Impact Report #1 | March 2022

Impact Report of the Green Bond Baden-Württemberg #2021

Results for Climate Change Mitigation, Climate Change Adaptation, Water & Marine Resources, Circular Economy, Pollution Prevention, Biodiversity & Ecosystems

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On behalf of

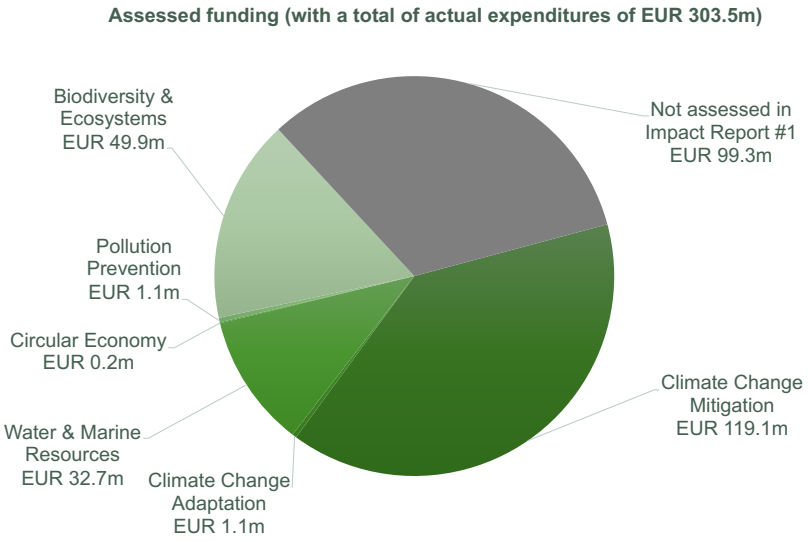
Baden-Württemberg
MINISTERIUM FÜR FINANZEN

Wuppertal Institut

Executive Summary

The State of Baden-Württemberg issued its first Green Bond in March 2021 (#2021) with a volume of 300 million Euro and referring to the State's expenditure in 2020. Wuppertal Institut has been commissioned with the impact reporting (#1) and evaluation of its compliance with the do-no-significant-harm (DNSH) criteria of the EU taxonomy regulation. The report describes the results of this assessment in line with the ICMA's *Harmonised Framework for Impact Reporting* (ICMA, 2021) as well as the current proposal for a European Green Bond Standard[1].

The Green Bond's impact orientation is aligned with the UN Sustainable Development Goals (SDGs), the State's sustainability strategy as well as the environmental objectives of the taxonomy regulation. The issuer has published a Green Bond framework in February 2021, a second-party-opinion (SPO) and an allocation report (Ministerium für Finanzen Baden-Württemberg, 2021a, 2021b; V.E., 2021). The bond comprises 49 eligible projects, covering all six environmental objectives.



The report focuses on the impacts from 25 projects, representing 52% of the total financing. Future reports will increase this share gradually with the aim to assess at least 75% of all projects. The majority of the assessed projects can be attributed to the objectives *Climate Change Mitigation* (8 projects, EUR 119m) and *Biodiversity & Ecosystems* (8 projects, EUR 50m). Another large portion is allocated to the objective *Water & Marine Resources* with EUR 32m funding for wastewater management measures. In total, 59 indicators were selected, qualified and quantified (see Annex for full results). The indicator-quality can be considered *best-practice* (quality C) for 10 indicators and *best-in-class* (quality B) for 6 indicators.

Risk Assessment for potential violations of DNSH criteria

None of the assessed projects in the Green Bond pose a high or even medium risk for significant damage to any of the objectives. It is unlikely that other projects constitute significant harm. Low or minimal risks could be identified for 10 out of 25 projects, of which 2 projects require full compliance with additional requirements for climate change adaptation in order to avoid harm (construction and renovation of energy-efficient public buildings). It can be reasonable assumed that this is the case for public buildings in the State, because a climate-adaptation strategy is in place.

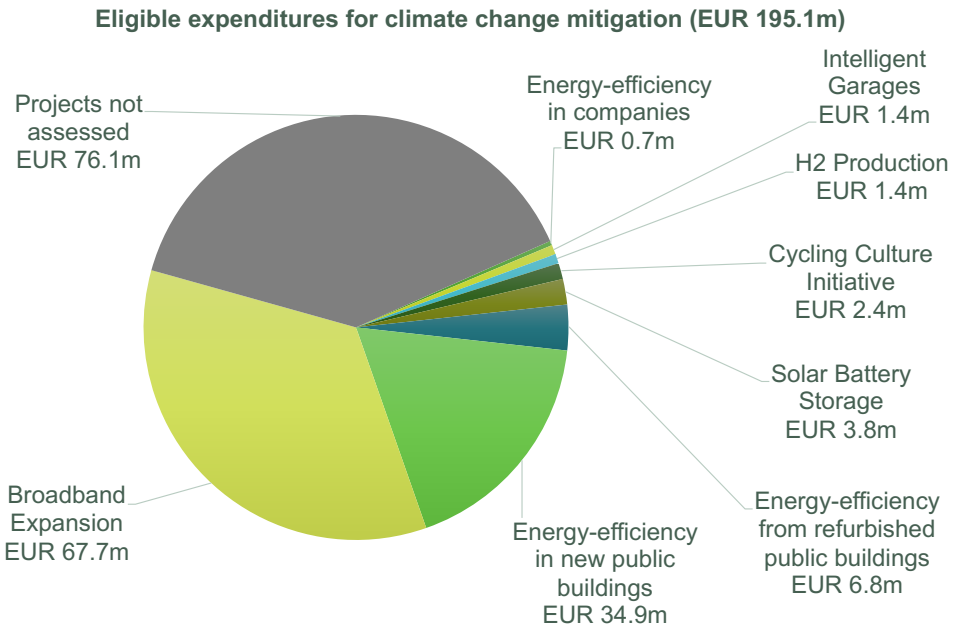
[1] see https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0391

Climate Change Mitigation

190 million Euro or 63% of the eligible funding contributes to the objective of climate change mitigation. Out of these funding, 8 programs with an eligible amount of EUR 119m were assessed for the impact report (62% of EUR 190m).

The project with the largest contribution is the expansion of broadband connections in the State of Baden-Württemberg (36% of eligible amounts for climate change mitigation). It is estimated that 7,000 new connections were potentially realized with the help of the financing. This relates to approximately 46,000 connections overall for 2020 and circa 500 approvals for broadband grants.

The second largest contributor are newly constructed public buildings (EUR 34.9m). 15 of these buildings were assessed that will avoid 3,800 tonnes[2] of CO_2-equivalents on an annual basis when finished. Compared with the emissions in the building stock from 1990, this represents a reduction in GHG emissions of 89%[3]. Based on the funding in 2020 alone (share of financing), 311 tonnes of GHG emissions will be avoided every year while a reduction of 7% can be attributed to the eligible amounts in the Green Bond.



Other assessed measures in this category also contribute to the reduction of GHG emissions or enable other stakeholders do so. These results are listed in the annex to the report (see 6.2).

Climate Change Adaptation

Four projects contributing to climate change adaptation were selected by the issuer of which two projects were assessed in the report. These two projects represent 88% (EUR 1.1m) of the overall funding in this category (EUR 1.3m). The main contribution stems from the promotion of climate-resilient forests and efforts for re- or afforestation in the State. 206 hectares of promoted forest area can be directly attributed to the issuer (out of 515 ha from all funds), that help to store 20.5 kilotonnes of carbon (out of 51 kilotonnes C). At least 239 tonnes of carbon are additionally absorbed by the trees every year (compared to 597 tonnes for the whole area).

[2] All tonnes in this report refer to metric values.
[3] By comparison, the overall GHG emissions from heat demand in the State's public buildings could be reduced by circa 50% between 2019 and 1990 (Ministerium für Finanzen Baden-Württemberg, 2020, p. 47).

Water & Marine Resources

Two projects were selected by the issuer in this category and both of them were quantified on the level of activities. In regard to the bond, 122 waste-water management measures were funded in 2020 with circa EUR 32m (100% financial share). In addition, 87 publications can be attributed to the interdisciplinary "Research Programme Network Water Research" promoted by the State of Baden-Württemberg (funding of circa EUR 0.7m).

Circular Economy

All projects were assessed in this category. Although both projects represent only a small portion of the Green Bond (circa EUR 230,000), a clear contribution to the overall objective can be shown. The main contributor in this category are four plants under construction (estimated total costs of circa EUR 71m) that are expected to address the issue of phosphorous shortage in agriculture[4]. These plants are expected to recover circa 1,400 tonnes of P per year (4.6 tonnes per year from financing in 2020).

Pollution Prevention

The majority of the funding (circa EUR 1.0m out of EUR 1.1m) in this category is attributed to a e-ticket system that will include all transport associations in the state and is expected to increase the use of clean public transport systems from 2022 onwards (official start of the system). In addition, clean vehicles for the State's fleet were promoted with circa EUR 100,000. This corresponds to 21 electric or otherwise climate-friendly vehicles that contribute to pollution prevention. It is estimated that these vehicles will save 6 kg NO_x emissions per year of service (equivalent to over 100,000 km mileage with a conventional EURO 6 petrol car).

Biodiversity & Ecosystems

Eight projects with EUR 49.9m were assessed in this area. The main impact relates to three projects for nature conservation and biodiversity (EUR 45.4m). This funding helps to protect an area of over 55,000 hectares (circa 41,000 ha from funding alone). Another large project relates to the monitoring of biotopes in the State. Approximately 6,900 of these projects are monitored with a financing of EUR 2.9m.

Additional effects can also be attributed to the promotion of agroforestry systems in Burundi (circa 3,500 families benefiting with EUR 100,000 in 2020) and the promotion of 270 hectares for artisanal vineries (circa EUR 810,000).

Outlook

A number of projects assessed here will also be part of future Green Bonds. The reporting will integrate these annual effects into an accumulated presentation. It is also intended to increase the overall share of assessed projects and quantified indicators. Regarding the methodology, theory-based evaluation methods will be tested that help to provide evidence for the plausibility of the desired outcome pathways.

[4] The shortage of mineral P fertilizer is expected to limit food and feed production in the future (Alewell et al., 2020).

Zusammenfassung

Das Land Baden-Württemberg hat im März 2021 seinen ersten Green Bond mit einem Volumen von 300 Millionen Euro begeben, welcher sich auf den Landeshaushalt 2020 (#2020) bezieht. Das Wuppertal Institut wurde mit der Wirkungsanalyse und der Bewertung der Einhaltung der Do-No-Significant-Harm-Kriterien (DNSH) der EU-Taxonomieverordnung beauftragt. Der vorliegende Bericht beschreibt die Ergebnisse dieser Bewertung in Übereinstimmung mit dem *Harmonised Framework for Impact Reporting* (ICMA, 2021) sowie dem aktuellen Vorschlag für einen Green Bond Standard der EU-Kommission.

Das Framework des Green Bonds orientiert sich an den *Sustainable Development Goals* (SDGs) der UN sowie an den Umweltzielen der Taxonomieverordnung. Das Land hat bereits im Februar 2021 ein Green Bond Framework, eine Second-Party-Opinion (SPO) und einen Allokationsbericht veröffentlicht (Ministerium für Finanzen Baden-Württemberg, 2021a, 2021b; V.E., 2021). Die Anleihe umfasst 49 geeignete Projekte, die alle sechs Umweltziele abdecken.

Der Bericht konzentriert sich auf die Auswirkungen von 25 Projekten, welche 52% des Gesamtvolumens entsprechen. In künftigen Berichten soll dieser Anteil schrittweise erhöht werden um mindestens 75% aller Projekte bewerten zu können. Der Großteil der bewerteten Projekte kann den Zielen *Klimaschutz* (8 Projekte über EUR 119 Mio.) und *Schutz und Wiederherstellung der biologischen Vielfalt und der Ökosysteme* (8 Projekte über EUR 50 Mio.) zugeordnet werden . Ein weiterer großer Teil entfällt auf das Ziel der *Nachhaltigen Nutzung und des Schutzes der Wasser- und Meeresressourcen*, wobei EUR 32 Mio. für Maßnahmen zur Abwasserentsorgung bereitgestellt werden. Insgesamt wurden 59 Indikatoren ausgewählt, qualifiziert und quantifiziert (siehe Anhang für vollständige Ergebnisse). In Bezug auf die Qualität der Indikatoren können 10 Indikatoren als *Best-Practice* (Qualität C) und 6 Indikatoren als *Best-In-Class* (Qualität B) angesehen werden.

Risikobewertung für mögliche Verstöße gegen die DNSH-Kriterien

Keines der im Rahmen des Green Bonds bewerteten Projekte birgt ein hohes oder mittleres Risiko einer erheblichen Beeinträchtigung zu einem der Umweltziele. Außerdem ist es unwahrscheinlich, dass andere Projekte einen erheblichen Schaden verursachen. Geringe oder minimale Risiken konnten bei 10 von 25 Projekten festgestellt werden, von denen 2 Projekte die vollständige Erfüllung zusätzlicher Anforderungen zur Anpassung an den Klimawandel erfordern, um Schäden zu vermeiden (Bau und Renovierung energieeffizienter öffentlicher Gebäude). Es kann davon ausgegangen werden, dass dies bei den öffentlichen Gebäuden des Landes der Fall ist, da eine Strategie zur Anpassung an den Klimawandel vorhanden ist.

Klimaschutz

190 Millionen Euro oder 63% der förderfähigen Mittel tragen zum Ziel der Eindämmung des Klimawandels bei. Von diesen Mitteln wurden 8 Projekte mit einem zugewiesenen Betrag von EUR 119 Mio. für den Wirkungsbericht bewertet (62% der 190 Millionen Euro).

