Second-Party Opinion

VodafoneZiggo Green Bond Framework

Evaluation Summary

Sustainalytics is of the opinion that the VodafoneZiggo Green Bond Framework is credible and impactful and aligns with the four core components of the Green Bond Principles 2018. This assessment is based on the following:

USE OF PROCEEDS The eligible categories for the use of proceeds — Renewable Energy, Energy Efficiency, Clean Transportation, Eco-efficient and/or circular economy adapted products, production technologies and process, and Green Buildings — are aligned with those recognized by the Green Bond Principles 2018. Sustainalytics considers that the eligible categories will lead to positive environmental impacts and advance the UN Sustainable Development Goals, specifically Goals 7, 9, 11 and 12.

PROJECT EVALUATION / SELECTION VodafoneZiggo has established a Green Bond Committee comprised of senior representatives from its Treasury and Corporate Social Responsibility Teams. The Committee will be responsible for evaluating and selecting projects in accordance with the eligibility criteria outlined in the Framework. Sustainalytics considers the project selection process in line with market practice.

MANAGEMENT OF PROCEEDS VodafoneZiggo intends to track proceeds through a Green Bond Register, through which proceeds will be segregated and allocated towards the financing and refinancing of projects deemed as eligible under the Framework. VodafoneZiggo has set a 36-month look-back period and intends to fully allocate within three years from the date of any applicable issuance. This is in line with market practice.

REPORTING VodafoneZiggo intends to report allocation proceeds on its website on an annual basis until full allocation. Allocation reporting may include the total amount allocated to eligible projects, the share of an amount equal to the net proceeds for financing vs. refinancing, and the balance of unallocated proceeds. In addition, VodafoneZiggo is committed to reporting on relevant environmental impact metrics, where feasible. Sustainalytics views VodafoneZiggo's allocation and impact reporting as aligned with market practice.

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Introduction

Founded in 2016 and headquartered in Utrecht, Netherlands, VodafoneZiggo (the "Company") is a joint venture between the Liberty Group and Vodafone. The Company provides fixed, mobile and integrated communication and entertainment services to consumers and businesses. As of September 30, 2020, the Company owns approximately EUR 19.5 billion of assets.

VodafoneZiggo has developed the VodafoneZiggo Green Bond Framework (the "Framework"), dated December 2020, under which it intends to use the net proceeds or an equivalent amount equal to the net proceeds from the issuance of green bonds to finance and/or refinance, in whole or in part, existing and/or future projects that aim to promote improved energy efficiency within the telecommunications sector in the Netherlands, supporting the transition towards low-carbon climate resilient growth. The Framework defines eligibility criteria in five areas:

1. Renewable Energy
2. Energy Efficiency
3. Clean Transportation
4. Eco-efficient and/or circular economy adapted products, production technologies and processes
5. Green Buildings

The Company engaged Sustainalytics to review the Framework, and provide a Second-Party Opinion on the Framework's environmental credentials and its alignment with the Green Bond Principles 2018 (GBP).[1] This Framework has been published in a separate document.[2]

Scope of work and limitations of Sustainalytics Second-Party Opinion

Sustainalytics' Second-Party Opinion reflects Sustainalytics independent[3] opinion on the alignment of the reviewed Framework with the current market standards and the extent to which the eligible categories are credible and impactful.

As part of the Second-Party Opinion, Sustainalytics assessed the following:

- The Framework's alignment with the Green Bond Principles 2018, as administered by ICMA;
- The credibility and anticipated positive impacts of the use of proceeds; and
- The alignment of the Company's sustainability strategy and performance and sustainability risk management in relation to the use of proceeds.

For the use of proceeds assessment, Sustainalytics relied on its internal taxonomy, version 1.6, which is informed by market practice and Sustainalytics' expertise as an ESG research provider.

As part of this engagement, Sustainalytics held conversations with various members of VodafoneZiggo's management team to understand the sustainability impact of their business processes and planned use of proceeds, as well as management of proceeds and reporting aspects of the Framework. VodafoneZiggo representatives have confirmed (1) they understand it is the sole responsibility of VodafoneZiggo to ensure that the information provided is complete, accurate or up to date; (2) that they have provided Sustainalytics with all relevant information and (3) that any provided material information has been duly disclosed in a timely manner. Sustainalytics also reviewed relevant public documents and non-public information.

This document contains Sustainalytics' opinion of the Framework and should be read in conjunction with that Framework.

Any update of the present Second-Party Opinion will be conducted according to the agreed engagement conditions between Sustainalytics and VodafoneZiggo.

Sustainalytics' Second-Party Opinion, while reflecting on the alignment of the Framework with market standards, is no guarantee of alignment nor warrants any alignment with future versions of relevant market

[1] The Green Bond Principles are administered by the International Capital Market Association and are available at https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/.
[2] The VodafoneZiggo Green Bond Framework is available on VodafoneZiggo's website at: https://www.vodafoneziggo.nl/en/samenleving/everything-healthy-environment
[3] When operating multiple lines of business that serve a variety of client types, objective research is a cornerstone of Sustainalytics and ensuring analyst independence is paramount to producing objective, actionable research. Sustainalytics has therefore put in place a robust conflict management framework that specifically addresses the need for analyst independence, consistency of process, structural separation of commercial and research (and engagement) teams, data protection and systems separation. Last but not the least, analyst compensation is not directly tied to specific commercial outcomes. One of Sustainalytics' hallmarks is integrity, another is transparency.

standards. Furthermore, Sustainalytics' Second-Party Opinion addresses the anticipated impacts of eligible projects expected to be financed with bond proceeds but does not measure the actual impact. The measurement and reporting of the impact achieved through projects financed under the Framework is the responsibility of the Framework owner.

In addition, the Second-Party Opinion opines on the intended allocation of proceeds but does not guarantee the realised allocation of the bond proceeds towards eligible activities.

No information provided by Sustainalytics under the present Second-Party Opinion shall be considered as being a statement, representation, warrant or argument, either in favour or against, the truthfulness, reliability or completeness of any facts or statements and related surrounding circumstances that VodafoneZiggo has made available to Sustainalytics for the purpose of this Second-Party Opinion.

