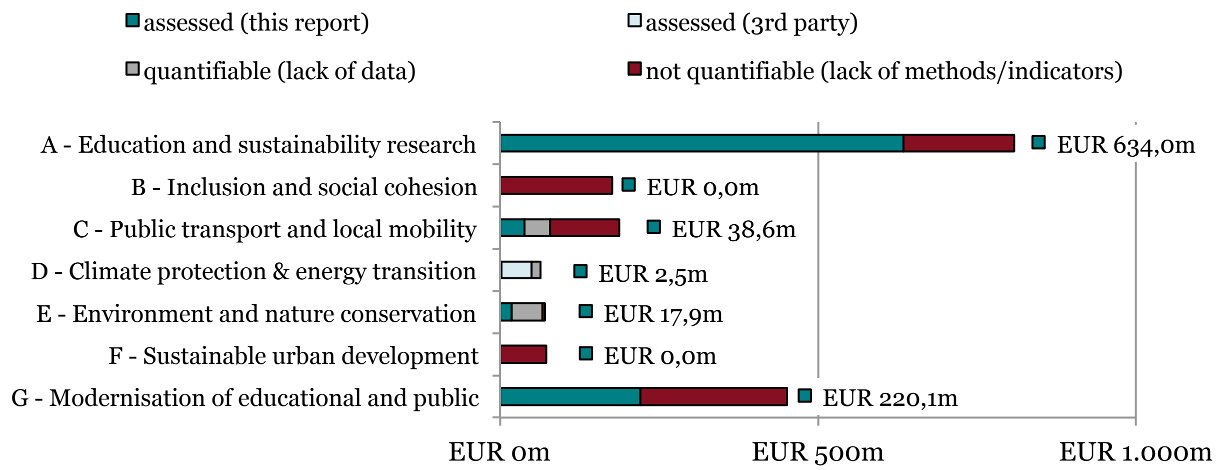
On behalf of the State Government of North Rhine-Westphalia (NRW), the Wuppertal Institute carried out an impact analysis of the NRW Sustainability Bond #3 of 2017 (referring to the 2016 budget). The bond has a volume of EUR 1,825m and a term of 10 years. The Sustainability Bond finances 49 eligible projects from the State's 2016 General Budget. All projects were selected in accordance with the specifications set out in the "Sustainability Bond Framework". This report analyses the contribution to climate protection (see Figure 1), sustainable land use and society created from this bond.
This NRW Sustainability Bond #3 is the third within 3 years.

Figure 1: Summary of assessed and quantified GHG savings in the NRW Sustainability Bond #3 (over average lifetime of measures)



Assessed Investments

Figure 2: Share of quantified investments in the Sustainability Bond #3 (referring to the State's 2016 budget)



Out of EUR 1,831m investments (€6m more than issued in the bond of EUR 1,825m) in 2016 (see Figure 2), EUR 913m (51%) could be directly associated with quantifiable social and ecological impacts within this report and further EUR 47m (4%) have been assessed by third parties. An additional EUR 103m (6%) are likely to contribute to the assessed impacts, but could not be quantified due to lack of data. The remaining investments of EUR 768m (43%) either contribute to other impacts or are not quantifiable within existing frameworks on Green Bonds.

Climate Protection: Greenhouse Gas (GHG) Savings

GHG Savings in NRW Sustainability Bond #3

The State of NRW invested around EUR 261m into eight different measures that could be associated with GHG savings in the budget year 2016. These measures stem from investments in the project categories C (student tickets, urban cycle paths, fast cycle paths), D (solar thermal panels) and G (new and refurbished university and public health buildings).

In sum, EUR 260m result in savings of 190,000 tons of CO_2 equivalents (CO2e) over the lifetime of the measures. Results for each measure range from 130 tons CO2e per year to 9,990 tons per year (see Table 1).

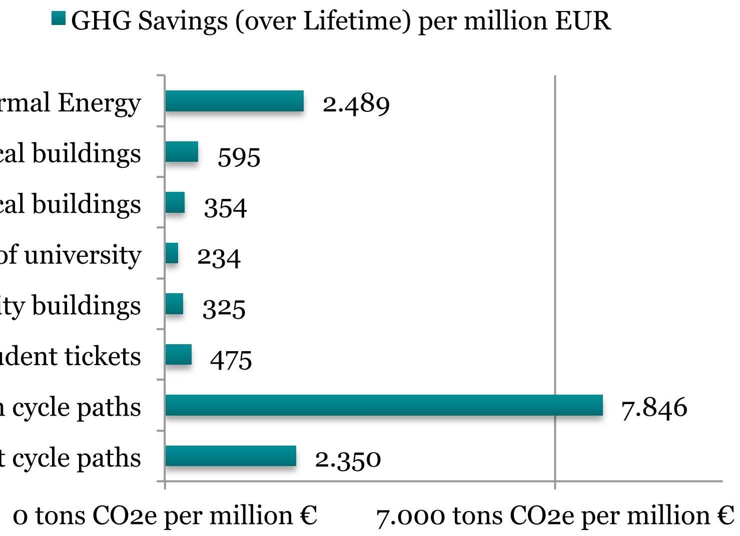
Table 1: GHG savings of measures in the project categories C, D and G