Das Projekt mit dem größten Beitrag ist der Ausbau von Breitbandanschlüssen in Baden-Württemberg (36% der zugewiesenen Mittel für den Klimaschutz). Es wird geschätzt, dass mit Hilfe der Finanzierung 7.000 neue Anschlüsse realisiert werden können. Dies bezieht sich auf ca. 46.000 Anschlüsse insgesamt für das Jahr 2020 und ca. 500 Bewilligungen für Breitbandförderungen.

Der zweitgrößte Betrag bezieht sich auf den Neubau öffentlicher Gebäude (34,9 Mio. EUR). Es wurden 15 dieser Gebäude bewertet, die nach ihrer Fertigstellung jährlich 3.800 Tonnen CO2-Äquivalente vermeiden werden. Verglichen mit den Emissionen des Gebäudebestands von 1990 bedeutet dies eine Verringerung der Treibhausgasemissionen um 89%. Allein durch die Finanzierung im Jahr 2020 werden jährlich 311 Tonnen THG-Emissionen vermieden, während eine Verringerung von 7% auf die im Rahmen der Green Bonds zugewiesenen Beträge zurückzuführen ist.

Andere bewertete Maßnahmen in dieser Kategorie tragen ebenfalls zur Verringerung der Treibhausgasemissionen bei oder ermöglichen anderen Akteuren, dies zu tun. Die Ergebnisse sind im Anhang zum vorliegenden Bericht aufgeführt (siehe Punkt 6.2).

Anpassung an den Klimawandel

Im Hinblick auf das Ziel der Anpassung an den Klimawandel wurden vom Ersteller vier Projekte ausgewählt, von denen zwei Projekte im vorliegenden Bericht bewertet wurden. Diese beiden Projekte machen 88% (1,1 Mio. EUR) der Gesamtfinanzierung in dieser Kategorie (1,3 Mio. EUR) aus. Der Hauptbeitrag wird durch die Förderung klimaresistenter Wälder und die Bemühungen um Wieder- und Neuaufforstung im Land geleistet. 206 Hektar der geförderten Waldfläche können direkt dem Emittenten zugerechnet werden (von 505 Hektar aus allen Mitteln), die dazu beitragen, 20,5 Kilotonnen Kohlenstoff zu speichern (von 51 Kilotonnen C insgesamt). In Bezug auf den Klimawandel werden jedes Jahr mindestens 239 Tonnen Kohlenstoff zusätzlich von den Bäumen aufgenommen (im Vergleich zu 597 Tonnen für die gesamte Fläche).

Nachhaltige Nutzung und Schutz von Wasser- und Meeresressourcen

In dieser Kategorie wurden vom Land zwei Projekte ausgewählt, die beide auf der Ebene der Aktivitäten quantifiziert wurden. In Bezug auf die Anleihe wurden 122 abwasserwirtschaftliche Maßnahmen im Jahr 2020 mit ca. 32 Mio. EUR (100% Finanzierungsanteil) gefördert und 87 Publikationen sind dem vom Land Baden-Württemberg geförderten interdisziplinären „Forschungsprogramm Netzwerk Wasserforschung“ zuzurechnen (Förderung von ca. 0,7 Mio. EUR).

Wandel zu einer Kreislaufwirtschaft

Auch in dieser Kategorie wurden alle Projekte bewertet. Obwohl beide Projekte nur einen kleinen Teil des Green Bond ausmachen (ca. 230.000 EUR), kann ein Beitrag zum Gesamtziel nachgewiesen werden. Den größten Beitrag in dieser Kategorie leisten vier im Bau befindliche Anlagen (geschätzte Gesamtkosten von ca. 71 Mio. EUR), mit denen das Problem der Phosphorknappheit in der Landwirtschaft angegangen werden soll. Diese Anlagen werden voraussichtlich ca. 1.400 Tonnen Phosphor pro Jahr zurückgewinnen (4,6 Tonnen pro Jahr aus der Finanzierung im Jahr 2020).

Vermeidung und Bekämpfung der Umweltverschmutzung

Der Großteil der Mittel (ca. 1,0 Mio. EUR von 1,1 Mio. EUR) aller drei Projekte in dieser Kategorie fließt in ein E-Ticket-System, das alle Verkehrsverbünde des Landes einbeziehen wird und die Nutzung umweltfreundlicher öffentlicher Verkehrsmittel ab 2022 (offizieller Start des Systems) steigern soll. Darüber hinaus wurden saubere Fahrzeuge für den Fuhrpark des Landes mit ca. 100.000 Euro gefördert. Dies entspricht 21 elektrischen oder anderweitig klimafreundlichen Fahrzeugen, die auch zur Vermeidung von Luftschadstoffen beitragen. Es wird geschätzt, dass diese Fahrzeuge 6 kg Stickoxid-Emissionen pro Betriebsjahr einsparen können (dies entspricht einer Laufleistung von über 100.000 km mit einem herkömmlichen EURO-6-Benzinfahrzeug).

Schutz und Wiederherstellung der biologischen Vielfalt und der Ökosysteme

In dieser Kategorie wurden acht Projekte mit einem Finanzierungsanteil von 49,9 Mio. EUR bewertet. Die größten Auswirkungen haben drei Projekte zum Schutz der Natur und der biologischen Vielfalt (45,4 Mio. EUR). Diese Mittel tragen dazu bei, eine Fläche von über 55.000 Hektar zu schützen (ca. 41.000 ha allein durch die Finanzierung). Ein weiteres großes Projekt betrifft die Überwachung von Biotopen im Land. Etwa 6.990 dieser Projekte wurden mit einer Finanzierung von 2,9 Mio. EUR in einer Datenbank erfasst.

Zusätzliche Wirkungen können auch in der Förderung von Agroforstsystemen in Burundi (ca. 3.500 Familien profitieren von 100.000 EUR im Jahr 2020) und der Förderung von 270 Hektar für handwerklichen Weinbau (ca. 810.000 EUR) zugeschrieben werden.

Ausblick

Viele der hier bewerteten Projekte werden auch Teil künftiger Green Bonds sein. Die Berichterstattung wird diese jährlichen Auswirkungen in eine kumulierte Darstellung integrieren. Außerdem soll der Gesamtanteil der bewerteten Projekte und quantifizierten Indikatoren erhöht werden. Im Bereich der Methodik werden theoriebasierte Bewertungsmethoden erprobt, die dazu beitragen, die Plausibilität der angestrebten Wirkungspfade zu belegen.

This report is based on the results of a study conducted on behalf of the **Ministerium für Finanzen des Landes Baden-Württemberg**. The authors are responsible for the content.

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1 Scope and Structure of the Report

The external reviewer (Wuppertal Institut) has conducted an impact assessment of the first Green Bond of the State of Baden-Württemberg (impact report #1) from 2021 (#2021). All funding is related to the State's 2020 expenditure. Effects are usually restricted to the year 2020 but can, in some cases, refer to future effects as well (e.g., ex-ante from plants under construction). Most effects take place within the geographical borders of the State, although some projects lead to benefits in other countries (e.g., promoting agroforestry systems in Burundi). The objectives of the report are defined by the issuer as listed below:

1) Review of compliance with do-no-significant-harm principle
2) Impact Assessment in line with ICMA framework and EU Green Bond Standard proposal
   a) Consideration of indicators proposed by issuer as well as suitable metrics found in the taxonomy regulation
   b) Quantification of indicators were possible, both for full and financed effects
   c) Transparent description of methods and data
   d) Continuous and further development of methodology, including the presentation of cumulative effects in future reports where possible
3) Summary of results in form of an executive summary

The full report has 6 main sections, as listed below:

1 Scope and Structure of the Report
2 Validation of Do-No-Significant-Harm
3 Methods and Data
4 Discussion and Outlook
5 Literature
6 Annex: Results for all indicators

The Green Bond Framework of the issuer is in line with the EU taxonomy, which by itself is aligned to the environmental objectives of the EU environmental action program (EAP). Some of these objectives address slightly different targets at once such as the sustainable use of water bodies compared to the protection of marine resources. We use a matching table (see table 1-1), to condense and abbreviate the targets in the report at hand. Each abbreviation or short-term relates to all targets defined by each objective.

table 1-1: matching table for environmental objectives in the EU taxonomy regulation

Environmental objective	Short name	Abbreviation
Climate change mitigation	Climate Change Mitigation	CM
Climate change adaptation	Climate Change Adaptation	CA
The sustainable use and protection of water and marine resources	Water & Marine Resources	WM
The transition to a circular economy	Circular Economy	CE
Pollution prevention and control	Pollution Prevention	PP
Protection and restoration of biodiversity and ecosystems	Biodiversity & Ecosystems	BE

2 Validation of Do-No-Significant-Harm

The issuer's Green Bond Framework intends to address (if eligible programs and projects are available in a given year) all six environmental objectives in the European Union as defined by the EU Taxonomy regulation[5] (FAO, 2020). This is achieved by describing and assigning eligible projects to one of the objectives (termed "significant contribution" in the language of the regulation). A second-party opinion was published that corroborates this attribution (V.E., 2021).

In line with Article 17 of that regulation, the issuer also ensures that there is "no significant harm" (abbreviated DNSH in the language of the regulation) to one of the other five objectives. The report at hand intends to validate this claim for all assessed projects or programs in the bond. A project or State program is deemed assessed when at least one indicator is reported here.

2.1 Validation method

The Taxonomy applies to economic activities that are mainly classified according to NACE[6] codes and focused on companies. The projects in the Green Bond on the other hand mostly refer to State programs. Although there are companies involved (e.g., when financially incentivized or profiting from free counselling services), the logic of the Taxonomy does not fully comply as some of the effects will occur outside of the funding and fiscal responsibility of the State.

It is therefore not feasible to review whether these programs are in line with specific do-no-harm criteria, unless

- there is a high probability for considerable damage ("high risk"),
- the project or program can be clearly matched to a NACE category where DNSH-criteria are well-defined,
- and these DNSH criteria include requirements beyond national or European environmental regulation and laws[7].

The approach outlined here consists of a 4-step process. First (1), we evaluate whether there is either a "low risk" or "high risk" for violating the generic DNSH criteria in Article 17 of the Taxonomy regulation. Secondly (2), we check for the availability and feasibility of specific DNSH-criteria in cases where a risk is anticipated (projects outside the taxonomy can still have a high risk but cannot be reviewed here). Thirdly (3), specific DNSH criteria are evaluated where applicable with the goal of conclusively identifying projects with a high risk. Fourthly (4), hazard-indicators are identified where necessary and described for each program with a high risk of doing significant damage to the environmental objectives according to the specific DNSH criteria laid out in the taxonomy.

[5] The environmental objectives of the EU taxonomy regulation are originally based on the 7th Environment Action Programme EAP (http://data.europa.eu/eli/dec/2013/1386/oj).
[6] NACE (Nomenclature statistique des activités économiques dans la Communauté européenne) is the most common classification system for economic activities in the EU. It is almost exclusively used for European Statistics or European Input-/Output-Tables.
[7] It can be safely assumed that companies and other actors only receive funding if they comply to national and European environmental laws.

2.2 Step 1: Generic Risk Assessment

Article 17 of the Taxonomy defines significant harm to environmental objectives in a more generic manner. Step 1 of the validation process is an expert review by the authors to check whether there is a high risk in each of the assessed projects.

Two types of definitions are necessary for that process. Firstly, the term *high risk* needs to be defined. Secondly, the description of the harm criteria needs to be framed in form of *control questions* that can be easily and, more importantly, clearly evaluated. The third and final step is applying these criteria to all 25 assessed projects in the Green Bond.

Definition of high risk

Most of the DNSH criteria refer to environmental risks[8]. A full environmental risk assessment (ERA) is an extensive process, requires state-of-art methodologies and data and is usually conducted by a team of experts for different areas of protection (see Suter (2001) for a comparison between environmental monitoring and risk assessment). This type of assessment is outside of the scope of the report at hand. Instead, high risk is defined by comparing the consequences (damages) of the project with the current status quo or the most common alternative:

> *"Projects have a high risk of violating DNSH if the magnitude of the potential damage and the likelihood for its occurrence are unequivocally higher (above reasonable variation) than the current practice or economic activity"*

The restriction for "[...] reasonable variation [...]" refers to the comparison of systems that are very similar. This usually leads to small differences of effects also (e.g., of caused GHG emissions) that are mainly caused by variability of input parameters or their co-dependence on other systems. Both probability and potential damage should be higher not only in some, but in all cases ("unequivocally") or at least it cannot be ruled out by the reviewing expert.

The two parts of the definition (magnitude and likelihood) are evaluated separately, so there can also be a *high likelihood of some damage* and a *small likelihood of significant damage*. We distinguish three cases:

1. no risk: there is no higher likelihood or higher damage anticipated
2. low risk: there is either higher likelihood or higher damage anticipated
3. high risk: both likelihood and higher damage are anticipated

As a consequence, projects deemed to have "no risk" in any of the objectives are not further investigated. Only projects with "low risk" or "high risk" are further processed for step 2 (Applicability of Taxonomy), step 3 (Evaluation of DNSH criteria) and step 4 (Identification of Hazard-indicators).

[8] We refer to risks on the environment and not to risks from the environment for health. Another term that can be used instead is "ecological risks".