Sustainalytics' Opinion

Section 1: Sustainalytics' Opinion on the VodafoneZiggo Green Bond Framework

Sustainalytics is of the opinion that the VodafoneZiggo Green Bond Framework is credible and impactful, and aligns with the four core components of the GBP. Sustainalytics highlights the following elements of VodafoneZiggo's Green Bond Framework:

- Use of Proceeds:
  - The eligible categories — Renewable Energy, Energy Efficiency, Clean Transportation, Eco-efficient and/or circular economy adapted products, production technologies and process, and Green Buildings — are aligned with those recognized by the GBP and are considered to provide environmental benefits by increasing renewable energy capacity, enabling energy efficiency, supporting the circular economy and reducing emissions from the transportation and buildings sector, all in the context of the telecommunications industry.
  - The Renewable Energy category may include investments in EU Wind Certificates (renewable energy certificates or "RECs") that are directly tied to wind power plants or investments in electricity from renewable sources such as solar and wind.
    - RECs contemplated are intended to procure power from European windfarms with the goal of increasing the share of renewable power in the Company's energy mix. VodafoneZiggo has confirmed that its current REC started in 2013 and is set to expire at the end of 2023. Sustainalytics views the timeframe of this certificate to be in line with market practice.
    - Sustainalytics views these investments to be in line with market practice and notes positively that the Company currently relies on 100% wind energy.
  - Within the Energy Efficiency category, VodafoneZiggo intends to finance and/or refinance a variety of activities related to (i) Internet of Things ("IoT"), (ii) Deployment or research and innovation in IoT solutions; (iii) Improving energy efficiency of everyday operations; and (iv) Network transformation (fixed + mobile) in order to improve energy efficiency:
    - Sustainalytics notes that IoT investments[4] described in the Framework will contribute to supporting internet connectivity for a high density of devices and are expected to enable more energy-efficient data transmission. This could unlock new opportunities in areas such as smart metering, smart lighting and smart cities. Refer to Section 3 for further discussion on the environmental impacts of these technologies.
      - Sustainalytics recognizes that by enabling high-speed network connectivity, VodafoneZiggo's solutions have the potential to support significant energy savings by end users across many sectors. Sustainalytics also acknowledges that the expansion of IoT networks and increasing data flows from IoT enablement technologies may result in additional overall energy demands on

[4] This includes Narrowband IoT (NB-IoT) and enhanced Machine-Type Learning; ultra-reliable, low-latency communication (URLLC); and massive Machine-Type Communication (Mmtc). Please refer to Appendix 1 for more information.

telecommunications networks. Overall, Sustainalytics believes that the enabled savings outweigh the potential adverse effects of additional network demands.
- Sustainalytics further notes that these technologies have a broad impact and can drive energy efficiency gains across a variety of industries. This does not exclude the possibility of application in environmentally harmful activities such as fossil fuel industries. However, Sustainalytics understands that VodafoneZiggo is not directly involved in the development of tailoured applications in such industries.

  - The second sub-category includes deployment and research in IoT solutions and products such as smart logistics, mobility, and fleet management systems as well as smart metering solutions. While Sustainalytics recognizes that R&D has the potential to drive positive environmental outcomes, it is also acknowledged that it is more challenging to quantify the direct impacts of such investments. As such, Sustainalytics encourages VodafoneZiggo to prioritize R&D investments that have reasonable assurance of implementation, as well as achievement of measurable impact in the near-term.
- Operational energy efficiency improvements include energy saving software such as machine learning and artificial intelligence (AI) applications, self-organizing networks (SON) and radio access network (RAN) sharing. Sustainalytics views these activities to be in line with market practice, while noting the diversity of the magnitude of potential benefits, given the various use-cases associated with these energy efficiency improvements. Refer to Section 3 and Appendix 1 for more information on the environmental impact of these technologies.
- Under the sub-category of network transformation, VodafoneZiggo contemplates investments in programs related to upgrading Customer Premise Equipment (CPE) as well as network infrastructure related to broadband, video and telephony services:
  - Investments in CPE are guided by the Company's roadmap to gradually upgrade legacy equipment and make it progressively more energy efficient.
  - Network infrastructure projects include on-site battery storage, fuel cells, and large-scale energy storage as well as in upgrading existing networks by acquiring technologies to enable deployment of 5G networks.
    - While the expansion of 5G technologies could lead to increased energy demands on the network, Sustainalytics believes that the energy efficiency gains achieved through such investments will result in a net energy reduction per unit of data transmitted. This will be achieved specifically by enabling energy efficiency of data transmission as well as operational efficiency across a range of industries and activities downstream of the network provider (please refer to Section 3 for further discussion on these impacts).

- Within the Clean Transportation category, the Company contemplates investments aimed at reducing GHG emissions from employee commutes through incentivizing the use of public transport, active modes of transport, or through a 'Green lease policy' (the "Policy") that encourages the use of electric or hybrid vehicles.
  - Sustainalytics views positively the provision of fully subsidized employee public transit cards and electric vans and bikes for technicians.
  - The Policy offers financial incentives to encourage the adoption of low-carbon vehicles among its senior employees. VodafoneZiggo has confirmed that employees are responsible for selecting either an electric or hybrid vehicle as part of the Policy, and that conventional internal combustion engine vehicles are ineligible. Given this context, Sustainalytics views the Policy to be environmentally impactful and in line with market practice.
- Under the Eco-efficient and/or circular economy adapted products, production technologies and processes category, VodafoneZiggo will finance projects aimed at extending the lifecycle of products and increasing the reuse of raw materials, including mobile devices, set-up boxes and packaging. Sustainalytics views these projects to be environmentally impactful while noting the

importance of ensuring appropriate e-waste risk mitigation mechanisms are in place. Refer to Section 2 for more information.