Measure	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	658	19,737	30
Urban cycle paths	2,406	72,186	30
Student tickets	9,987	9,987	1
New university buildings	127	6,340	50
University buildings (refurbishment)	133	2,670	20
New clinical buildings	880	58,107	66
Clinical buildings (refurbishment)	744	14,877	20
Solar Thermal Energy	311	6,223	20

Some measures can only be quantified on a yearly basis (such as student tickets), while others are likely to save emissions beyond the term of the Sustainability Bond (such as new buildings for universities).

The highest efficiency (see Figure 3) measured in GHG savings per million euro invested, can be attributed to the construction of cycle paths and panels for solar thermal energy conversion. However, new buildings do not only contribute to higher energy efficiency. There are additional social co-benefits, as the refurbishment and construction of clinical and non-clinical university buildings prevent health hazards, improves research capabilities and patient care.

Figure 3: Normalised[1] efficiency of climate protection measures for quantified investments

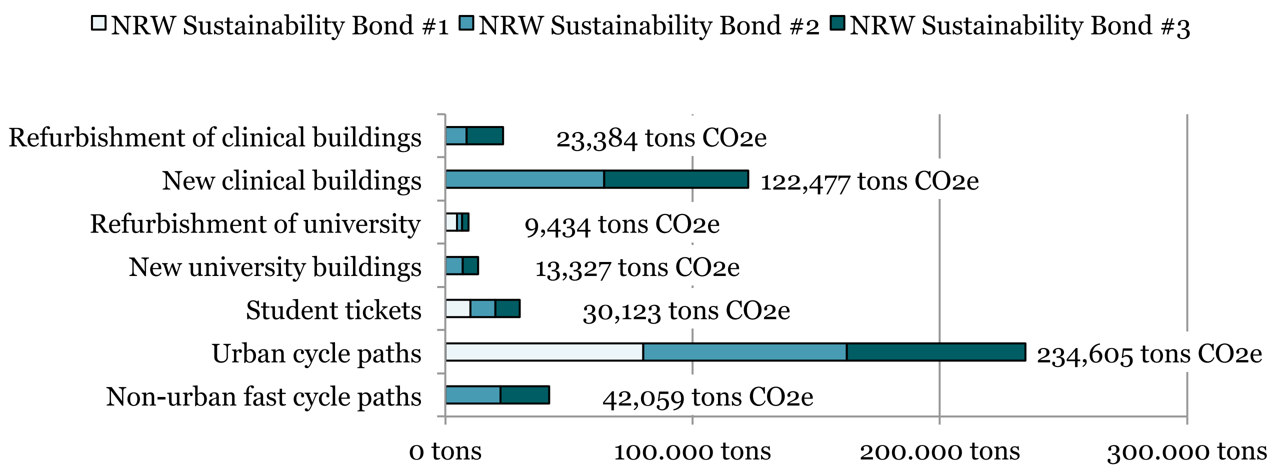


GHG Savings between 2014 and 2016

Most of the assessed and quantified measures for climate protection in the Sustainability Bond #3 were also funded by the Sustainability Bonds #2 (2016) and #1 (2015). With the exception of solar thermal energy (Bond #3) and co-generation of heat and power (Bond #2), they can therefore be aggregated to a three year portfolio (see Figure 4).

Over the course of three years (2014 – 2016) EUR 578m were invested, inducing potential GHG savings of 475,000 tons CO2e over the assumed lifetime of the measures.

Figure 4: GHG savings over lifetime of projects from 2014 to 2016 in the portfolio for NRW Sustainability Bonds



[1] The efficiency factors refer to the assessed investments only and the GHG savings over the assumed average lifetime of measures.

Third Party Assessments

Apart from the aforementioned assets, the State of NRW also invested EUR 162m over the course of three years (2014-2016) into other projects that mitigate greenhouse gas emissions, increase capacity for renewable energies and provide companies with services and funding in order to increase their energy efficiency and resource efficiency. This resulted not only in savings of GHG emissions, but also helped companies reduce their material and water consumption as well as waste production. These projects are also financed (or refinanced) by the State's Sustainability Bonds. The projects are beyond the scope of this analysis, but we present the results of third party assessments here.