Control Questions

The following figure 2-1 shows the criteria for significant-harm in the EU Taxonomy regulation.

figure 2-1: article 17 of the Taxonomy Regulation

Article 17

Significant harm to environmental objectives

1. For the purposes of point (b) of Article 3, taking into account the life cycle of the products and services provided by an economic activity, including evidence from existing life-cycle assessments, that economic activity shall be considered to significantly harm:

(a) climate change mitigation, where that activity leads to significant greenhouse gas emissions;

(b) climate change adaptation, where that activity leads to an increased adverse impact of the current climate and the expected future climate, on the activity itself or on people, nature or assets;

(c) the sustainable use and protection of water and marine resources, where that activity is detrimental:

(i) to the good status or the good ecological potential of bodies of water, including surface water and groundwater; or

(ii) to the good environmental status of marine waters;

(d) the circular economy, including waste prevention and recycling, where:

(i) that activity leads to significant inefficiencies in the use of materials or in the direct or indirect use of natural resources such as non-renewable energy sources, raw materials, water and land at one or more stages of the life cycle of products, including in terms of durability, reparability, upgradability, reusability or recyclability of products;

(ii) that activity leads to a significant increase in the generation, incineration or disposal of waste, with the exception of the incineration of non-recyclable hazardous waste; or

(iii) the long-term disposal of waste may cause significant and long-term harm to the environment;

(e) pollution prevention and control, where that activity leads to a significant increase in the emissions of pollutants into air, water or land, as compared with the situation before the activity started; or

(f) the protection and restoration of biodiversity and ecosystems, where that activity is:

(i) significantly detrimental to the good condition and resilience of ecosystems; or

(ii) detrimental to the conservation status of habitats and species, including those of Union interest.

2. When assessing an economic activity against the criteria set out in paragraph 1, both the environmental impact of the activity itself and the environmental impact of the products and services provided by that activity throughout their life cycle shall be taken into account, in particular by considering the production, use and end of life of those products and services.

Based on this description, the following control questions are used for evaluation:

"Is there a high risk that this project or program (taking the life cycle into account) [...]

a) (Climate Change Mitigation) [...] leads to additional greenhouse gas emissions?

b) (Climate Change Adaptation) [...] leads to adverse impacts of climate change on people, nature or assets?

c) (Water & Marine Resources) [...] harms the good environmental status of water bodies or marine waters?

d) (Circular Economy) [...] leads to inefficiencies in the use of materials and natural resources, increases the generation, incineration or disposal of waste or the long-term disposal of waste causes harm to the environment?

e) (Pollution Prevention and Control) [...] leads to an increase in the emission of pollutants into water, land or air?

f) (Biodiversity and Ecosystems) [...] harms the good condition of biodiversity and ecosystems (including the conservation status of habitats and species)?"

Risk assessment

Applying the definition for high risk and the control questions, a risk assessment was conducted. The full assessment for all 25 projects and programs can be found in the Annex (6.1), while the following table 2-1 summarizes the results for all 10 projects that have a "low risk" (no "high risk" was identified).

Most identified issues are caused by the small likelihood of increasing waste production or additional harmful substances (7 out of 10 projects). In many projects it is also unclear whether there are problems at all (e.g., phosphate recovery from sewage) or the occurrence of damages is highly depended on the specific implementation (e.g., for buildings).

The next step is to assess which of these projects and programs can be associated with specific DNSH criteria in the EU Taxonomy.

table 2-1: results of the risk assessment with the help of control questions related to article 17
(CM: Climate Change Mitigation; CE: Transition to Circular Economy; PP: Pollution Prevention and Control; BE: Protection of Biodiversity and Ecosystems)

Project	Obj.	risk	System for comparison	Reasoning
State funding of broadband	CM	low	no additional fiber optic connections	a) higher likelihood for slightly lower waste prevention b) small likelihood for significant damage to ecosystems
Zero Emission - Green Hydrogen, Lampoldshausen	CM	low	provision of conventional liquid fuels and/or batteries	a) small likelihood for significant damage to water bodies b) higher likelihood for significant damage to ecosystems
INPUT - Intelligent network link of parking garages and underground garages	CM	low	parking lots and garages without grid integration	a) higher likelihood for slightly lower waste prevention
Solar battery storage systems	CM	low	pumped hydroelectric storage	a) higher likelihood for slightly lower waste prevention b) small likelihood of significant pollution
Notably energy-efficient new buildings in the public building construction	CM	low	stock of existing public buildings	a) higher likelihood for slightly lower climate resilience b) higher likelihood for some damage to ecosystems
Notably energy-efficient restructuring measures in the public building construction	CM	low	stock of existing public buildings	a) higher likelihood for slightly lower climate resilience
Phosphorus recovery from sewage sludge	CE	low	phosphate mining	a) higher likelihood of slightly higher GHG emissions b) higher likelihood of slightly higher pollution

Project	Obj.	risk	System for comparison	Reasoning
Procurement of Hybrid vehicles / Charging stations	PP	low	conventional vehicles for public services	a) higher probability for slightly lower waste prevention
E-Mobility in the car pool of BW police - purchase of motorcycle with electric motor	PP	low	conventional vehicles for public services	a) higher probability for slightly lower waste prevention
Exemplary regions for organic food	BE	low	conventional farming	a) higher likelihood of slightly higher GHG emissions

2.3 Step 2: Applicability of EU Taxonomy

Out of 10 projects with a "low risk" attribution, 7 projects are also covered by the Taxonomy. The following table 2-2 lists all projects, their applicability and the objectives covered by either generic or specific DNSH criteria.

table 2-2: applicability of projects from risk assessment for EU Taxonomy
(CM: Climate Change Mitigation; CE: Transition to Circular Economy; PP: Pollution Prevention and Control; BE: Protection of Biodiversity and Ecosystems)

Project	Applicability	Activity in Taxonomy	Objectives with DNSH criteria (generic or specific)
State funding of broadband	*not part of taxonomy*	*no activity*	*no activity*
Zero Emission - Green Hydrogen, Lampoldshausen	*not part of taxonomy*	*no activity*	*no activity*
INPUT - Intelligent network link of parking garages and underground garages	yes	4.9 - Transmission and distribution of electricity	CA, CE, PP, BE
Solar battery storage systems	yes	4.10 - Storage of electricity	CA, CE, BE
Notably energy-efficient new buildings in the public building construction	yes	7.1 - Construction of new buildings	CA, WM, CE, PP, BE
Notably energy-efficient restructuring measures in the public building construction	yes	7.2 - Renovation of existing buildings	CA, WM, CE, PP

Project	Applicability	Activity in Taxonomy	Objectives with DNSH criteria (generic or specific)
Phosphorus recovery from sewage sludge	yes, without contribution[1]	5.9 - Material recovery from non-hazardous waste	CA, BE
Procurement of Hybrid vehicles / Charging stations	yes, without contribution[1]	6.5 - Transport by motorbikes, passenger cars and light commercial vehicles	CM, CA, CE
E-Mobility in the car pool of BW police - purchase of motorcycle with electric motor	yes, without contribution[1]	6.5 - Transport by motorbikes, passenger cars and light commercial vehicles	CM, CA, CE
Exemplary regions for organic food	*not part of taxonomy*	*no activity*	*no activity*

[1] There are currently only full data sheets for substantial contributions to CM and CA.

2.4 Step 3: Evaluation of DNSH criteria

With the exception of project No. 24 (Phosphorus recovery from sewage sludge according to activity 5.9), each activity can be tested against at least one specific criterion. The next step is therefore to identify whether any of these criteria require efforts beyond existing laws or regulation in Germany. We distinguish three types of DNSH criteria for that purpose:

- (1) Specific technical criteria in the context of activities
- (2) Specific regulatory criteria in the context of activities
- (3) Generic criteria requiring project-specific assessments

Criteria of type (1) are assessed individually as shown in table 2-3.

For criteria of type (2), a "minimal risk" is assumed. All projects in the risk assessment adhere to national regulations and it is very likely that these regulations are in accordance with the minimal European requirements described in the Taxonomy.

For criteria of type (3), individual risk assessments would be necessary to fully comply with the taxonomy. This is not possible due to lack of data and methodology. Instead, we distinguish three additional cases. First, "minimal risk" is assigned, if the original risk assessment from step 1 did not reveal a higher probability or a higher damage potential. Secondly, we assign "significant harm cannot be excluded" if these objectives were indeed considered to have "low risk" in the original assessment. Thirdly, "no risk" is assigned if the generic requirements of the Taxonomy are in line with German law and regulation.

As a result (see table 2-3), only 2 out of a total of 25 projects in the Green Bond can be associated with a noteworthy risk (other than "low" or "minimal") of DNSH violations. All identified issues refer to buildings and the necessity of providing individual assessments to ensure that climate risks do not materialize.

table 2-3: DNSH evaluation of projects from risk assessment that are applicable to the Taxonomy Regulation
(CM: Climate Change Mitigation; CE: Transition to Circular Economy; PP: Pollution Prevention and Control; BE: Protection of Biodiversity and Ecosystems)

Project	Evaluation of DNSH	Specific DNSH evaluation
INPUT - Intelligent network link of parking garages and underground garages	*CA: minimal risk* *CE: minimal risk* *BE: minimal risk*	*none*
Solar battery storage systems	*CA: minimal risk* *CE: minimal risk* *BE: minimal risk*	*none*
Notably energy-efficient new buildings in the public building construction	CA: significant harm cannot be excluded WM: minimal risk CE: minimal risk BE: no risk	WM: it is unlikely that public buildings exceed water usage in accordance with Appendix E of Taxonomy CE: required rates in accordance with national targets/regulations (e.g., KrWG); only requirements for backfilling poses a very small risk BE: it can be safely assumed that no public building in Germany is constructed on one of the specifically defined lands in the EU Taxonomy; significant harm from the more generic criteria can be excluded due to national compliance with Directive 2011/92/EU
Notably energy-efficient restructuring measures in the public building construction	CA: significant harm cannot be excluded WM: minimal risk CE: minimal risk	WM: it is unlikely that public buildings exceed water usage in accordance with Appendix E of Taxonomy CE: required rates in accordance with national targets/regulations (e.g., KrWG); only requirements for backfilling poses a very small risk
Phosphorus recovery from sewage sludge	*CA: minimal risk* *BE: minimal risk*	*none*
Procurement of Hybrid vehicles / Charging stations	CM: minimal risk CA: minimal risk CE: no risk	CM: it is very likely that all vehicles are below the thresholds of the Taxonomy CE: all vehicles purchased should be in line with Annex I of DIRECTIVE 2005/64/EC (as required by Taxonomy)
E-Mobility in the car pool of BW police - purchase of motorcycle with electric motor	CM: minimal risk CA: minimal risk CE: no risk	CM: it is very likely that all vehicles are below the thresholds of the Taxonomy CE: all vehicles purchased should be in line with Annex I of DIRECTIVE 2005/64/EC (as required by Taxonomy)

In the next and final step of the validation, it is evaluated whether additional hazard-indicators are necessary to manage these risks.

2.5 Step 4: Identification of Hazard-indicators

Hazards in the impact report indicate the risk for target conflicts and in particular violations of the DNSH criteria of the EU taxonomy. They are developed if individual projects in the Green Bond can be associated with quantifiable contributions to one of the objectives, while significant harm to other objectives is likely or cannot be ruled out.

The validation of the issuer's DNSH assessment in the report at hand identified two projects where this type of risks can occur. Both projects refer to construction activities in the EU Taxonomy (7.1 - Construction of new buildings, 7.2 - Renovation of existing buildings). The only objective potentially affected is "Climate Change Adaptation". However, no specific DNSH criteria apply here but only the more generic criteria set out in Appendix A in Annex I of the Taxonomy Regulation.

The most current climate impact assessment for Germany (UBA, 2021) identifies three main climate risks related to construction activities and buildings. By the middle of the century and under pessimistic rather than optimistic conditions, there is a high risk for "damage to buildings due to river flooding", a high risk for more "urban climate / heat islands" and a high risk for worse "indoor climate". In addition, the risks of "damage to buildings due to heavy rain" and damage to "vegetation in settlements" is considered medium under the same scenario. Even when considering adaptation measures under the Adaptation Action Plan III (APA III) (UBA, 2021, p. 70), these high and medium risks can only be reduced to "medium-high" or "medium".

The State of Baden-Württemberg (as issuer) is aware of these (and other building-related) risks and has not only developed a climate-adaptation strategy but also monitors its progress (Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg & LUBW Landesanstalt für Umwelt Baden-Württemberg, 2021; Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg & LUBW Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg, 2015). In our opinion, these measures ensure (at least for now) that no additional climate risks are caused by these projects that constitute a "significant harm".

2.6 Summary of DNSH risks

We concur with the assessment of the issuer that none of the projects in the Green Bond pose a high or even medium risk for significant damage to any of the objectives. However, low or minimal risks could be identified for 10 out of 25 projects, of which 2 projects require full compliance with additional requirements in order to avoid harm. Both the construction and renovation of energy-efficient public buildings should be continued to be monitored in light of future climate risks to these buildings and the people working there.

3 Methods and Data

The following sections first present the methodology (indicator classification, robustness criteria, adaptation of ICMA framework), followed by a description of the selection and quantification of indicators in each of the six environmental objectives.