- The Green Buildings category includes investments in existing and new buildings as well as energy efficient improvements measures.
    - VodafoneZiggo has confirmed that it applies the following eligibility criteria for investments in buildings: (i) refurbished and renovated office buildings which have made an improvement of at least two 'Energy Label' (Energy Performance Certificate or "EPC") steps up to a minimum EPC label of "C", representing a relative improvement of 20-30%, or (ii) new office buildings that have an EPC label of "A+". Sustainalytics views this positively and notes that EPC label A+ corresponds to the top 15% of building stock in the Netherlands in terms of energy efficiency.
    - Sustainalytics views VodafoneZiggo's energy efficient measures to be in line with market practice, and notes that the Company is targeting to reach an annualized PUE of <1.5 for its data centers by 2025.
    - In the context of implementing its Energy Plan, which includes a strategy to assess the energy efficiency of the Company's assets to identify potential targets for consolidation and decommissioning, VodafoneZiggo intends to decommission or consolidate some of its fixed and mobile network sites. These efforts are expected to increase the efficiency of its fixed and mobile network sites, in line with its corporate target of reducing energy efficiency year-over-year. Sustainalytics encourages VodafoneZiggo to report on the quantitative impacts of these projects.

- Project Evaluation and Selection:
    - VodafoneZiggo has established a Green Bond Committee (the "Committee"), comprised of senior representatives from the Company's Treasury and Corporate Social Responsibility Team. The Committee will be responsible for evaluating and selecting projects in accordance with the eligibility criteria outlined in the Framework.
    - Based on the clear delegation of duties and appropriate oversight, Sustainalytics considers this process to be in line with market practice.
- Management of Proceeds:
    - VodafoneZiggo will allocate the net proceeds or an amount equal to the net proceeds of any green bonds issued under the Framework to finance or refinance projects deemed as eligible under the eligibility criteria. The Corporate Finance department will be responsible for managing such allocation through the use of a Green Bond Register.
    - VodafoneZiggo intends to allocate the net proceeds or an amount equal to the net proceeds within three years from the date of issuance of any applicable green bond raised under the Framework. For refinancing of eligible projects, the Company will apply a look-back period of 36 months from the time of issuance. Pending allocation, the net proceeds or an amount equal to the net proceeds will be managed in accordance with VodafoneZiggo's standard liquidity management practices.
    - Based on the presence of internal tracking systems and disclosure on temporary allocation of proceeds, Sustainalytics considers this process to be in line with market practice.
- Reporting:
    - VodafoneZiggo has indicated a commitment to reporting on the allocation and impact at the project level on an aggregated basis for all of VodafoneZiggo's green bonds. Reporting will be made available on the Company's website and will be conducted on an annual basis, until full allocation.
        - Allocation reporting may include the total amount allocated to eligible projects, the share of the net proceeds or an amount equal to the net proceeds used for financing vs. refinancing, and the balance of unallocated proceeds.
        - As art of its impact reporting, VodafoneZiggo may provide a description of the eligible projects, and draw on several environmental impact metrics, where feasible, such as tons of CO_2e saved/Terabyte or RGU (for mobile or fixed network), energy used per Terabyte per annum per (MWh) and square meter of green buildings, by certification type and level. In addition, the Company may provide impact assessment methodologies, where relevant, in order to increase transparency.

- Based on VodafoneZiggo's commitment to allocation and impact reporting on an annual basis, Sustainalytics considers this process to be in line with market practice.

Alignment with Green Bond Principles 2018

Sustainalytics has determined that the VodafoneZiggo Green Bond Framework aligns to the four core components of the GBP. For detailed information please refer to Appendix 2: Green Bond/Green Bond Programme External Review Form.

Section 2: Sustainability Performance of VodafoneZiggo

Contribution of framework to VodafoneZiggo's sustainability strategy

Sustainalytics is of the opinion that VodafoneZiggo demonstrates a strong commitment to integrating sustainability considerations within both its internal operations and through its offerings. In 2020, the Company created a CSR roadmap to 2025 entitled 'People, Planet Progress',[5] with the underlying goal of 'halving [its] environmental impact by 2025' and creating 'a positive impact on Dutch society'.[6] The environmental components of this strategy are as follows: (i) energy consumption and GHG emissions; (ii) circular economy (waste), and (iii) environmental impact of products and services.[7]

As part of its new CSR Strategy, 'People, Planet, Progress',[8] VodafoneZiggo has established the following environmental targets and objectives:

- Achieving a 2% energy efficiency improvement every year: The Company aims to achieve this by introducing new technologies to its sites to reduce total energy expenditure of cooling, and by identifying old equipment that can be replaced with energy efficient alternatives. The Company successfully met this ongoing goal between 2019 and 2020.
- Offering unlimited public transport cards for all employees: At present, all employees are eligible for unlimited public transport cards, and 40% of employees are currently enrolled in the program.
- Refurbishing set-up boxes and modems and using eco-friendly packaging: The Company currently offers a financial incentive to customers for selling their old smart phones back, and the return rate of media boxes if over 80%.

In addition to the above, VodafoneZiggo is committed to producing a 'Carbon Footprint'[9] report on an annual basis, where the Company analyzes its scope 1, 2 and 3 emissions across its main operational divisions, including 1) Network, 2) Buildings, 3) Retail, and 4) Travel. The report, based on the method of the Greenhouse Gas Protocol (GHG Protocol) and the ISO 14064-1 standard, compares the Company's year-over-year emissions performance. In 2019, VodafoneZiggo's Scope 1 and 2 emissions decreased by 16% compared to 2016, due to an overall decrease in energy usage across all divisions. The Company's Scope 3 emissions decreased by 30% when compared to 2016 as a result of a company-wide travel policy driven at decreasing business travel by personal cars and adopting new, energy efficient modes of transport for employee travel.

Sustainalytics is of the opinion that the VodafoneZiggo Green Bond Framework is aligned with the Company's overall sustainability strategy and will further the Company's action on its key environmental priorities. Sustainalytics specifically encourages the Company to quantify estimated energy efficiency gains of the eligible activities outlined in the Framework, particularly as it relates to increased data usage, and to consider aligning its carbon reduction goals to science-based targets.

Well-positioned to address common environmental and social risks associated with the projects

While Sustainalytics recognizes that the use of proceeds from the Framework will be directed towards eligible projects that are recognized as having positive environmental and social impacts, it is also acknowledged that such projects may pose environmental and social risks. Some key risks include end of life management (including e-waste), supply chain environmental impact, exposure to data privacy, as well as health and safety risks.