Table 2 shows the results of such projects from category D (Climate Protection and Energy Transition). 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.

Table 2: Third party assessments of the ecological savings in project category D

Type	Sustainability Bond NRW funding (2014-2016)	Investments outside the Sustainability Bond (2014-2016)	Ecological savings (per annum between 2014 and 2016)*
Effizienz Agentur NRW efa+[2] **(as part of resource efficient economy)**	EUR 10.8m	EUR 24.4m in the scope of resource efficiency (validated)	■ 37,935 tons of CO_2e ■ 9,889 tons of material resources ■ 165,775 m³ of water
		EUR 205.5m in the scope of financing (validated)	■ 64,787 tons of CO_2e ■ 10,545 tons of material resources ■ 200,763 m³ of water
Ökoprofit NRW[3] **(as part of resource efficient economy)**	EUR 0.7m	EUR 45.1m for 2,027 measures	■ 42,789 tons of CO_2e ■ 4,995 tons of waste ■ 262,389 m³ of water
EFRD (2014-2020)[4] **(priority axis 3)**	EUR 53.0m	not assignable	■ 289,926 tons of CO_2e

** Different methods were used to calculate the ecological impacts of the projects. The results are not summable.*

[2] https://www.ressourceneffizienz.de/ressourceneffizienz

[3] http://www.oekoprofit-nrw.de (only available in German)

[4] https://www.efre.nrw.de (only available in German)

Sustainable Land Use – Ecological Impacts

The State of NRW invested about EUR 71m of the Sustainability Bond into measures associated with sustainable land use. This project category (E) covers measures in the areas of nature conservation, flood protection and ecological sustainable farming and animal welfare. Only in the field of ecological sustainable farming the quantification of promoted area was possible. Thus, EUR 16.8m (23.6%) could be associated with a promoted area of 282,366 hectare (see Table 3).

In the case of other measurements, e.g. flood protection and habitat protection, no quantification was possible due to lack of data. Regarding public reporting, protected areas have increased in the last years, especially in the case of flood protection or habitat protection (Federal Government NRW, 2016, p. 18). According to LANUV NRW (2017) 16.2% of the NRW area provides enhanced protection status.

Table 3: Quantification of promoted area in the case of Ecological sustainable farming

Type	Sustainability Bond Funding in million EURO (2016)	Promoted area in hectare
Agri-environmental measures	4.6*	27,826
NRW country share in the European Agricultural Fund for Rural Development (ELER[5])	12.2	254,540

** **An additional EUR 1.1m** (EUR 5.7m in total) **was invested into agri-environmental measures** (including measures to promote animal welfare)**. The promoted area in this table refers to the allocated investments of EUR 4.6m.***

Social Impacts

Most of the social impacts referring to education, inclusion, social cohesion and even mobility could not be quantified within this assessment, mainly due to lack of data and an appropriate methodology. For example, the State's funding for "social tickets" for people with low income is likely to contribute to climate protection on the one hand, but also enables social integration. 300,000 people used "social tickets" in 2015, which is about 15% of 2 million people that are entitled to this benefit (Federal Government NRW, 2017).

One impact that could be quantified is the State's funding of EUR 808.0m into general education and education for sustainability. A majority of these funds (78%) were used to sponsor additional student capacities in North Rhine-Westphalia in cooperation with the Federal Government as part of the Hochschulpakt 2020 (Covenant of Bund and federal states for the expansion of universities). These State funds enabled 23,000 people to start academic studies in 2016. Figure 5 shows the number of first-year students 2014 and 2016 in NRW.