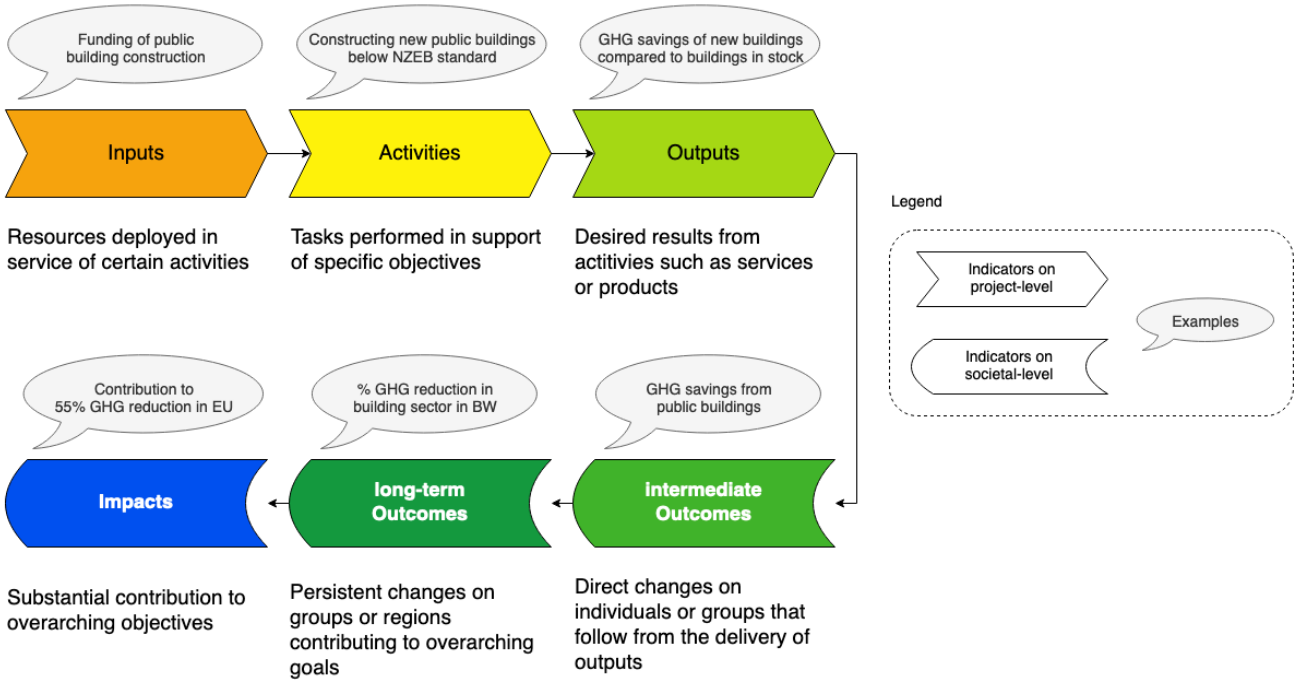
3.1 Methodology

Indicator Quality

The impact assessment at hand not only identifies and selects key performance indicators of the projects financed, but also qualifies them in relation to their societal or ecological relevance. Any quantifiable metric can be assessed in its ability to contribute to targets or to measure success.

We apply a theory-of-change (ToC) logic for that purpose which is in line with other assessments by the authors (Teubler, 2021) as well as current practices for SDG mapping (Dangelmaier, 2019). At its core, a ToC allows the distinction of different types of indicators depending on their position on a cause-effect chain. The following figure 3-1 shows our terminology and examples for them.

figure 3-1: terminology and logic for indicator quality in Green Bond Baden-Württemberg (own compilation based on Teubler, 2022)



Any project, program or measure in the Green Bond can achieve every type of indicator quality (one project can have more than one indicator). However, providing evidence for changes on a societal level and tracking these changes back to financing is very difficult. In most cases, inputs and activities are the only indicators that can be reported without the use of models and assumptions on the additionality of these measures. As a rule of thumb, data and method requirements increase with higher indicator quality (up to a point where most projects cannot be robustly related to societal outcomes).

In addition, the Green Bond BW is unique in the way that it aims to contribute to all six environmental objectives of the EU Taxonomy regulation while also adhering to the regulation's do-no-significant-harm criteria. This is a potential for target-conflicts that the methodology needs to address. We therefore introduce two additional types of indicators that should be reported if these target conflicts are likely: hazard-indicators and rebound-indicators. Both are measures of probability and damage, intended to be control variables when re-financing green projects. Hazards indicate the risk for significant-harm to the five other objectives and rebounds the compensation or even over-compensation of target contribution. An example for such a direct rebound would be the financing of energy-efficiency measures in companies that in turn lead to additional energy use from expanding the economic activity.

All indicators are color-coded and classified from A to G based on the logic of European energy-efficiency classifications (see table 3-1). In theory, indicators could also measure and track impacts which represent the overarching goals of the intervention. We did not include the possibility in the table shown here. If needed, such an indicator could be classified as A+, but we currently see no option how the impact assessment of a Green Bond could provide evidence for that.

table 3-1: color-coded indicator quality for indicators in the report at hand

Color Code	Indicator Quality	Interpretation for Reader
long-term outcomes	A	best-needed
intermediate outcomes	B	best-in-class
outputs	C	best practice
activities	D	high standard
inputs	E	minimum requirement
hazards	F	risks for DNSH
rebounds	G	risks for lower target contribution

Criteria for Robustness of Reporting

Each reported value depends on the robustness of the input data for indicator quantification. We differentiate five types of robustness ranging from 1 (best) to 5 (lowest) as shown in table 3-2. The main criterion is the necessity of calculation or models (robustness of 2, 3 or 4) and the availability of primary data (robustness of 1 or 2). Primary data in this context are actual reported values (e.g., in monitoring reports), official statistics as well as any direct data input by the issuer (e.g., eligible expenditures from the State's budget). Secondary data mainly consists of scientific findings and reports as well as press releases by State ministries and agencies. Auxiliary variables are data that are needed to convert or estimate results. They can be of high quality (e.g., global warming potentials in IPCC reports) but are independent of the systems assessed in each category. The final and lowest robustness is attributed to data that required calculation by 3rd parties but cannot be replicated due to lack of data or reporting on the method used.

Most indicators of high quality are expected to show a lower robustness, because they are usually not measured directly and require the use of models and additional secondary data. On the other hand, most low-

quality indicators usually exhibit a high robustness. Only few data points and calculations are needed or they are even directly part of the underlying framework (such as agreed funding in a regulation).

table 3-2: robustness criteria for data collection and quantification

Robustness	Criteria	Examples
1	primary data (directly reported or monitored)	number of approved grants for broadband expansion
2	directly calculated from primary data	energy use of buildings based on energy demand per floor area and year
3	calculated with the help of secondary data, auxiliary variables, share of financing assumptions	GHG savings from direct input on the energy demand of buildings before and after renovation
4	estimated on the basis of models or relations that simplify the cause-effect-relationships	promoted organic farming area based on funding per hectare in a regulation
5	results from 3rd party reporting without the possibility for validation	number of families benefiting from funding for agroforestry projects

Adaptation of ICMA reporting template

We use the templates provided by the International Capital Market Association (ICMA) as a basis for our own reporting (ICMA, 2021) but adapted them to the needs of a Green Bond issued by a federal State in Germany. Apart from providing information on the quality of indicators, we set-up the following conventions.

In our first convention, we assume that the eligibility for Green Bonds is 100% in all cases, as corroborated by a SPO and the issuer's framework (see summary).

In our second convention, we omit the information on the lifetime of projects. All parts of the impact reporting refer to the expenditures in the State's budget for one year. Some projects (usually state programs) exceed the lifetime of one year and some related systems are anticipated to show benefits well beyond the scope of State financing. In addition, not all funds in the State's yearly expenditure cover direct investments or costs from the same budget year but can also include allocations from previous budget years (as approved grants could be funded later on). We think that providing a value for the project lifetime would obscure these effects rather than increase transparency.

Thirdly, all effects are reported on an annual basis. The reason for that is partially based on the reasoning for our second convention (omittance of project lifetime). However, reporting annual effects also allows to accumulate effects over several bonds later on in the project.

Our fourth convention is an extension of the reporting template. We distinguish between "full effects" and "financed" effects. Not all established full effects can also be attributed to financed effects and vice versa. For the most part though, financed effects are a direct result from the "share of financing" provided in the results tables in the annex.

Our final convention relates to the reporting of total values. Here, only the number of projects/measures or funding (input-indicators with quality E) is aggregated because most of the indicators are not compatible or summable.

3.2 Climate Change Mitigation

Indicators for 8 projects that contribute to climate change mitigation could be identified, qualified and quantified. The following sections describe what data and methods were used to achieve this goal.

For some of the projects, savings in greenhouse gas (GHG) emissions could be estimated as an indicator for the contribution to climate protection goals. In each of these cases, the global warming potential over 100 years (GWP 100a) was used as a metric. The GWP is the standard for calculating GHG effects and expressed in kg of CO_2-equivalents. The reports by the International Panel on Climate Change (IPCC) are the main source for the corresponding GWP factors for greenhouse gases.

Broadband expansion

The issuer's framework presumes a positive causation between high-speed (50 Mbit/s and more) internet access of entities (public services, companies, households) and a reduction in greenhouse gas emissions. This is the case, when digital options either replace high-carbon activities (e.g., work-related travel, commuting, live-shopping) or their indirect GHG emission benefits overcompensate the direct energy-related emissions for their service (e.g., from additive manufacturing, online-meetings). However, there is not sufficient data and no sufficient methodology (both from the issuer and scientific literature) to actually calculate these GHG effects. Three other indicators were identified instead.

Firstly (1), the overall annual approvals for broadband grants by the State of BW is reported as an input-indicator (E). This data (492 approvals from both the State's and federal promotion program) was directly provided by the responsible ministry.

Secondly (2), the amount of additional broadband connections is reported as an activity-indicator (D). According to information provided by the interior ministry in BW, 37,442 such connections were provisionally approved in 2020 from federal promotion (EUR 354m) alone. By using these values as indication for the overall effect, it can be estimated that ca. 46,000 connections could have been realized, of which 7,000 can be directly attributed to the Green Bond.

Thirdly (3), an overall increase in broadband access can be, at least partially, accredited to the State's funding. According to national reports from the "Breitbandatlas", the share of high-speed access with 50 Mbit/s and more increased in rural areas by 6.3% between 2019 and 2020 (BMVI, 2020, 2021). Although this is not a direct contribution to climate change mitigation (therefore no qualified indicator), socio-economic benefits are a likely outcome of this achievement.

The following table 3-3 lists the result and evaluates the robustness of the reporting.

table 3-3: results for the project "State funding of broadband (No. 6)"

indicator	quality	full effect	financed effect	robustness
additional 50 Mbit access in rural areas (households)	other	+ 6.4%	not available	1

additional fiber optic connections	D	7,500	1,804	3
approvals for broadband grants	E	348	384	1

H_2 production

The "zero emission" project (DLR, 2020) describes a research facility for the production and use of green hydrogen coordinated by the DLR. The main component, a 2MW electrolyzer, is planned to produce 50-80 tonnes of liquid hydrogen per year. Liquid hydrogen has many applications for climate change mitigation such as substituting fossil fuels or converting excess renewable energy into energy storage.

Because the plant itself is currently under construction (finished by end of 2022), most of the 16 million euro of State funding is attributed after 2020 and these effects cannot be estimated at the moment.

The following table 3-4 shows the reported input-indicator of plants constructed (E) and activity-indicator of storage capacity added (D) as of 2020 (robustness of 1 under assumed technical capacity).

table 3-4: results for the project "H_2 production, Lampoldshausen (No. 7)"

indicator	quality	full effect	financed effect	robustness
(future) H2 capacity added	D	not finished	0.2 MW	1
future plants funded	E	not finished	1	1

Intelligent garages

The projects INPUT and INPUT 2.0 provide state funding (up 40% of the costs or EUR 500,000 per project) for charging stations and intelligent grid connections in parking lots and parking garages. These systems are intended to charge electric vehicles but also have the goal of avoiding high net loads in the electric grid. As such, they have the potential to reduce the necessity of energy production or to provide renewable energy for electric cars, thus reducing the GHG emissions. However, there is currently not sufficient data to estimate these effects.

An input-indicator (E) that is reported is therefore the number of projects funded in 2020 (see table 3-5).

table 3-5: results for the project "INPUT: Intelligent parking & underground garages (No. 20)"

indicator	quality	full effect	financed effect	robustness
projects funded	E	11	4	1

Solar battery storage systems

The State's funding program for grid-serving photovoltaic (PV) storage systems ("netzdienliche PV-Speicher") incentivizes the installation of battery storage capacity alongside photovoltaic systems. This results in additional renewable energy production while reducing the necessity for additional electricity during peak hours at the same time. It is likely that this measure contributes to climate change mitigation. Unfortunately,

no current data on the success of the program is available, which is why reported effects from 2018 and 2019 are used for estimations.

Overall, an additional PV power of 50 MW_P (not directly funded) and 35 MWh of battery capacity could be realized within the first funding period between 2018 and 2019. Using the results in the monitoring report and the funding of EUR 9.5m from this period as a reference (ISEA & RTWH Aachen, 2021), the following effects can be estimated for the year 2020.

Firstly (1), it is estimated that eligible funds of 3.8 million euro represent the input-indicator (E) of approximately 800 additional approved applications (compared to 2,000 per year overall[9]).

Secondly (2), the funding incentivizes the installation of additional renewable energy capacity of 25 MW_P (in reference to 50 MW_P for EUR 9.5m over two years), although this indirect activity-indicator (D) cannot be directly attributed to the financing (the aim of the project was to fund small battery installations).

Thirdly (3), an additional renewable storage capacity of 17.5 MWh (full effect) or 3.7 MWh (financed) can be reported as output-indicator (C). This estimate is based on the assumption that grants of EUR 9.5m provided 35 MWh capacity in the first reporting period and that EUR 45m out of the additional private investments of EUR 120m directly benefited the installation of batteries .

The following table 3-6 reports these indicators together with their quality and robustness.

table 3-6: results for the project "Solar Battery Storage Systems (No 21)"

indicator	quality	full effect	financed effect	robustness
renewable storage capacity added	C	17,5 MWh	3.7 MWh	4
renewable energy capacity added	D	25 MW_P	not applicable	4
approved funding applications	E	2,000	800	4

Energy efficiency in companies

The State's funding for "Regional centers of excellence for energy efficiency" helps companies with improving their energy efficiency. Assuming that this resulted in actual energy-savings despite potential rebound effects, this project is likely to induce GHG savings. As this data on company level was not available, these effects cannot be estimated at the moment. The directly reported data by the issuer (primary data) still enabled the reporting of the following indicators.