[5] VodafoneZiggo, 'VodafoneZiggo introduces new CSR strategy for 2025: People Planet Progress' (2020), at: https://www.vodafoneziggo.nl/en/nieuws/vodafoneziggo-introduces-new-csr-strategy-2025-people-planet-progress/
[6] VodafoneZiggo, Society: https://www.vodafoneziggo.nl/en/samenleving/.
[7] VodafoneZiggo, Society: https://www.vodafoneziggo.nl/en/samenleving/.
[8] VodafoneZiggo, Society: https://www.vodafoneziggo.nl/en/samenleving/.
[9] VodafoneZiggo shared this document with Sustainalytics, and it was assessed on a confidential basis.

Sustainalytics is of the opinion that VodafoneZiggo is able to manage and/or mitigate potential risks through implementation of the following:

- To mitigate both its direct and indirect environmental impact, VodafoneZiggo has developed an environmental program called 'Planet Tomorrow',[10] which is aligned with the ISO 14001 certificate. In addition, the Company has developed an E-Waste Policy[11] which specifically addresses VodafoneZiggo's ability manage e-waste from different parts of the Company's operations. As part of this policy, VodafoneZiggo has developed specific requirements, including clear accountability for the ownership of e-waste management, a categorization of waste streams and appropriate treatment and/or disposal practices, and an approved contractor list for all suppliers dealing with hazardous and e-waste.[12]
- VodafoneZiggo manages its supply chain risks through its Code of Sustainable and Ethical Purchasing Policy,[13] which sets out obligatory requirements to ensure social, environmental, and ethical compliance. This includes having a clear policy or procedure in place to avoid knowingly purchasing conflicting materials, as well as implementing an environmental management system to the extent applicable to each individual suppliers' business. As part of this process, suppliers are expected to identify and correct any activities that fall below the standards of the Code. As of 2021, VodafoneZiggo will manage its suppliers using the EcoVadis Platform,[14] where the Company will require suppliers to complete an EcoVadis assessment of the social, environmental and ethical impact of their operations.
- VodafoneZiggo's approach to addressing risks concerning data privacy, security and surveillance is guided by its Code of Conduct (the "Code").[15] The Code outlines the Company's commitment to respecting its users' privacy and personal data. This includes a requirement for its suppliers to take organizational and technical security measures to protect information and information carriers, and to report data breaches immediately, where necessary.
- VodafoneZiggo addresses occupational health and safety risks through its Health, Safety and Wellbeing ("HS&W) Standard.[16] The HS&W outlines a commitment to accurate reporting of accidents to ensure that incidents are reported, investigated, reviewed, and acted upon to prevent future occurrence and further harm. The Company is responsible for reviewing and verifying compliance with the HS&W Standard on an annual basis.

Based on these policies, standards and assessments, Sustainalytics is of the opinion that VodafoneZiggo has implemented adequate measures and is well-positioned to manage and mitigate environmental and social risks commonly associated with the eligible categories.

Section 3: Impact of Use of Proceeds

All five use of proceeds categories are aligned with those recognized by the GBP. Sustainalytics has focused on three below where the impact is specifically relevant in the local context.

Importance of energy-efficient network infrastructure

According to a report by McKinsey & Company, the telecom sector accounts for 2-3% of the total global energy demand.[17] While transferring data through the current mobile networks consumes about 15% of energy, the remaining 85% is lost due to the heat loss in power amplifiers, the intermittent operations of the equipment, and inefficient network infrastructure which includes rectifiers, cooling systems and battery units.[18] In the case of the fixed-line network, the plain old telephone service (POTS) and the broadband access network

[10] Vodafone Ziggo, Environment: https://www.vodafoneziggo.nl/en/samenleving/environment/
[11] VodafoneZiggo shared this document with Sustainalytics, and it was assessed on a confidential basis.
[12] Additional measures include copies of certificates, permits and/or licenses for all e-waste suppliers, evidence nots of treatment/disposal of e-waste, and evidence of clauses in contracts defining responsibility and provision made for take back of waste electronic equipment.
[13] VodafoneZiggo, Code of Sustainable and Ethical Purchasing: https://www.vodafoneziggo.nl/documents/48/VodafoneZiggo_Code_of_Sustainable_and_Ethical_purchasing_Version.pdf
[14] EcoVadis: https://ecovadis.com/
[15] VodafoneZiggo, Code of Conduct: https://www.vodafoneziggo.nl/documents/174/VZ_Code_of_conduct_English.pdf
[16] VodafoneZiggo shared this document with Sustainalytics, and it was assessed on a confidential basis.
[17] McKinsey & Company report, "The case for committing to greener telecom networks" at https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-case-for-committing-to-greener-telecom-networks
[18] McKinsey & Company report, "The case for committing to greener telecom networks" at https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-case-for-committing-to-greener-telecom-networks

account for up to 50% of the total network energy consumption, making the narrow-band and broadband access nodes the focal points of energy efficiency within fixed line networks.[19]

The European wireless network industry is bracing for the advent of the next-generation 5G services, which is expected to reach a market size of EUR 26.06 billion by 2025.[20] In its '5G for Europe Action Plan', the European Union has noted that "5G is seen as a game changer, enabling industrial transformations through wireless broadband services provided at gigabit speeds, the support of new types of applications connecting devices and objects (the Internet of Things), and versatility by way of software virtualization allowing innovative business models across multiple sectors."[21] In addition to the expected social and economic opportunities coming from the deployment of and enabling technology from 5G networks, there are also some potentially compelling environmental benefits. 5G networks have been modelled to use up to 90% less energy used per bit compared with 4G[22] and experts predict that even if initial versions of 5G networks consume similar amounts of energy compared to their predecessors, this will decline over time as both network optimization and energy efficient hardware is developed further.[23] In the Netherlands, the launch of 5G commercial services began in 2020, when the government raised EUR 1.23 billion from its first 5G bandwidth auction.[8] Through its Connectivity Action Plan[24] and Dutch Digital Strategy 2.0,[25] the Dutch government has also underscored the need for "major investments by market parties" to facilitate timely introduction of 5G in the country.