[5] http://www.eler.nrw.de

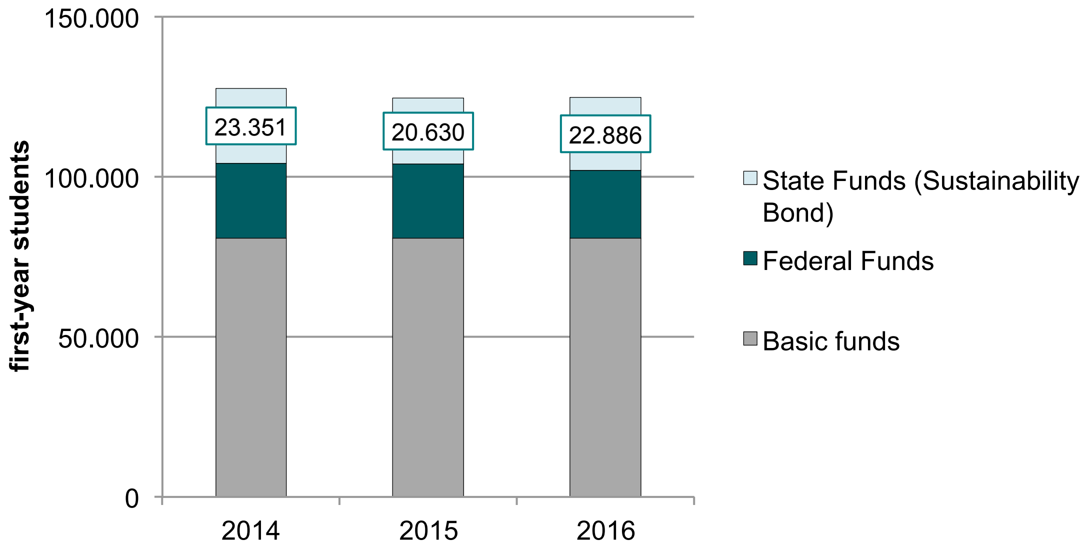


Figure 5: Additional first-year students as part of the Hochschulpakt 2020

Further Information: NRW Sustainability Strategy

The issuance of a NRW Sustainability Bond is part of the **Sustainability Strategy of NRW** based on the Sustainable Development Goals (SDGs), comprising of 70 social and environmental indicators in 19 fields of action. Further information on the strategy can be obtained from http://www.nachhaltigkeit.nrw.de. Constantly updated information on the development of the indicators are published at www.nachhaltigkeitsindikatoren.nrw.de (only available in German).

Overview on GHG savings (NRW Sustainability Bond #3)

Table 4 lists the results on GHG savings in all assessed project categories according to IFC (2015).

Table 4: Results on GHG savings according to IFC framework 2015 (Green Bonds -- Working Towards a Harmonized Framework for Impact Reporting)

Renewable Energy (RE)	Signed Amount	Share (of investment)	Eligibility for green bonds	RE Component	Annual energy generation		Annual GHG emissions reduced/avoided	
Project name	million EURO	%	% of signed amount	% of signed amount	GWh/a		in 1,000 tonnes of CO2-equivalents	
					100%	financed	100%	financed
Solar thermal energy	2.5	23.8	100	100	5.9	1.4	1.31	0.31
Energy Efficiency (EE)	**Signed Amount**	**Share (of investment)**	**Eligibility for green bonds**	**EE Component**	**Annual energy savings**		**Annual GHG emissions reduced/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 *	46.6	100	100	41.7	0.6	0.6	0.13	0.13
University buildings * (refurbishment)	46.9	100	100	24.4	0.6	0.6	0.13	0.13
New clinical buildings *	278.6	100	100	58.9	4.0	4.0	0.88	0.88
Clinical buildings * (refurbishment)	79.2	100	100	31.6	3.3	3.3	0.74	0.74
Low Carbon Transport (LCT)	**Signed Amount**	**Share (of investment)**	**Eligibility for green bonds**	**LCT Component**	**Annual savings of PKW km**		**Annual GHG emissions reduced/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	9.3	100	100	753.9	70.3	106.1	9.99
Urban cycle paths	9.2	100	100	100	16.9	16.9	2.41	2.41
Fast cycle paths	8.4	100	100	100	4.6	4.6	0.66	0.66

Methods and Data

GHG factors (without upstreams) are drawn from the research center 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 assessment of GHG savings by solar thermal panels is based on a report by the Wüstenrot Stiftung (Corradini *et al.*, 2014). The authors estimated in a conservative scenario, that 237.53 PJ of final energy can be substituted, if 167 million m^2 of solar panels were installed in Germany. This results in 395 kWh of substituted heat per m^2 or 87 kg CO2e per m^2, based on the heat supply for households in Germany (RWI, 2016) and the GHG factors used in this report.

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^2 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 clinical buildings are based on press releases on current and past construction projects by universities in NRW. The allocation of funding was conducted with help of the State's budget plan in NRW.

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 Münster and the university of Bochum. As a result, final heat savings of 3,156 kWh per bed (clinics) and 88 kWh per m^2 (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 furnished 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, 2016).

In the case of sustainable land use and social impacts, data were provided by the relevant Ministry for Environment, Agriculture, Conservation and Consumer Protection and the Ministry of Culture and Science of the State of NRW. The area data was calculated according to the investment share.

The recommendations of the EU Action Plan on sustainable finance (due to be published in March 2018) will be taken into consideration when designing the impact report for the next Sustainability Bond.

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