Firstly (1), the input-indicator (E) "number of offers for consultation" is reported as a measure for how many companies were successfully contacted. 1,464 of these offers can be attributed to 2020.

Secondly (2), the activity-indicator (D) "number of energy consultations in companies" is reported as a measure for successful offers. 234 of these consultations can be attributed to 2020.

[9] Based on 4,000 approved applications for EUR 9.5m over 2 years.

Thirdly (3), the amount of energy efficiency measures is counted as an output-indicator (C). With a financing share of 100%, 82 of these measures were conducted in 2020.

The following table 3-7 lists all indicators and evaluates their robustness.

table 3-7: results for the project "Regional centers of excellence for energy efficiency (No 22)"

indicator	quality	full effect	financed effect	robustness
energy efficiency measures in companies	C	82	82	1
energy consultations in companies	D	234	234	1
number of offers for consultation	E	1,464	1,464	1

Energy efficiency in new public buildings

State funding for new public buildings (government and administrative buildings, universities and clinics) can be associated with climate change mitigation, because these buildings are required to be at least 20% below the NZEB standard ("nearly zero emission buildings"). Under the assumption that these buildings replace existing public buildings (at least in the long run), net energy savings and therefore net GHG emissions savings can be attributed to their construction. A model was developed for the purpose of estimating these effects aligned with best-practices for the carbon accounting of building use and based on the issuer's data.

For the reporting (and usage) of the financial share, the estimated total costs of the measures were drawn from the State's budget for 2020.

The issuer provided the authors with data on each of the 15 buildings funded in 2020. This data consists of information on the location, the type of the building, the net floor area and useable space, the heating system(s) and the annual primary energy demand in accordance with current regulation (Q_P in kWh / m²). The primary energy demand of a building consists of both electricity and heat demand of the building itself, but is also a result of the so-called primary-energy-factor (PEF) that describes the amount of energy that is lost between energy production and consumption. The PEF can be below 1 in regard to fossil fuels (e.g., from a wood pellet heater), which in turn can lead to very low energy demands for either or both heat and electricity. From this data alone it is therefore not possible to directly quantify the actual heat demand and compare it to the average heat demand of public buildings in the State. A simplified model was developed instead, that applies the following conventions:

1 The primary energy demand divided by the PEF for the heating energy carrier equals the heat demand of the building. PEFs below 1 are considered with a PEF of 1.

2 In case of several heat systems, the system with the highest GHG intensity was selected as the only heating system of the building.

3 All unspecified heating systems are defined as gas heating systems (one case).

4 Close heat is treated as district heat for purposes of GHG emission intensity.

Conventions (1) and (2) result in an estimated heat demand that is likely higher than the actual heat demand of the buildings, because electricity is not accounted for at all. Conventions (3) and (4) ensure that filling data gaps results in higher GHG emissions. Overall, the conservative approach applied in the model ensures that the resulting GHG savings are not overestimated.

Data for reference buildings is directly drawn from the State's current energy report (Ministerium für Finanzen Baden-Württemberg, 2020). The data therein refers to the year 2019 but includes information on the heat demand, electricity demand and GHG emissions from previous years (including 1990). This report directly contains information on the heating standard (in kWh/m²) as well as the most relevant GHG emission intensities for electricity (for buildings), gas, oil and district heating. The data in this report was also used to directly calculate the GHG emission factors for buildings up to 2019 and buildings up to 1990. The average GHG emission intensity for biomass could not be directly found in the State's energy report. Instead, the recommended emission factor for wood pellets in the current DGNB[10] framework was used (DGNB, 2020).

The primary energy factors were drawn from the current GEG regulation (Annex 4 as well as §22 Abs.1) for all energy carriers except district heating (Gesetz zur Einsparung von Energie und zur Nutzung erneuerbarer Energien zur Wärme- und Kälteerzeugung in Gebäuden* (Gebäudeenergiegesetz - GEG), 2020). The latter is specific to the plant(s) at a certain location and was directly drawn from a current list on links for so-called f_P - certificates that is available for all German cities (AGFW, 2021).

For calculating the GHG emissions of all systems (new buildings in the bond, current (2019) buildings in the State as well as buildings in 1990), the following formulars were used.

$$GHG_{annual-avoided,total} = GHG_{aa,r} - GHG_{a-a,p} \quad (1)$$

with

$GHG_{annual\text{-}avoided,\ total}$: Greenhouse gas emissions avoided in [t CO_2-equivalents/a]
$GHG_{aa,r}$: GHG emissions avoided annually for the reference system in [t CO_2-equivalents/a]
$GHG_{aa,p}$: GHG emissions avoided annually for the new buildings in [CO_2-equivalents/a]

$$GHG_{aa,i} = fed_i \times A \times ghg_i \quad (2)$$

with

$GHG_{aa,i}$: GHG emission for each system i in [t CO_2-equivalents/a]
fed_i: specific final energy demand (heat) for each system in [kWh/m²]
A_i: net area for each system in [m²]
ghg_i : GHG emission intensity for each energy system i in [g CO_2-equivalents/kWh]
i : 2020 (buildings in bond), 2019 (reference building), 1990 (building stock in 1990)

$$\text{delta} - GHG_{1990} = 1 - \frac{GHG_{aa,2020}}{GHG_{aa,1990}} \quad (3)$$

with

[10] German Sustainable Building Council (Deutsche Gesellschaft für Nachhaltiges Bauen)

delta - GHG_{1990} : GHG savings for new buildings compared to 1990

As a result, the following indicators could be reported with financial shares directly drawn from the total costs of the buildings in the State's 2020 budget.

Firstly (1), the number of buildings funded is directly reported as input-indicator (E) with 15 buildings in 2020 (of which 0,9 buildings are financed in direct comparison).

Secondly (2), the net floor area added to the building stock is reported as activity-indicator (D) with circa 94,000 m² overall and 5,800 m² financed.

Thirdly (3), the avoided annual GHG savings are estimated as output-indicator (C) based on the model described in the section at hand. The buildings assessed avoid circa 3,900 tonnes CO_2-equivalents per year as a full effect and 240 tonnes directly from the financing in 2020.

Fourthly (4), the GHG emissions of the new buildings are compared to buildings of the same size in 1990 as an outcome-indicator (B). Compared with the heating standards and systems in 1990, the GHG emissions in these buildings are 89% lower as a full effect and 6% lower directly from financing.

The following table 3-8 lists all indicators and evaluates the robustness of the results.

table 3-8: results for the project "Notably energy-efficient new buildings in the public building construction (No 27)"

indicator	quality	full effect	financed effect	robustness
GHG emissions compared to 1990	B	- 89%	- 6	4
GHG emissions avoided per year	C	3,873 t CO2e	240 t CO2e	4
net floor area added	D	94,058 m²	5,835 m²	1
new buildings funded	E	15	0,9	1

Energy efficiency from refurbished public buildings

Refurbishments and renovations from funding in the bond are not only providing benefits in terms of energy savings and GHG emission reductions (e.g., social or work-related benefits). However, these effects are the most likely to contribute to the environmental objective of climate change mitigation. The total costs of all measures are reported in the State's budget for 2020 and used to calculate the share of financing for all indicators.

For 2020, three administrative buildings were assessed and their GHG savings estimated on the basis of issuer data. This data consists of information on the location, the type of the building, the net floor area and useable space, the heating system(s) as well as the estimated final heat demand before and after implementing the renovation. Similar to the model for new buildings (see previous section) this data can be used to estimate potential GHG savings per year and savings compared to buildings from 1990. However, the data here allows for a direct comparison of heat demands, thus improving the robustness of the results. Data sources used other than direct building data are the State's energy report (Ministerium für Finanzen Baden-Württemberg, 2020)

and the f_P - certificates for Karlsruhe and Rhein-Neckar GmbH (AGFW, 2021). All necessary data, including GHG emission intensities and PEFs for district heating, are therefore drawn directly from primary data.

Based on the formulas in the previous section, the following indicators could be directly reported or calculated.

Firstly (1), the number of buildings funded is directly reported as input-indicator (E) with 3 buildings in 2020 (financing represents 0.3 of these buildings).

Secondly (2), the energy-efficient net floor area added to the building stock is reported as activity-indicator (D) with circa 22,000 m² as a full effect compared to 2,000 m² financed.

Thirdly (3), the avoided annual GHG savings are estimated as output-indicator (C) based on the direct relationship between energy use and GHG emissions. The buildings assessed avoid circa 200 tonnes CO_2-equivalents per year as a full effect and 20 tonnes directly from the financing in 2020.

Fourthly (4), the GHG emissions of the new buildings are compared to buildings of the same size in 1990 as an outcome-indicator (B). Compared with the heating standards and systems in 1990, the GHG emissions in these buildings are 86% lower as a full effect and 8% lower directly from financing.

The following table 3-9 lists all indicators and evaluates the robustness of the results.

table 3-9: results for the project "Notably energy-efficient restructuring measures in the public building construction (No 28)"

indicator	quality	full effect	financed effect	robustness
GHG emissions compared to 1990	B	- 86%	- 8%	4
GHG emissions avoided per year	C	199 t CO2e	19 t CO2e	4
energy-efficient net floor area added	D	22,166 m²	2,079 m²	1
new buildings funded	E	3	0.3	1

Cycling Culture Initiative

The funding for the State's cycling culture initiative sets itself targets for the avoidance of GHG emissions. Although it is likely that this project results indeed in a lower motorized mobility (e.g., by replacing car-km) for the participants and thus lower GHG emissions, the overall effect has not been monitored yet.

The current report therefore includes one input-indicator (E) on the number of funded communities with the option of estimating GHG effects later on. The following table 3-10 lists the results and evaluates the robustness of this indicator (we assume a financial share of 100%).

table 3-10: results for the project "Cycling Culture Initiative (No 38)"

indicator	quality	full effect	financed effect	robustness
communities funded	E	12	12	1

3.3 Climate Change Adaptation

Indicators for two projects could be identified and quantified: development of climate-resilient forests and funding for the "Karlsruhe Transformation Center for Sustainable Futures and Cultural Change".

Development of climate-resilient forests and/or (re-)afforestation

According to the issuer, 40% of the funding for this program comes out of the State's budget and overall, 515 ha of forest have either been protected or re- and afforested. Ideally, information on the achieved land-use change (e.g., from farming land to forest) would be available as well, because it would indicate additional benefits for climate change adaptation. Nonetheless, these figures allow to estimate two minimal benefits: total carbon storage and annually absorbed carbon.

The total carbon stored can be based on the "Global Forrest Resource Assessment" for Germany (FAO, 2020). The most current data for Germany refers to 2012 and reports a carbon stock for biomass in forests (both above and below ground) of 99.54 tonnes of carbon per hectare (t C/ha).

The annually absorbed carbon can be based on the national GHG inventory for Germany. In 2018, remaining forest land in Germany absorbs an additional 1.16 t of carbon per hectare and year. By comparison, land conversion values range from 6.13 t C/(ha*a) for farmland to forest up to 16.22 t C/(ha*a) for grassland conversion.

The following indicators could be directly reported or calculated from this information.

Firstly (1), the funding itself can be reported as an input-indicator (E). The directly financed EUR 0.84m in the Green Bond correspond to an overall funding of EUR 2.1m (at a share of financing of 40%).

Secondly (2), the size of the protected forest area can be reported as an activity-indicator (D). The reported value of 515 ha overall, corresponds to a direct financing of 206 ha.

Thirdly (3), the total carbon stored is reported as it describes the main output (C) of the projects. Although this value relates both to the past (if forest continues to exist) and the future (new forest persisting for a longer period of time), it can be reported as an annual effect. It is crucial though, that future impact reports do not report on the same area twice for reasons of double-counting.

Fourthly (4), the additional absorbed carbon can be reported as an intermediate outcome (B) on an annual basis. As shown above, it is assumed that the actual effects are higher when other land sources were converted for the purpose of afforestation.

The following table 3-11 lists the results and evaluates the robustness of these indicators (we assume a 40% share of financing).

table 3-11: results for the project " Development of climate-resilient forests and/or (re-)afforestation (No. 9)"

indicator	quality	full effect	financed effect	robustness
annually absorbed carbon (carbon sink)	B	597 t C/a	239 t C/a	3
stored carbon (biomass above and below ground) 5	C	51,263 t C	20,505 t C	3
promoted forest area	D	515 ha	206 ha	1
funding for forest-related measures	E	EUR 2.1m	EUR 0.8m	1

Real World Laboratories: Karlsruhe Transformation Center for Sustainable Futures and Cultural Change (No. 47)

This project relates to funding for a research unit. The annual expenditure of circa EUR 240,000 is fully attributed to that purpose (100% share of financing). Two indicators could be identified and quantified.

Firstly (1), the overall funding is reported as "funding for activity-based expenditures" for both "full effect" and "financed" annual effects (input-indicator with quality E).

Secondly (2), the number of publications in the year 2020 is reported as an activity-indicator (D). According to the institute's website (Piltz, 2021), 16 of these publications (mainly book and journal articles) were published in 2020.

The following table 3-12 lists the results and evaluates the robustness of the indicators (we assume a financial share of 100%).

table 3-12: results for the project " Karlsruhe Transformation Center for Sustainable Futures and Cultural Change (No 47)"

indicator	quality	full effect	financed effect	robustness
number of publications	D	16	16	1
funding for activity-based expenditures	E	EUR 0.24m	EUR 0.24m	1

3.4 Water & Marine Resources

For two projects (*Research Programme Network Water Research* and *Sewerage infrastructure Investments*) two indicator each could be identified, qualified and quantified.