The European Union, through its 2030 Climate and Energy Framework, has set several targets, including achieving a minimum of a 32.5% improvement in energy efficiency.[26] In line with this, the Netherlands set an absolute target of achieving a primary energy consumption of 1,950 petajoule (PJ) by 2030, a reduction of 873 PJ of energy consumption compared to 2018.[27,28]

Based on this context, Sustainalytics is of the opinion that VodafoneZiggo's investment in the wireless network transformation to 5G, along with the investments in energy-efficient fixed-line network infrastructure, offers the potential for energy-efficiency savings. Sustainalytics encourages VodafoneZiggo to develop and deploy both infrastructure and hardware that will enhance the social, economic and environmental benefits of these newer technologies. Overall, Sustainalytics expects VodafoneZiggo's investments to contribute to the Netherlands' national goals and to the transition towards a low-carbon economy.

Impact of IoT to create energy-efficient ecosystem

According to a report by the IDC, the Internet of Things (IoT) is expected to become a EUR 891 billion market by 2022.[29]The IoT is a system of interrelated devices that connects devices, software, or data, enabling advanced services that are only possible with the interactions among these devices and data. This interaction among devices and data further enables improvements in efficiency and reliability, which also enhances overall energy efficiency for end users.[30] For instance, as indicated in the publication from the European Consumer Organization on smart metering, the accessibility of real-time energy consumption data for both the supply and demand of energy, energy suppliers and consumers can better manage and control their energy distribution and consumption. This can increase overall energy efficiency through enhanced optimization of energy distribution and consumption.[31] In 2016, the 3rd Generation Partnership Project (3GPP), a member-

[19] Huawei energy efficiency solution whitepaper, "Improving energy efficiency, Lower CO2 emission and TCO" at http://www.mobilontelecom.com/upload/Huawei-Energy-Efficiency-White-Paper.pdf
[20] Market Data forecast analysis, "Europe 5G Services Market Research – Segmentation By Vertical (Smart Cities, Connected Vehicles, Connected Factories, Smart Buildings, Smart Utilities, Connected Healthcare, and Broadband Services), Application (eMBB, MMTC and URLLC, and FWA), and Region - Forecast to 2025", at https://www.marketdataforecast.com/market-reports/europe-5g-services-market
[21] European Commission, 5G for Europe: An Action Plan, 2016, available at: https://ec.europa.eu/%20newsroom/dae/document.cfm?doc_id=17131
[22] DATA Makes Possible by Western Digital, "5G vs. 4G – A Side-by-Side Comparison", (2019), at: https://datamakespossible.westerndigital.com/5g-vs4g-side-by-side-comparison/
[23] IEEE Spectrum, The 5G Dilemma: More Base Stations, More Antennas—Less Energy?, 2018, at: https://spectrum.ieee.org/energywise/telecom/wireless/will-increased-energy-consumption-be-the-achilles-heel-of-5g-networks
[24] Ministry of Economic Affairs and Climate Policy, Government of the Netherlands report, "Climate Action Plan", at https://www.government.nl/binaries/government/documents/reports/2018/07/13/connectivity-action-plan/Connectivity+Action+Plan.pdf
[25] Government of the Netherlands report, " Dutch Digitisation Strategy 2.0" at https://www.nederlanddigitaal.nl/binaries/nederlanddigitaal-nl/documenten/publicaties/2019/11/13/english-version-of-the-dutch-digitalisation-strategy-2.0/Dutch+Digitisation+Strategy+2.0.pdf
[26] EU website, "2030 climate & energy framework", at https://ec.europa.eu/clima/policies/strategies/2030_en
[27] EU report, "Draft Integrated National Energy and Climate Plan 2021-2030" at https://ec.europa.eu/energy/sites/ener/files/documents/netherlands_draftnecp_en.pdf.pdf
[28] International Energy Agency report, "The Netherlands 2020 - Energy Policy Review" at https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/The_Netherlands_2020_Energy_Policy_Review.pdf
[29] CBI Miinistry of Foreign Affairs article, "The European market potential for integrated internet of things and big data services" at https://www.cbi.eu/market-information/outsourcing-itobpo/intergrated-internet-things/market-potential
[30] Internet of Things: Challenges and Opportunities (2014), Mukhopadhyay, S. C., & Suryadevara, N. K. To be retrieved from https://researchers.mq.edu.au/en/publications/internet-of-things-challenges-and-opportunities
[31] Empowering Consumers Through Smart Metering (2011), The European Consumer Organization: https://www.beuc.eu/publications/2012-00369-01-e.pdf

driven organization that develops technical specifications for cellular networks[32], introduced the enhanced machine-type communication (eMTC) and the Narrowband Internet of Things (NB-IoT), the two complementary IoT technologies that are made for different IoT use cases.[33] Research on the performance of eMTC and NB-IoT for smart city applications shows that both technologies can offer 8 years of battery life in a poor coverage scenario and the energy consumption for both technologies is function of the coverage conditions and data length.[34]

Given the above, Sustainalytics is of the opinion that VodafoneZiggo's investments into the expansion of the IoT network can contribute to reduced energy consumption of telecommunications networks and further enable energy efficiency savings of industry applications.

Importance of clean transportation to reduce GHG emissions

In 2019, the transportation sector accounted for 24% of direct CO_2 emissions from fuel combustion globally.[35] Even though electric vehicles make up a constantly growing share of total vehicles (over 1 million vehicles in 2015 and 2 million in 2016), fossil fuel-powered cars still dominate the landscape.[36] According to a report by the International Transport Forum (ITF), the volumes of the transportation sector will experience substantial growth across all its segments, including passenger and commercial cars, by 2050, resulting in potential CO_2 emissions increases of 60% by 2050.[37] The report also highlights that measures proposed within the transportation sector by signatories to the Paris Agreement are insufficient for meeting their targets if growing emissions from passenger and freight mobility are not addressed. [21]

Through its 2019 Climate Act, the Netherlands set a target to reduce 49% of the country's GHG emissions by 2030 (compared to 1990 levels) along with a 95% reduction target by 2050.[38] To achieve this target, the country aims to leverage upon developments within the transportation sector. The Dutch transportation sector reported the second-highest market share of Battery Electric Vehicles (as of Q1 2019), and highest number of EV charging stations in Europe.[39] Even in public transport, the country reported operating trains through 100% wind energy.[40] The country also aims to sell only zero-emission passenger vehicles by 2030.[41] To enhance the uptake of electric vehicles, the Netherlands provides 100% purchase tax exemption on the purchase of fully-electric vehicles and partial tax exemptions on the purchase of hybrid vehicles until 2024. [51] In 2020, the government also introduced a subsidy scheme on the purchase and lease of eligible electric cars until July 2025.[42] Given these incentives, it is estimated that about 400,000 electric passenger vehicles will enter the Dutch roads per year from 2030.[43] The market stakeholders and the Dutch government also foresee a charging requirement of 1.8 million public, semi-public and private charge points for the year 2030.[27]

Given this context, Sustainalytics favorably views VodafoneZiggo's financing of electric and hybrid vehicles and subsidized public transport cards for its employees that will result in reduced GHG emissions and, in turn, support the timely achievement of the Netherlands' climate goals.

Alignment with/contribution to SDGs

The Sustainable Development Goals (SDGs) were set in September 2015 and form an agenda for achieving sustainable development by the year 2030. This green bond advances the following SDGs and targets:

[32] Qualcomm report, "Understanding 3GPP – starting with the basics" at https://www.qualcomm.com/news/onq/2017/08/02/understanding-3gpp-starting-basics
[33] Qualcomm report, "LTE IoT is starting to connect the massive IoT today, thanks to eMTC and NB-IoT" at https://www.qualcomm.com/news/onq/2017/06/15/lte-iot-starting-connect-massive-iot-today-thanks-emtc-and-nb-iot
[34] Research Gate website, "Evaluating the Performance of eMTC and NB-IoT for Smart City Applications" at https://www.researchgate.net/publication/326773325_Evaluating_the_Performance_of_eMTC_and_NB-IoT_for_Smart_City_Applications
[35] IEA, Tracking Transport, (2019), at: https://www.iea.org/reports/tracking-transport-2019.
[36] Number of passenger cars and commercial vehicles in use worldwide from 2006 to 2015 in (1,000 units); https://www.statista.com/statistics/281134/number-of-vehicles-in-use-worldwide/; International Energy Agency, Global EV Outlook 2017; https://www.iea.org/publications/freepublications/publication/GlobalEVOutlook2017.pdf
[37] ITF Transport Outlook 2017, (2017), at: https://www.itf-oecd.org/sites/default/files/docs/transport-co2-paris-climate-agreement-ndcs.pdf
[38] Government of the Netherlands website, "Climate policy" at https://www.government.nl/topics/climate-change/climate-policy#:~:text=To%20combat%20climate%20change%2C%20the,Act%20on%20May%2028%2C%202019
[39] Autovista Group analysis, "Charging network density underpins BEV uptake", at https://autovistagroup.com/news-and-insights/charging-network-density-underpins-bev-uptake
[40] Guardian report, "Dutch electric trains become 100% powered by wind energy" at https://www.theguardian.com/world/2017/jan/10/dutch-trains-100-percent-wind-powered-ns
[41] European Metropolitan Transportation Authorities report, " Ambitions to achieve Zero Emission Mobility in Amsterdam region", at https://www.emta.com/spip.php?article1202&lang=fr#:~:text=In%202016%2C%20the%20Transport%20Authorities,must%20use%20100%25%20renewable%20energy.
[42] Wallbox report, "Everything You Need To Know About EV Incentives In The Netherlands" at https://wallbox.com/en_us/netherlands-ev-incentives
[43] Holland report, "Mission Zero Powered by Holland" at https://www.rvo.nl/sites/default/files/2019/06/Misson%20Zero%20Powered%20by%20Holland.pdf

Use of Proceeds Category	SDG	SDG target
Renewable Energy	7. Affordable and Clean Energy	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix
Energy Efficiency	7. Affordable and Clean Energy 9. Industry, Innovation and Infrastructure	7.3 By 2030, double the global rate of improvement in energy efficiency 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
Clean Transportation	11. Sustainable Cities and Communities	11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.
Eco-efficient and/or circular economy adapted products, production technologies and processes	12. Responsible Consumption and Production	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
Green Buildings	11. Sustainable Cities and Communities	11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries

Conclusion

VodafoneZiggo has developed the VodafoneZiggo Green Bond Framework under which it may issue green bonds and the use of proceeds to finance projects that aim to increase renewable energy capacity, enable energy efficiency, support the circular economy and reduce emissions from the transportation and buildings sector, all in the context of the telecommunications industry. Sustainalytics expects that the projects funded by the green bond proceeds will provide positive environmental impact.

The VodafoneZiggo Green Bond Framework outlines a process by which proceeds will be tracked, allocated, and managed, and commitments have been made for reporting on the allocation and impact of the use of proceeds. Furthermore, Sustainalytics believes that the VodafoneZiggo Green Bond Framework is aligned with the overall sustainability strategy of the company and that the green use of proceeds categories will contribute to the advancement of the UN Sustainable Development Goal 7, 9, 11 and 12. Additionally, Sustainalytics is of the opinion that VodafoneZiggo has adequate measures to identify, manage and mitigate environmental and social risks commonly associated with the eligible projects funded by the use of proceeds.

Based on the above, Sustainalytics is confident that VodafoneZiggo is well-positioned to issue green bonds and that the VodafoneZiggo Green Bond Framework is robust, transparent, and in alignment with the four core components of the Green Bond Principles 2018.

Appendices

Appendix 1: An overview of the different categories of technologies and practices for investments

Technology	Description
Narrowband Internet of Things (NB-IoT)	The NB-IoT is a technical specification for cellular networks that offers deeper coverage, low power consumption, low costs, and connection volume.[44] It is considered to be a cost-effective technology suitable for a wide range of applications, and any devices that have low energy consumption, low data transfer demands and are geographically dispersed can benefit from its deployment.[45]
enhanced Machine-type Communication (eMTC)	The eMTC is a technical specification for cellular networks that comes with attributes of portability, peak speed and voice capabilities and is better suited for use cases that involve voice calls, high bandwidth speed, and portable terminals.[46]
Ultra-Reliable Low Latency Communications (URLLC)	The URLLC is a 5G service category that facilitates critical applications that require quick response time and reliable results, such as autonomous driving or robotic surgery. For example, the URLLC standards require "sub-millisecond latency with error rates that are lower than 1 packet loss in 10^5 packets".[47]
Massive Machine Type Communications (mMTC)	The mMTC is a 5G service category that is designed to support up to 1 million battery-powered, low-cost and low-data-rate IoT devices per square kilometer. In other words, it is a narrowband Internet access for sensing, metering, and monitoring devices.[48] Some of the use cases include smart metering, smart waste management, smart parking, among others.
Enhanced Mobile Broadband (eMBB)	The eMBB is a 5G service category that helps improve the current 4G LTE networks tremendously and is essentially designed for providing high-bandwidth internet access.[49]
Self-organizing Network (SON)	The SON is a technology that was originally developed to streamline cellular RAN deployment and optimization and later found its application in minimizing the need for manual configuration of the network infrastructure, right from the installation to the troubleshooting phase. Besides the automation capabilities, SON is also known for reducing the energy requirements of the network.[50] With its increasing use-cases for 5G infrastructure, it is estimated that the SON will account for a market worth EUR 4.58 billion by 2022.[51]
Radio Access Network (RAN) Sharing	RAN sharing is a practice through which two or more operators share RAN and gain access to a mutually operated infrastructure. Given that