Research Programme Network Water Research

The Baden-Württemberg Water Research Network comprises three interdisciplinary research networks (involving several Baden-Württemberg universities) . In addition, funding is provided for workshops and events to develop long-term perspectives for (A) material balance and water quality, (B) natural hazards and extreme events, (C) ecosystems functions and biodiversity, (D) governance of water and land use (Scherer, 2019). During the research program, a number of publications and 'toolboxes' between the two projects *EffectNet* and *CHARM* were published. Two indicators were selected with a financial share of 100%.

Firstly (1), the overall funding of circa EUR 680,000 is reported as "funding for activity-based expenditures" for both "full effect" and "financed" annual effects (input-indicator with quality E).

Secondly (2), the number of publications in the year 2020 is reported as an activity-indicator (D). According to the issuer, 87 of these publications were published in 2020.

The following table 3-13 lists the results and evaluates the robustness of the indicator.

table 3-13: results for the project "Research Programme Network Water Research (No. 45)"

indicator	quality	full effect	financed effect	robustness
number of publications	D	87	87	1
funding for activity-based expenditures	E	EUR 0.7m	EUR 0.7m	1

Sewerage Infrastructure Investments

The project relates to waste water management measures. It is currently not possible to further distinguish different types of these measures and attribute them to different types of objectives in this category. The two selected indicators are therefore restricted to the funding itself as well as the number of measures in 2020 (122 measures according to the issuer). All measures are funded with a financial share of 100%.

Firstly (1), the overall funding of circa EUR 32.1m is reported as "funding for waste-water management" for both "full effect" and "financed" annual effects (input-indicator with quality E).

Secondly (2), the number of measures in 2020 is reported as activity-indicator (D). According to the issuer, 122 of these measures were conducted in 2020.

The following table 3-14 lists the results and evaluates the robustness of the indicator.

table 3-14: results for the project "Sewerage Infrastructure Investments (No. 52)"

indicator	quality	full effect	financed effect	robustness
number of waste-water management measures	D	122	122	1
funding for waste-water management	E	EUR 32.7m	EUR 32.7m	1

3.5 Circular Economy

The indicators of two projects could be identified, qualified and quantified (circulation folders out of grass paper and phosphorus recovery from sewage sludge). The following section will explain the data and methods.

Circulation folders made of grass paper

For the project of providing office supplies for the regional council of Tübingen, one indicator was identified. The purchased paper products consist of grass paper and are likely to save water resources as well as GHG emissions compared to conventional paper products. Due to lack of data, only the direct funding of EUR 2,600 could be reported as the input-indicator (E) "public procurement of sustainable products". At a financial share of 100% (see table 3-15), the robustness of this indicator is defined as 1 (highest robustness).

table 3-15: results for the project "Circulation folders made of grass paper (No. 4)"

indicator	quality	full effect	financed effect	robustness
public procurement of sustainable products	E	EUR 0.003m	EUR 0.003m	1

Phosphorus recovery from sewage sludge

Four fertilizer recovery plants are currently under construction until the end of 2023. Based on the cost projections for three of these plants (circa EUR 17.9m per plant on average), a financial share of 0.3% can be estimated for the year 2020. In addition, the future output of these plants can be estimated using the same data and method (circa 358 tonnes of recovered phosphorous per annum and plant). Three indicators were selected and quantified accordingly.

Firstly, the current (2020) funding to plant construction is reported as an input-indicator (E). The expenditures of circa EUR 230,000 represent a financial share of circa 0.3% (calculation based on average for 3 plants).

Secondly, the number of plants under construction is reported as activity-indicator (D). The funding in 2020 represents 0.01 plants out of a total of 4 plants by the end of 2023.

Thirdly, the future amount of recovered phosphorous represents the output of all four projects. It is estimated that 1,434 tonnes of P will be recovered annually (t/a) as a full-effect (4.6 tonnes from funding in 2020).

The following table 3-16 lists all indicators and evaluates the robustness of the results.

table 3-16: results for the project "Phosphorus recovery from sewage sludge (No. 24)"

indicator	quality	full effect	financed effect	robustness
future potentials of recovered phosphorus 5	C	1,434 t/a	4.6 t/a	4
fertilizer recovery plants 5	D	4	0.01	4
funding for phosphorus recovery plant construction 5	E	EUR 71.7m	EUR 0.23m	4

3.6 Pollution Prevention

Indicators for three projects could be identified and quantified: Procurement of Hybrid Vehicles and charging stations, e-mobility in the carpool of the BW police and intelligent public transport in BW.

Procurement of Hybrid Vehicles / Charging stations

The procurement of hybrid and electric vehicles contributes to the goal of pollution prevention by avoiding air emissions associated with conventional vehicles. Emissions that are expected to be avoided (at least from direct combustion) are nitrogen oxide (NO_x), particular matter (PM), volatile hydrocarbons (HCs) and carbon monoxide (CO). The additional installation of charging stations enables these vehicles, but could also be used to charge up the private vehicles of employees by the State. In addition to pollution prevention, a positive benefit to climate change mitigation is expected as well (savings of circa 27 tonnes of CO_2 for 2020 according to

the issuer). All of these effects could be quantified if the available data allows for it. However, in light of the available data quality, we choose to estimate only the savings of nitrogen oxide for the time being. As a result, the following indicators were selected and quantified.

Firstly, the total funding is reported as "funding for clean mobility". The actual share of financing is not known, which is why a 100% share of financing is assumed for now (input-indicator E).

Secondly, the total number of vehicles as well as charging stations is reported as activity-indicator (D). As the latter is not known, we only account for the 20 vehicles reported by the issuer here.

Thirdly, the potential savings of nitrogen oxide is estimated and reported as output-indicator (C). We use the current regulatory thresholds for diesel and petrol vehicles as a standard for comparison (80 mg NOx/km and 60 mg NOx/km respectively according to ADAC (2021)). The procured vehicles on the other hand either have no direct NOx emissions (9 full electric vehicles and 1 hydrogen vehicle) or correspond to direct NOx emission of 10 mg/km (see also Winter et al. (2014), p. 121). In regard to the mileage per year, the results of a 2012 study for Stuttgart's vehicle fleet is used (circa 5,400 km/a from a sample of 66 Nissan Leaf according to Fraunhofer IAO & University of Stuttgart (2012), p. 24). As a result, at least 6 kg of NO_x emissions are expected to be avoided per year by these vehicles.

The following table 3-17 lists all indicators and evaluates the robustness of the results.

table 3-17: results for the project " Procurement of Hybrid Vehicles / Charging stations (No. 5)"

indicator	quality	full effect	financed effect	robustness
saving of nitrogen oxide emissions	C	6 kg NO_x	6 kg NO_x	4
number of procured vehicles and/or charging stations 6	D	20	20	3
funding for clean mobility	E	EUR 0.1m	EUR 0.1m	3

Intelligent public transport in Baden-Württemberg

According to the issuer, the project kicks off at the beginning of 2022, and first user data should be available by the end of 2022. Accordingly, a full effect (such as numbers of tickets sold or estimates for avoided car-km) cannot be determined yet. So far, only the input-indicator (E) "funding for clean transportation" is reported with a 100% share of financing assumed (see table 3-18).

table 3-18: results for the project "Intelligent public transport in Baden-Württemberg (No. 31)"

indicator	quality	full effect	financed effect	robustness
funding for clean mobility	E	EUR 1m	EUR 1m	1

E-Mobility in the carpool of BW police

The police of Baden-Württemberg plans to electrify its vehicle pool. Starting with the purchase of electric motorcycles, this contributes to the avoidance of air emissions and thus pollution prevention. Due to lack of data, only the potential savings of nitrogen oxide emissions are estimated as a direct effect (see also the previous

section on procuring hybrid and electric cars by the State). Three indicators were identified, selected and quantified in this category.

Firstly (1), the direct funding is reported as input-indicator (E) "funding for clean mobility" with circa EUR 12,000 and an assumed 100% share of financing.

Secondly (2), the number of funded vehicles is reported as activity-indicator (D). Only one of two motorcycles can be assessed here, which is why reporting is restricted to one motorcycle as well.

Thirdly (3), the savings or avoidance of nitrogen oxide emissions is estimated. Based on the difference between a EURO 5 motorcycle (petrol, 60 mg NOx/km) and an electric motorcycle (0 mg NOx/km), 60 mg NOx can be saved per km and year. The issuer reports 3,643 km/a here, which results in an output-indicator (C) of 0.2 kg NOx/a.

The following table 3-19 lists all indicators and evaluates the robustness of the results.

table 3-19: results for the project "E-Mobility in the carpool of BW police (No. 51)"

indicator	quality	full effect	financed effect	robustness
saving of nitrogen oxide emissions	C	0.2 kg NO_x/a	0.2 kg NO_x/a	3
number of procured vehicles and/or charging stations 6	D	1	1	3
funding for clean mobility	E	EUR 0.01m	EUR 0.01m	3

3.7 Biodiversity & Ecosystems

Indicators in eight projects could be identified, qualified and quantified. This category is the only one that contains projects with impacts outside of Germany (in particular the funding for agroforestry systems in Burundi). The following sections describe methods and data used for the indicators.

Development of agroforestry systems in Burundi

This project has several goals and different types of outcomes as well as stakeholders involved. In the context of the restoration or protection of ecosystems, agroforestry combines conventional farming products (here coffee) with schooling of farmers on organic farming as well as the plantation of fruits that provide additional ecosystem benefits (such as nutrition enrichment). The evaluation of desired effects is under way and might be reported in future impact assessments. So far, indicators selected in the report at hand focus on the farmers benefiting from the program instead. They are based on a project description by the Fairtrade cooperative Weltpartner (Weltpartner, 2022).

Firstly (1), expenditures of circa EUR 100,000 can be allocated to the budget year 2020 that represents about one third (33%) of the overall State's funding of EUR 300,000 over three and a half years. This input-indicator (E) is reported as "funding for organic farming".

Secondly (2), the number of small farming cooperatives is reported as activity-indicator (D) that are trained in the development of agroforestry systems on their plantations. 18 such cooperatives were schooled, of which one third (6) are directly financed in 2020.

Thirdly (3), the number of families are reported as output-indicator (C) that benefit from sales and marketing for coffee from organic farming. From the overall addressed 11,000 families, circa 3.600 families can be directly attributed to the Green Bond assessed in the report at hand.

The following table 3-20 lists the results and evaluates the robustness of the indicators (we assume a financial share of 33% out of a full State funding of EUR 300,000 over 3.5 years).

table 3-20: results for the project "Development of agroforestry systems in Burundi (No 3)"

indicator	quality	full effect	financed effect	robustness
families benefiting from organic coffee marketing	C	11,000	3,594	5
schooled small farming cooperatives	D	18	6	5
funding for organic farming	E	EUR 0.3m	EUR 0.1m	1

Subsidies for artisanal vineries

The State of Baden-Württemberg promotes wine production in steep-slope sites without the help of machinery. This organic farming process protects ecosystems and land resources. Two indicators can be identified and reported here based on the reported expenditure in 2020 and the amount of funding per hectare (EUR 3,000) defined in the associated administrative regulation (Ministerium für Ernährung, Ländlichen Raum und Verbraucherschutz Baden-Württemberg, 2017).

Firstly (1), the direct funding of EUR 810,000 for organic farming is reported as an input-indicator (E) with a 100% share of financing.

Secondly (2), the promoted eco-friendly or organically farmed area is reported as an output-indicator (C). Based on a promotion of EUR 3,000 per hectare, 270 hectares can be estimated and reported here.

The following table 3-21 lists the results and evaluates the robustness of the indicators.

table 3-21: results for the project " Subsidies for artisanal vineries (No. 11)"

indicator	quality	full effect	financed effect	robustness
promoted eco-friendly/organic area	C	270 ha	270 ha	4
funding for organic farming	E	EUR 0.8m	EUR 0.8m	1

Exemplary regions for organic food

This project provides funding for selected regions in the State of Baden-Württemberg. Its aim is to improve regional marketing, especially for organic food. The funding can refer to costs of a regional manager (for three to seven years), general operating costs as well as costs for the activation of the territory concerned (Ministerium für Ernährung, Ländlichen Raum und Verbraucherschutz Baden-Württemberg, 2018). Since

currently no data is available on the overall promoted area for organic farming (or the amount of food produced), the following two indicators were selected and quantified.

Firstly (1), the funding itself is reported as an input-indicator (E) on "funding for organic farming" with a financial share of 100%.

Secondly (2), the number of selected regions from 2018 (4) and 2019 (5) is reported as an (annual) activity-indicator (D) on the "number of promoted regions for organic food". As all grants directly relate to accounted and eligible costs, a financial share of 100% is assumed here as well.

The following table 3-22 lists the results and evaluates the robustness of the indicators.

table 3-22: results for the project "Exemplary regions for organic food (No. 12)"

indicator	quality	full effect	financed effect	robustness
number of promoted regions for organic food	D	9	9	5
funding for organic farming	E	EUR 0.6m	EUR 0.6m	1

Biotope mapping

The mapping of biotopes is considered to be a contribution to the protection of biodiversity and ecosystems. The following two indicators were selected and quantified at a 100% share of financing.

Firstly (1), the "funding for ecosystem monitoring" is directly reported as input-indicator (E) with EUR 2.9m in 2020.

Secondly (2), the overall number of new or updated biotopes is reported as activity-indicator (D). Using the reporting data itself (LUBW, 2022), the overall count of such biotopes sums up to 6,914 between the beginning and end of 2020.

The following table 3-23 lists the results and evaluates the robustness of the indicators.

table 3-23: results for the project "Biotope mapping (No. 14)"

indicator	quality	full effect	financed effect	robustness
number of updated/new biotopes	D	6,914	6,914	1
funding for ecosystem monitoring	E	2.9	2.9	1

Non-productive investments in conservation

This project refers to maintenance, enhancement and conservation measures and new construction of various habitats in the open countryside, such as the creation of wetland biotopes or the planting of hedges. The added value in terms of nature conservation results from the comparison (evaluation) of the area in terms of nature conservation before and after implementation. Three indicators are selected and quantified in the report at hand.

Firstly (1), the overall funding from the State's budget is reported as input-indicator (E) as "funding for nature conservation". The total funding of circa EUR 20.6m is reported with a 100% share of financing.

Secondly (2), the number of projects and measures funded is reported as activity-indicator (D). So far, circa 7,000 projects can be attributed to the funding in 2020.

Thirdly (3), the area that is either protected or enhanced in the context of nature conservation is directly reported by the issuer (primary data). This is considered not only a direct output of the projects but an intermediate-outcome (B) in line with the environmental objective of ecosystem protection and restoration. Not all measures relate to such areas which is why no specific monetary value or share can be assigned in the results table in the annex. However, the overall area reported here (circa 13,500 hectare) is fully applicable as an annual result.

The following table 3-24 lists the results and evaluates the robustness of the indicators.

table 3-24: results for the project "Non-productive investments in conservation (No. 15)"

indicator	quality	full effect	financed effect	robustness
protected/enhanced eco-friendly area	B	13,518	13,518	1
funded projects for nature conservation and biodiversity	D	6,941	6,941	1
funding for nature conservation and biodiversity	E	20.6	20.6	1

Special Programme for Biodiversity

The funds in this program are used to implement individual projects to strengthen biodiversity by various funding recipients such as clubs, associations, private individuals, counties, municipalities and others. In addition to these projects, monitoring measures are implemented by contractors (engineering companies). We assume a 100% share of financing and all the necessary data is provided by the issuer.

The following three indicators are selected and in line with reporting on the previous program on non-productive investments into nature conservation.

Firstly (1), the overall funding from the State's budget is reported as input-indicator (E) as "funding for nature conservation". The total funding of circa EUR 8.3m is reported.

Secondly (2), the number of projects funded is reported as activity-indicator (D). So far, circa 1,000 projects can be attributed to the funding in 2020.

Thirdly (3), the area that is either protected or enhanced in the context of biodiversity is directly reported by the issuer (primary data). This is considered not only a direct output of the projects but an intermediate-outcome (B) in line with the environmental objective of biodiversity protection and restoration. Not all measures relate to such areas which is why no specific monetary value or share can be assigned in the results table in the annex. However, the overall area reported here (circa 2,500 hectare) is fully applicable as an annual result.

The following table 3-25 lists the results and evaluates the robustness of the indicators.

table 3-25: results for the project "Special program for biodiversity (No. 16)"

indicator	quality	full effect	financed effect	robustness
protected/enhanced eco-friendly area	B	2,478 ha	2,478 ha	1
funded projects for nature conservation and biodiversity	D	1,004	1,004	1
funding for nature conservation and biodiversity	E	EUR 8.3m	EUR 8.3m	1

Nature conservation contracts

The program comprises multi-year contracts with farms and other land users that include specific management requirements aligned with conservation goals to maintain or develop contracted lands. In addition to funding from the State, approximately EUR 10m are provided from EU funds, resulting in a 62% share of financing. All information and data are provided by the issuer and considered a primary source. Two indicators are selected and reported.

Firstly (1), in line with other indicators for that environmental objective, the funding is directly reported as input-indicator (E) on "nature conservation and biodiversity". From the overall funding of EUR 26.5m, 62% or EUR 16.5m are reported as financed effect.

Secondly (2), the contracted area is reported as intermediate-outcome (B) as it is considered to be a direct contribution to the overall objective of ecosystems and biodiversity protection. The issuer reports a protected area of circa 40,000 ha, of which circa 25,000 ha is reported as financed annual effect[11].

The following table 3-26 lists the results and evaluates the robustness of the indicators.

table 3-26: results for the project "Nature conservation contracts (No. 17)"

indicator	quality	full effect	financed effect	robustness
protected/enhanced eco-friendly area	B	39,995 ha	24,911 ha	1
funding for nature conservation and biodiversity	E	EUR 26.5m	EUR 16.5m	1

WiNo: Real World Laboratory Knowledge Dialogue Nordschwarzwald

The Reallabor Wissensdialog Nordschwarzwald (WiNo) contributes to the sustainable development of the Black Forest National Park Region. The WiNo research program was developed from the beginning in an exchange between science, practice and civil society. It contributes to the conservation of biodiversity and regional sustainability transformation with research work, workshops, empirical and experimental surveys, expert discussions and excursions. Two indicators were selected and reported that are in line with the reporting of a similar project for climate change adaptation (Karlsruhe Transformation Center for Sustainable Futures and Cultural Change).

[11] Future reports need to consider the duration of existing contracts in order to report only on additional and accumulative effects.

Firstly (1), the overall funding of circa EUR 150,000 is reported as "funding for activity-based expenditures" for both "full effect" and "financed" annual effects (input-indicator with quality E).

Secondly (2), the number of publications in the year 2020 is reported as an activity-indicator (D). According to the issuer, 11 of these publications were published in 2020.

The following table 3-27 lists the results and evaluates the robustness of the indicators (we assume a financial share of 100%).

table 3-27: results for the project "WiNo: Real World Laboratory Knowledge Dialogue Nordschwarzwald (No. 48)"

indicator	quality	full effect	financed effect	robustness
number of publications	D	11	11	1
funding for activity-based expenditures	E	EUR 0.15m	EUR 0.02m	1

4 Discussion and Outlook

The issuer is an early adopter in using the EU taxonomy regulation for the selection and attribution of eligible Green Bond projects. This implies that a wide range of environmental issues is addressed for which no commonly agreed indicators exist. Some projects could also contribute to more than one taxonomy objective or, in the case of broadband promotion, target socio-economic goals as well. In addition, DNSH criteria had to be assessed for the first time that are tailored towards economic activities rather than public programs and measures.

This novelty of the Bond required considerable development and adaptation of methods by the reviewer. Only about half of the projects as well as funding could be fully assessed as a consequence. Future reports will gradually increase this share, but there is reason to assume that some projects will never be applicable to the quantification of actual project outputs or societal outcomes. Both the issuer and reviewer can of course always fall back to reporting the funding itself (input-indicator of quality E in the methodology in the report at hand). However, additional impact-relevant information does not necessarily have to be of a quantitative nature.

The reviewer will investigate in future reports, whether a theory-of-change (Toc) approach (see figure 4-1) might help to address that challenge. Although normative by its nature, such cause-effect reasoning and visualization can provide qualitative, but robust, evidence for contributing to overarching sustainability goals. A fully formulated ToC narrative would also help to streamline the language of the assessment in terms of the most basic indication of funds. By connection the inputs by the issuer to activities, outputs and outcomes, project categories can be clustered and appropriately named for their purpose in the goal contribution.

figure 4-1: application of a theory-of-change approach for Green Bonds in line with the EU taxonomy regulation (Teubler, J. (2022): Logic Model for ESG Impact Pathways and Assessments. Dissertation. work in progress)

5 Literature

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6 Annex: Results for all indicators

6.1 Risk Assessment

For each project with reported indicators, it was assessed whether there is a higher likelihood of harm to one of the five other objectives and whether potential harm is significant (see section 2). The review in the following table was conducted with the help of a risk definition (comparing the measures with alternatives) and six control questions referring to each of the environmental objectives of the EU Taxonomy regulation. A "low risk" is attributed if only one of the two risk components could be anticipated (10 cases), while a "high risk" requires positive responses for both criteria (no cases).

table 6-1: risk assessment (step 1 of DNSH validation)

	Project in Green Bond	Status Quo: System for Comparison	Risk of DNSH	CM		CA		WM		CE		PP		BE	
				MAG	LH	MAG	LH	MAG	LH	MAG	LH	MAG	LH	MAG	LH
CM	State funding of broadband	no additional fibre optic connections	low risk	-	-	o	o	o	o	o	+	o	o	+	o
	Zero Emission - Green Hydrogen, Lampoldshausen	provision of conventional liquid fuels and/or batteries	low risk	-	-	o	o	+	o	o	o	o	o	o	+
	INPUT - Intelligent network link of parking garages and underground garages	parking lots and garages without grid integration	low risk	-	-	o	o	o	o	o	+	o	o	o	o
	Solar battery storage systems	pumped hydroelectric storage	low risk	-	-	o	o	o	o	o	+	+	o	o	o
	Regional centers of excellence for energy efficiency	no energy-efficiency measures by companies	no risk	-	-	o	o	o	o	o	o	o	o	o	o
	Notably energy-efficient new buildings in the public building construction	stock of existing public buildings	low risk	-	-	o	+	o	o	o	o	o	o	o	+
	Notably energy-efficient restructuring measures in the public building construction	stock of existing public buildings	low risk	-	-	o	+	o	o	o	o	o	o	o	o
	Cycling Culture Initiative	local public transport	no risk	-	-	o	o	o	o	o	o	o	o	o	o
CA	Subsidies for the development of climate resilient forests and/or (re-)afforestation	areas before afforestation	no risk	o	o	-	-	o	o	o	o	o	o	o	o
	Karlsruhe Transformation Center for Sustainable Futures and Cultural Change	other research	no risk	o	o	-	-	o	o	o	o	o	o	o	o
WM	Research Programme Network Water Research	other research	no risk	o	o	o	o	-	-	o	o	o	o	o	o
	Sewerage infrastructure investments	no sewage disposal measures	no risk	o	o	o	o	-	-	o	o	o	o	o	o
CE	Circulation folders made of grass paper	conventional paper folders	no risk	o	o	o	o	o	o	-	-	o	o	o	o
	Phosphorus recovery from sewage sludge	phosphate mining	low risk	o	+	o	o	o	o	-	-	o	+	o	o
PP	Procurement of Hybrid vehicles / Charging stations	conventional vehicles for public services	low risk	o	o	o	o	o	o	o	+	-	-	o	o
	Intelligent public transport in Baden-Württemberg - digitally mobile nationwide	normal ticketing for public transport	no risk	o	o	o	o	o	o	o	o	-	-	o	o
	E-Mobility in the car pool of BW police - purchase of motorcycle with electric motor	conventional vehicles for public services	low risk	o	o	o	o	o	o	o	+	-	-	o	o
BE	Development of agroforestry systems in Burundi	coffee production without additional CO2 binding	no risk	o	o	o	o	o	o	o	o	o	o	-	-
	Subsidies for artisinal vineries	vineyards with machinery	no risk	o	o	o	o	o	o	o	o	o	o	-	-
	Exemplary regions for organic food	conventional farming	low risk	o	+	o	o	o	o	o	o	o	o	-	-
	Biotope mapping	good condition ecosystems without mapping	no risk	o	o	o	o	o	o	o	o	o	o	-	-
	Non-productive investments in conservation	no investments in land conservation (leave it is as it is)	no risk	o	o	o	o	o	o	o	o	o	o	-	-
	Special Programme for Biodiversity	no measures for biodiversity (leave it as it is)	no risk	o	o	o	o	o	o	o	o	o	o	-	-
	Nature conservation contracts	land use (e.g. agriculture) without conservation	no risk	o	o	o	o	o	o	o	o	o	o	-	-
	Real World Laboratory Knowledge Dialogue Nordschwarzwald	other research	no risk	o	o	o	o	o	o	o	o	o	o	-	-

6.2 Indicator Results

The following results are presented in accordance with the current *Harmonized Framework for Impact Reporting* (ICMA, 2021). In addition to the ICMA recommendations, effects are also distinguished between overall performance (full effect) and financed outputs (financed) (see also 0).

table 6-2: results for Climate Change Mitigation

Climate Mitigation - Indicators	Indicator quality	signed amount [1]	Share of financing [2]	Eligibility for green bonds	allocated amount	Indicator name (all indicators refer to 1 year of funding from the State's budget)	Indicator unit	Annual Effects [3]	
Project Name [4]	[A-E]	million EUR	%	% of signed amount	million EUR			full effect	financed
State funding of broadband (No. 6)	other [5]	67.72	n.a.	100%	66.95	additional 50 Mbit access in rural areas (households)	[Δ%]	+ 6.3	n.a.
	D	67.72	16%	100%	66.95	additional connections [8]	[1]	46,000	7,000
	E	67.72	16%	100%	66.95	approvals for broadband grants	[1]	496	78
H_2 production, Lampoldshausen (No. 7)	D	1.41	9%	100%	1.39	hydrogen production capacity added	[MW]	*not finished*	0.2
	E	1.41	9%	100%	1.39	plants funded	[1]	*not finished*	1.0
INPUT: Intelligent parking & underground garages (No. 20)	E	1.40	39%	100%	1.38	projects funded	[1]	11	4
Solar Battery Storage Systems (No 21)	C	3.79	21%	100%	3.75	renewable storage capacity added	[MWh]	17.5	3.7
	D	3.79	0%	100%	3.75	renewable energy capacity added [6]	[MW_P]	25.0	n.a.
	E	3.79	40%	100%	3.75	approved funding applications	[1]	2,000	800
Regional centers of excellence for energy efficiency (No 22)	C	0.67	100%	100%	0.66	energy efficiency measures in companies	[1]	82	82
	D	0.67	100%	100%	0.66	energy consultations in companies	[1]	234	234
	E	0.67	100%	100%	0.66	number of offers for consultation	[1]	1,464	1,464
Notably energy-efficient new buildings in the public building construction (No 27) [7]	B	34.93	6%	100%	34.53	GHG emissions compared to 1990	[%]	- 89	- 6
	C	34.93	6%	100%	34.53	GHG emissions avoided per year	[t CO2e / a]	3,873	240
	D	34.93	6%	100%	34.53	energy-efficient net floor area added	[quare-metre]	94,058	5,835
	E	34.93	6%	100%	34.53	new buildings funded	[1]	15	0.9
Notably energy-efficient restructuring measures in the public building construction (No 28)	B	6.75	9%	100%	6.68	GHG emissions compared to 1990	[Δ%]	- 86	- 8
	C	6.75	9%	100%	6.68	GHG emissions avoided per year	[t CO2e / a]	199	19
	D	6.75	9%	100%	6.68	energy-efficient net floor area added	[quare-metre]	22,166	2,079
	E	6.75	9%	100%	6.68	new buildings funded	[1]	3	0.3
Cycling Culture Initiative (No 38)	E	2.39	100%	100%	2.36	communities funded	[1]	12	12
TOTAL - Climate Mitigation	E	**119**	**11%**	**100%**	**118**	**funded projects and/or measures (E)**	**[1]**	**4,001**	**2,360**