[44] DZone report, " Choosing Between eMTC and NB-IoT" at https://dzone.com/articles/choosing-between-emtc-and-nb-iot
[45] Vodafone, "Specialised Narrowband-IoT services", (2019), at: https://www.vodafone.com/business/iot/managed-iot-connectivity/nbiot#narrowbandiot-applications-and-solutions
[46] DZone report, " Choosing Between eMTC and NB-IoT" at https://dzone.com/articles/choosing-between-emtc-and-nb-iot
[47] International Telecommunication Union report, "Minimum requirements related to technical performance for IMT-2020 radio interface(s)" at https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2410-2017-PDF-E.pdf
[48] Medium report, " Ultra-Reliable Low-Latency Communication (URLLC)", at https://medium.com/5g-nr/ultra-reliable-low-latency-communication-urllc-9b2505e81579
[49] IoT For All report, "An Introduction to a Full 5G System" at https://www.iotforall.com/full-5g-system
[50] SciELO paper, "Energy efficiency as a SON mechanism for HSPA+ networks" at http://www.scielo.org.bo/scielo.php?script=sci_arttext&pid=S1683-07892011000100002
[51] SNS Telecom and IT report, " SON (Self-Organizing Networks) in the 5G Era: 2019 – 2030 – Opportunities, Challenges, Strategies & Forecasts" at https://www.snstelecom.com/son

	RAN accounts for about 60% of the total energy used at a mobile site[52], this inter-operator arrangement not only ensures CAPEX and OPEX savings but also helps reduce energy consumption for all participating networks.[53]
Off-grid hybrid power	The off-grid hybrid energy systems are being used to power the Base Transceiver Stations (BTS), facilitating wireless communication between user equipment and a network. An analysis of solar PV-diesel hybrid power systems for off-grid BTS units in Ghana suggests that the hybrid infrastructure has the potential to reduce GHG emissions by 90%, when compared to the BTS units that were powered by diesel generators.[54]
DOCSIS 3.1	DOCSIS 3.1 modems offer environmental benefits as they use advanced energy management protocols making them" much more energy efficient" than their predecessor DOCISIS 3.0 modems.[55]

[52] McKinsey & Company report, "The case for committing to greener telecom networks" at https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-case-for-committing-to-greener-telecom-networks
[53] Soha Farhat, Abed Samhat, Samer Lahoud, Bernard Cousin. Radio Access Network Sharing in 5G: Strategies and Benefits. Wireless Personal Communications, Springer Verlag, 2017, pp.1-26. ff10.1007/s11277-017-4321-1ff. ffhal-01546827f at https://hal.archives-ouvertes.fr/hal-01546827/document
[54] International Journal of Energy for a Clean Environment, "Techno-Economics of Solar PV-Diesel Hybrid Power Systems for Off-grid Outdoor Base Transceiver Stations in Ghana" at https://www.researchgate.net/publication/315935958_Techno-Economics_of_Solar_PV-Diesel_Hybrid_Power_Systems_for_Off-grid_Outdoor_Base_Transceiver_Stations_in_Ghana
[55] Heavy Reading whitepaper, " DOCSIS 3.1: Cable Tackles the Gigabit Challenge" at https://www.veexinc.com/assets/uploads/microsites/docsis31/HR%20DOCSIS%203.1%20Initiative%20WP%202-16-16.pdf

Appendix 2: Green Bond / Green Bond Programme - External Review Form

Section 1. Basic Information

Issuer name:	VodafoneZiggo
Green Bond ISIN or Issuer Green Bond Framework Name, if applicable:	VodafoneZiggo Green Bond Framework
Review provider's name:	Sustainalytics
Completion date of this form:	December 4, 2020
Publication date of review publication:	

Section 2. Review overview

SCOPE OF REVIEW

The following may be used or adapted, where appropriate, to summarise the scope of the review.

The review assessed the following elements and confirmed their alignment with the GBP:

☒	Use of Proceeds	☒	Process for Project Evaluation and Selection
☒	Management of Proceeds	☒	Reporting

ROLE(S) OF REVIEW PROVIDER

☒	Consultancy (incl. 2nd opinion)	☐	Certification
☐	Verification	☐	Rating
☐	Other *(please specify)*:		

Note: In case of multiple reviews / different providers, please provide separate forms for each review.

EXECUTIVE SUMMARY OF REVIEW and/or LINK TO FULL REVIEW *(if applicable)*

Please refer to Evaluation Summary above.

Section 3. Detailed review

Reviewers are encouraged to provide the information below to the extent possible and use the comment section to explain the scope of their review.

1. USE OF PROCEEDS

Overall comment on section *(if applicable)*:

The eligible categories for the use of proceeds — Renewable Energy, Energy Efficiency, Clean Transportation, Eco-efficient and/or circular economy adapted products, production technologies and process, and Green Buildings — are aligned with those recognized by the Green Bond Principles 2018. Sustainalytics considers that the eligible categories will lead to positive environmental impacts and advance the UN Sustainable Development Goals, specifically Goals 7, 9, 11 and 12.