[1] Represents "allocated amount" in the ICMA (2021) Standard (p. 62, "c/"). For the issuer, this refers to the actual annual expenditure (net, only funds from the State's budget).
[2] These allocated costs refer to the total funding (e.g. when reporting number of projects) or total costs (e.g. when reporting effects).
[3] "full effect" refers to the (annual) indicator value for the entire project, while "financed" multiplies this effect with the share of total project financing.
[4] Projects can be listed more than once if more than one indicator is reported. The number in brackets refers to the number of the project in the project list of the issuer. Some project names were shortened for purpose of concise display.
[5] While this indicator could be considered an intermediate outcome towards social or socio-economic goals, it does not provide evidence for reduced GHG emissions as required for the objective "GHG Mitigation".
[6] Installing new PV power was a requisition to receive funding for battery storage. Therefore, the installation of PV capacity alone has a share of financing of 0% but is reported here as effect.
[7] The GHG effects (B and C) are estimated with the help of a simplified model. Due to the use of primary energy demands of the building, the effects are likely to be underestimated in terms of actual savings.
[8] These results represent preliminary results for 2020 and are estimated on federal approvals only (354 mEUR for 37,442 connections).

table 6-3: results for Climate Change Adaptation

Climate Change Adaption - Indicators	Indicator quality	signed amount [1]	Share of financing [2]	Eligibility for green bonds	allocated amount	Indicator name (all indicators refer to 1 year of funding from the State's budget)	Indicator unit	Annual Effects [3]	
Project Name [4]	[A-E]	million EUR	%	% of signed amount	million EUR			full effect	financed
Development of climate resilient forests and/or (re-)afforestation (No 9)	B	0.84	40%	100%	0.83	annually absorbed carbon (carbon sink)	[t C/a]	597	239
	C	0.84	40%	100%	0.83	stored carbon (biomass above and below ground) [5]	[t C]	51,263	20,505
	D	0.84	40%	100%	0.83	promoted forest area	[ha]	515	206
	E	0.84	40%	100%	0.83	funding for forest-related measures	[mEUR]	2.1	0.8
Real World Laboratories: Karlsruhe Transformation Center for Sustainable Futures and Cultural Change (No. 47)	D	0.24	100%	100%	0.24	number of publications	[1]	16	16
	E	0.24	100%	100%	0.24	funding for activity-based expenditures	[mEUR]	0.2	0.2
TOTAL - Climate Change Adaption	E	**1.1**	**46%**	**100%**	**1**	**annual funding for measures**	**[mEUR]**	**2.3**	**1.1**

[1] Represents "allocated amount" in the ICMA (2021) Standard (p. 62, "c/"). For the issuer, this refers to the actual annual expenditure (net, only funds from the State's budget).
[2] These allocated costs refer to the total funding (e.g. when reporting number of projects) or total costs (e.g. when reporting effects).
[3] "full effect" refers to the (annual) indicator value for the entire project, while "financed" multiplies this effect with the share of total project financing.
[4] Projects can be listed more than once if more than one indicator is reported. The number in brackets refers to the number of the project in the project list of the issuer. Some project names were shortened for purpose of concise display.
[5] The stored carbon continues to be stored (and has been stored in the past) unless forest is removed or otherwise changed. Only additional protected areas can add to this indicator in the future.

table 6-4: results for Water & Marine Resources

Water & Marine Resources - Indicators	Indicator quality	signed amount [1]	Share of financing [2]	Eligibility for green bonds	allocated amount	Indicator name (all indicators refer to 1 year of funding from the State's budget)	Indicator unit	Annual Effects [3]	
Project Name [4]	[A-E]	million EUR	%	% of signed amount	million EUR			full effect	financed
Research Programme Network Water Research (No. 45)	D	0.68	100%	100%	0.67	number of publications	[1]	87	87
	E	0.68	100%	100%	0.67	funding for activity-based expenditures	[mEUR]	0.7	0.7
Sewerage Infrastructure Investments	D	32.1	100%	100%	31.7	number of waste-water management measures	[1]	122	122
	E	32.1	100%	100%	31.7	funding for waste-water management	[mEUR]	32.1	32.1
TOTAL - Water & Marine Resources	E	**32.7**	**100%**	**100%**	**32.4**	**annual funding for measures & research**	**[mEUR]**	**32.7**	**32.7**

[1] Represents "allocated amount" in the ICMA (2021) Standard (p. 62, "c/"). For the issuer, this refers to the actual annual expenditure (net, only funds from the State's budget).
[2] These allocated costs refer to the total funding (e.g. when reporting number of projects) or total costs (e.g. when reporting effects).
[3] "full effect" refers to the (annual) indicator value for the entire project, while "financed" multiplies this effect with the share of total project financing.
[4] Projects can be listed more than once if more than one indicator is reported. The number in brackets refers to the number of the project in the project list of the issuer. Some project names were shortened for purpose of concise display.

table 6-5: results for Circular Economy

Circular Economy - Indicators	Indicator quality	signed amount [1]	Share of financing [2]	Eligibility for green bonds	allocated amount	Indicator name (all indicators refer to 1 year of funding from the State's budget)	Indicator unit	Annual Effects [3]	
Project Name [4]	[A-E]	million EUR	%	% of signed amount	million EUR			full effect	financed
Circulation folders made of grass paper (No. 4)	E	0.003	100%	100%	0.003	public procurement of sustainable products	[mEUR]	0.003	0.003
Phosphorus recovery from sewage sludge (No. 24)	C	0.23	0.3%	100%	0.23	future potentials of recovered phosphorus [5]	[t/a]	1,434	4.6
	D	0.23	0.3%	100%	0.23	fertilizer recovery plants [5]	[1]	4	0.01
	E	0.23	0.3%	100%	0.23	funding for phosphorus recovery plant construction [5]	[mEUR]	71.7	0.23
TOTAL - Circular Economy	E	**0.2**	**0.3%**	**100%**	**0.2**	**annual funding for measures**	**[mEUR]**	**71.7**	**0.2**

[1] Represents "allocated amount" in the ICMA (2021) Standard (p. 62, "c/"). For the issuer, this refers to the actual annual expenditure (net, only funds from the State's budget).
[2] These allocated costs refer to the total funding (e.g. when reporting number of projects) or total costs (e.g. when reporting effects).
[3] "full effect" refers to the (annual) indicator value for the entire project, while "financed" multiplies this effect with the share of total project financing.
[4] Projects can be listed more than once if more than one indicator is reported. The number in brackets refers to the number of the project in the project list of the issuer. Some project names were shortened for purpose of concise display.
[5] Costs and projected output only available for 3 of the 4 plants funded by the State. All values (including costs) are estimated by calculating the average of these 3 plants.

table 6-6: results for Pollution Prevention

Pollution Prevention - Indicators	Indicator quality	signed amount [1]	Share of financing [2]	Eligibility for green bonds	allocated amount	Indicator name (all indicators refer to 1 year of funding from the State's budget)	Indicator unit	Annual Effects [3]	
Project Name [4]	[A-E]	million EUR	%	% of signed amount	million EUR			full effect	financed
Procurement of Hybrid Vehicles / Charging stations (No. 5)	C	0.09	100% [5]	100%	0.09	saving of nitrogen oxide emissions	[kg NO_x]	6	6
	D	0.09	100% [5]	100%	0.09	number of clean vehicles and/or charging stations [6]	[1]	20	20
	E	0.09	100% [5]	100%	0.09	funding for clean mobility	[mEUR]	0.1	0.1
Intelligent public transport in Baden-Württemberg (No. 31)	E	0.99	100%	100%	0.98	funding for clean mobility	[mEUR]	1.0	1.0
E-Mobility in the car pool of BW police (No. 51)	C	0.01	100% [5]	100%	0.01	saving of nitrogen oxide emissions	[kg NO_x]	0.2	0.2
	D	0.01	100% [5]	100%	0.01	number of clean vehicles and/or charging stations	[1]	1	1
	E	0.01	100% [5]	100%	0.01	saving of nitrogen oxide emissions	[mEUR]	0.01	0.01
TOTAL - Pollution Prevention	E	**1.1**	**100%**	**100%**	**1.1**	**annual funding for measures**	**[mEUR]**	**1.1**	**1.1**

[1] Represents "allocated amount" in the ICMA (2021) Standard (p. 62, "c/"). For the issuer, this refers to the actual annual expenditure (net, only funds from the State's budget).
[2] These allocated costs refer to the total funding (e.g. when reporting number of projects) or total costs (e.g. when reporting effects).
[3] "full effect" refers to the (annual) indicator value for the entire project, while "financed" multiplies this effect with the share of total project financing.
[4] Projects can be listed more than once if more than one indicator is reported. The number in brackets refers to the number of the project in the project list of the issuer. Some project names were shortened for purpose of concise display.
[5] The actual share of financing is not known and assumed to be 100%. It is very likely though, that not all the costs are covered by funds in the programme(s).
[6] The number of procured charging stations (if procured at all) is not known. All funding is therefore attributed to the 20 vehicles reported by the issuer.

table 6-7: results for Biodiversity & Ecosystems

Biodiversity and Ecosystems - Indicators	Indicator quality	signed amount [1]	Share of financing [2]	Eligibility for green bonds	allocated amount	Indicator name (all indicators refer to 1 year of funding from the State's budget)	Indicator unit	Annual Effects [3]	
Project Name [4]	[A-E]	million EUR	%	% of signed amount	million EUR			full effect	financed
Development of agroforestry systems in Burundi (No 3)	C	0.10	33%	100%	0.097	families benefiting from organic coffee marketing	[1]	11,000	3,594
	D	0.10	33%	100%	0.097	schooled small farming cooperatives	[1]	18	6
	E	0.10	33%	100%	0.097	funding for organic farming	[mEUR]	0.3	0.1
Subsidies for artisinal vineries (No 11)	C	0.81	100%	100%	0.80	promoted eco-friendly/organic area	[ha]	270	270
	E	0.81	100%	100%	0.80	funding for organic farming	[mEUR]	0.8	0.8
Exemplary regions for organic food (No 12)	D	0.58	100%	100%	0.58	number of promoted regions for organic food	[1]	9	9
	E	0.58	100%	100%	0.58	funding for organic farming	[mEUR]	0.6	0.6
Biotope mapping (No 14)	D	2.92	100%	100%	2.89	number of updated/new biotopes	[1]	6,914	6,914
	E	2.92	100%	100%	2.89	funding for ecosystem monitoring	[mEUR]	2.9	2.9
Non-productive investments in conservation (No 15)	B	n.a.	100%	100%	n.a.	protected/enhanced eco-friendly area [5]	[ha]	13,518	13,518
	D	20.58	100%	100%	20.35	funded projects for nature conservation and biodiversity	[1]	6,941	6,941
	E	20.58	100%	100%	20.35	funding for nature conservation and biodiversity	[mEUR]	20.6	20.6
Special Programme for Biodiversity (No 16)	B	n.a.	100%	100%	n.a.	protected/enhanced eco-friendly area [5]	[ha]	2,478	2,478
	D	8.27	100%	100%	8.18	funded projects for nature conservation and biodiversity	[1]	1,004	1,004
	E	8.27	100%	100%	8.18	funding for nature conservation and biodiversity	[mEUR]	8.3	8.3
Nature conservation contracts (No 17)	B	16.51	62%	100%	16.33	protected/enhanced eco-friendly area	[ha]	39,995	24,911
	E	16.51	62%	100%	16.33	funding for nature conservation and biodiversity	[mEUR]	26.5	16.5
WiNo: Real World Laboratory Knowledge Dialogue Nordschwarzwald (No 48)	D	0.15	100%	100%	0.15	number of publications	[1]	11	11
	E	0.15	100%	100%	0.15	funding for activity-based expenditures	[mEUR]	0.15	0.02
TOTAL - Biodiversity and Ecosystems	E	**49.9**	**83%**	**100%**	**49.4**	**annual funding for measures**	**[mEUR]**	**60.1**	**49.9**

[1] Represents "allocated amount" in the ICMA (2021) Standard (p. 62, "c/"). For the issuer, this refers to the actual annual expenditure (net, only funds from the State's budget).
[2] These allocated costs refer to the total funding (e.g. when reporting number of projects) or total costs (e.g. when reporting effects).
[3] "full effect" refers to the (annual) indicator value for the entire project, while "financed" multiplies this effect with the share of total project financing.
[4] Projects can be listed more than once if more than one indicator is reported. The number in brackets refers to the number of the project in the project list of the issuer. Some project names were shortened for purpose of concise display.
[5] Not all funded projects are monitored for changes of promoted/enhanced areas. The allocation of projects to this indicator is unknown and therefore reported effects attributed to all of the funding.