Use of proceeds categories as per GBP:

☒	Renewable energy	☒	Energy efficiency
☐	Pollution prevention and control	☐	Environmentally sustainable management of living natural resources and land use
☐	Terrestrial and aquatic biodiversity conservation	☒	Clean transportation
☐	Sustainable water and wastewater management	☐	Climate change adaptation
☒	Eco-efficient and/or circular economy adapted products, production technologies and processes	☒	Green buildings
☐	Unknown at issuance but currently expected to conform with GBP categories, or other eligible areas not yet stated in GBP	☐	Other *(please specify)*:

If applicable please specify the environmental taxonomy, if other than GBP:

2. PROCESS FOR PROJECT EVALUATION AND SELECTION

Overall comment on section (if applicable):

VodafoneZiggo has established a Green Bond Committee comprised of senior representatives from its Treasury and Corporate Social Responsibility Team. The Committee will be responsible for evaluating and selecting projects in accordance with the eligibility criteria outlined in the Framework. Sustainalytics considers the project selection process in line with market practice.

Evaluation and selection

☒	Credentials on the issuer's environmental sustainability objectives	☒	Documented process to determine that projects fit within defined categories
☒	Defined and transparent criteria for projects eligible for Green Bond proceeds	☒	Documented process to identify and manage potential ESG risks associated with the project
☐	Summary criteria for project evaluation and selection publicly available	☐	Other *(please specify):*

Information on Responsibilities and Accountability

☒ Evaluation / Selection criteria subject to external advice or verification

☐ In-house assessment

☐ Other (please specify):

3. MANAGEMENT OF PROCEEDS

Overall comment on section *(if applicable)*:

VodafoneZiggo intends to track proceeds through a Green Bond Register, through which proceeds will be segregated and allocated towards the financing and refinancing of projects deemed as eligible under requirements and processes outlined in the Framework. Vodafone Ziggo has set a 36-month look-back period and intends to fully allocate within three years from the date of any applicable issuance. This is in line with market practice.

Tracking of proceeds:

☒ Green Bond proceeds segregated or tracked by the issuer in an appropriate manner

☒ Disclosure of intended types of temporary investment instruments for unallocated proceeds

☐ Other *(please specify)*:

Additional disclosure:

☐ Allocations to future investments only

☒ Allocations to both existing and future investments

☐ Allocation to individual disbursements

☒ Allocation to a portfolio of disbursements

☐ Disclosure of portfolio balance of unallocated proceeds

☐ Other *(please specify)*:

4. REPORTING

Overall comment on section (if applicable):

VodafoneZiggo intends to report allocation proceeds on its website on an annual basis until full allocation. Allocation reporting may include the total amount allocated to eligible projects, the share of the net proceeds or an amount equal to the net proceeds for financing vs. refinancing, and the balance of unallocated proceeds. In addition, VodafoneZiggo is committed to reporting on relevant environmental impact metrics, where feasible. Sustainalytics views VodafoneZiggo's allocation and impact reporting as aligned with market practice.

Use of proceeds reporting:

☐ Project-by-project

☒ On a project portfolio basis

☐ Linkage to individual bond(s)

☐ Other *(please specify):*

Information reported:

☒ Allocated amounts

☒ Green Bond financed share of total investment

☐ Other *(please specify):*

Frequency:

☒ Annual

☐ Semi-annual

☐ Other (please specify):

Impact reporting:

☐ Project-by-project

☒ On a project portfolio basis

☐ Linkage to individual bond(s)

☐ Other (please specify):

Information reported (expected or ex-post):

☐ GHG Emissions / Savings

☒ Energy Savings

☐ Decrease in water use

☒ Other ESG indicators (please specify): Tons of CO_2 equivalent avoided/Terabyte; tons of CO_2 equivalent avoided/RGU; square meter of green buildings, by certification type and level.

Frequency

☒ Annual

☐ Semi-annual

☐ Other (please specify):

Means of Disclosure

☐ Information published in financial report

☐ Information published in sustainability report

☐ Information published in ad hoc documents

☒ Other (please specify): Company's website.

☐ Reporting reviewed (if yes, please specify which parts of the reporting are subject to external review):

Where appropriate, please specify name and date of publication in the useful links section.

USEFUL LINKS (e.g. to review provider methodology or credentials, to issuer's documentation, etc.)

SPECIFY OTHER EXTERNAL REVIEWS AVAILABLE, IF APPROPRIATE

Type(s) of Review provided:

☐ Consultancy (incl. 2nd opinion)
☐ Certification
☐ Verification / Audit
☐ Rating
☐ Other *(please specify):*

Review provider(s): **Date of publication:**

ABOUT ROLE(S) OF INDEPENDENT REVIEW PROVIDERS AS DEFINED BY THE GBP

i. Second-Party Opinion: An institution with environmental expertise, that is independent from the issuer may issue a Second-Party Opinion. The institution should be independent from the issuer's adviser for its Green Bond framework, or appropriate procedures, such as information barriers, will have been implemented within the institution to ensure the independence of the Second-Party Opinion. It normally entails an assessment of the alignment with the Green Bond Principles. In particular, it can include an assessment of the issuer's overarching objectives, strategy, policy and/or processes relating to environmental sustainability, and an evaluation of the environmental features of the type of projects intended for the Use of Proceeds.

ii. Verification: An issuer can obtain independent verification against a designated set of criteria, typically pertaining to business processes and/or environmental criteria. Verification may focus on alignment with internal or external standards or claims made by the issuer. Also, evaluation of the environmentally sustainable features of underlying assets may be termed verification and may reference external criteria. Assurance or attestation regarding an issuer's internal tracking method for use of proceeds, allocation of funds from Green Bond proceeds, statement of environmental impact or alignment of reporting with the GBP, may also be termed verification.

iii. Certification: An issuer can have its Green Bond or associated Green Bond framework or Use of Proceeds certified against a recognised external green standard or label. A standard or label defines specific criteria, and alignment with such criteria is normally tested by qualified, accredited third parties, which may verify consistency with the certification criteria.

iv. Green Bond Scoring/Rating: An issuer can have its Green Bond, associated Green Bond framework or a key feature such as Use of Proceeds evaluated or assessed by qualified third parties, such as specialised research providers or rating agencies, according to an established scoring/rating methodology. The output may include a focus on environmental performance data, the process relative to the GBP, or another benchmark, such as a 2-degree climate change scenario. Such scoring/rating is distinct from credit ratings, which may nonetheless reflect material environmental risks.

Disclaimer

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The Green Bond Principles