°CICERO Shades of Green

Yara
Company assessment

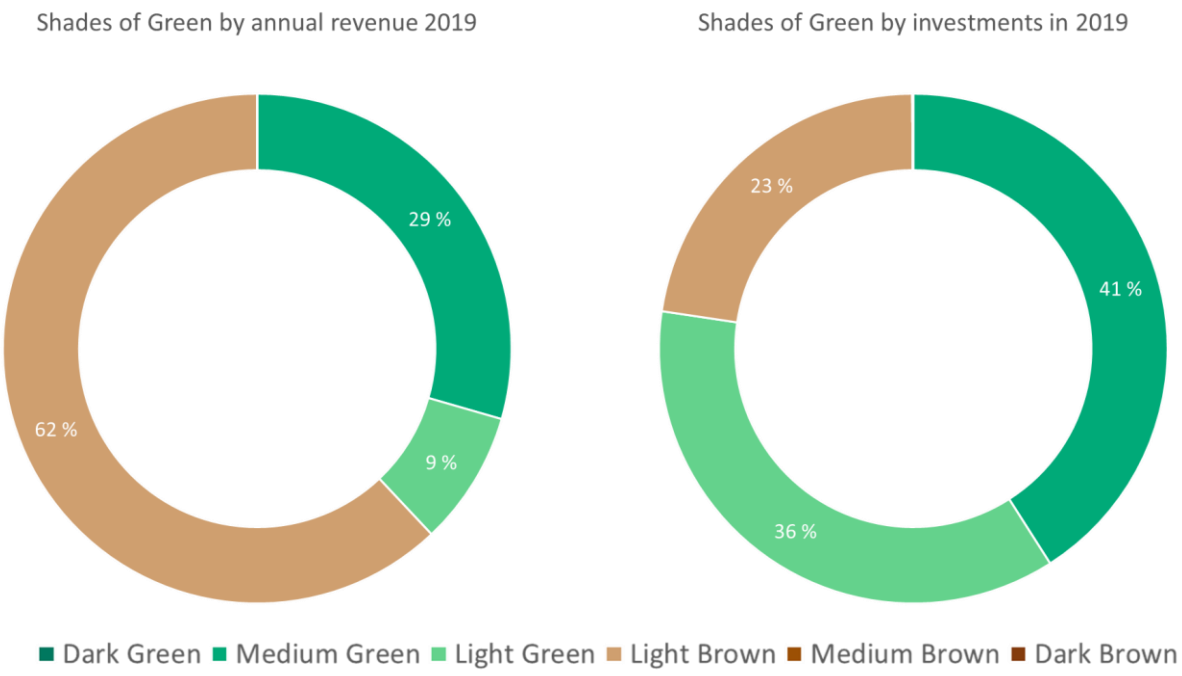
Chemicals/Materials (sector)

Region: Global with production sites on six continents

August 31, 2020

Executive summary

Yara International ASA was the first and is one of the world's largest producers of mineral nitrogen fertilizer. The company also encompasses the production of nitrates, ammonia, Urea and other nitrogen-based chemicals. The company is listed on the Oslo Stock Exchange and has its headquarters in Oslo. The company has around 16,000 employees, 28 production sites on six continents, operations in more than 60 countries and sales to about 160 countries. About half of Yara's production capacity, and about 40% of its markets, are in Europe.

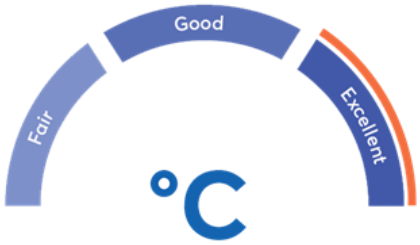


Almost 40% of Yara's revenue in 2019 was from fertilizers, products and services shaded green (s. left). 77% of 2019 investments went to assets and activities shaded green (s. right). Yara's production of nitrate, nitric acid, NPK and other nitrogen chemicals which features approximately 90% less N_2O emissions and is also commercially available to third parties is shaded Medium Green. Light Green are chemicals, fertilizers and industrial services that substantially improve climate impacts compared to business-as-usual, incl. Yara's mining investments. Finally, a Light Brown shading is given to other products, mainly from ammonia, Urea and third party products as well as investments in shipping. Yara has no revenue from Medium Brown or Dark Brown activities and currently does not invest in these activities. The Light Green category includes investments in and revenue from products that reduce local pollution problems. In some instances, the customer's use could be brown depending on the context such as scrubber technology for fossil fuel technology where alternative exists.

As a fertilizer company, Yara is naturally exposed to transition and physical risks associated with climate change and more extreme precipitation events. Yara informed us that for the most part local cases of flooding and damaging warehouses/on-site storage has been observed in the past and that investments are screened against extreme weather impact. In addition, Yara is exposed to indirect physical climate risks through their customers, mainly agricultural stakeholders, being exposed to increased physical risks. As Europe's largest private consumer of natural gas and with large parts of its fertilizer and chemicals business being based on fossil fuels, Yara is exposed to transition risks, e.g., through carbon pricing as well as technology risks through emerging low-carbon alternative solutions and opportunity risks, e.g., through future shipping solutions with green or blue ammonia. Yara is aware of physical and transition risks but has not yet implemented TCFD reporting and scenario analysis.

Today, agriculture causes about one quarter of global greenhouse gas (GHG) emissions, with land use change originating from agricultural expansion being the main culprit. The manufacturing of mineral fertilizers contributes to GHG emissions directly (Scope 1 and 2) and in the application of the product due to soil emissions from microbe metabolism (Scope 3). However, fertilizers are also vital in limiting the need to expand farmland and the associated land use changes. Yara is currently developing two pilot projects demonstrating zero-emission ammonia production. The ammonia process combines nitrogen from the air with hydrogen, which is mostly harvested from natural gas. The pilot projects will be based on supply of hydrogen from renewable energy and electrolysis of water. Ammonia is used as a basis for synthetic nitrogen fertilizers globally. In addition, CICERO Green encourages Yara to increased focus on reduced emissions resulting from final application of the fertilizers.

Yara has high transparency on environmental governance structure and good reporting procedures and standards. Yara has set carbon intensity targets, but no absolute emission targets. In addition, Yara has established a Carbon neutral solutions business unit. Yara has a long-standing track-record of reporting key environmental indicators while not yet reporting according to TCFD recommendations. While Yara could implement wider targets and reporting schemes according to green and brown investments and revenue, CICERO Green assesses Yara's governance score as **Excellent**.



While it is currently unclear to which extent Yara's activities comply with the proposed EU taxonomy, CICERO Green currently assumes that 38% of Yara's revenue could comply with the taxonomy and 41% of Yara's investments and potentially additional 36% invested in Yara's mining activities could qualify. However, this is dependent on to which extent investments in infrastructure that only indirectly supports nitric acid, NPK or nitrates production would qualify (e.g., acquisition of phosphate mines) and if all of the EU taxonomy's criteria are met in detail by Yara. In addition, the taxonomy poses the conflict that only parts of Yara's activities could align with the taxonomy, e.g., the company produces ammonia and subsequently uses the ammonia in a separate plant for nitric acid production. While the ammonia plant would not qualify according to the emission thresholds suggested in the EU taxonomy, the nitric acid production itself would qualify due to separate section in the taxonomy.

Table 1 Measured specific sector metrics for Yara.

Specific sector metrics	Emission intensity KPI (tCO_2e/t N-fertilizer produced)	Scope 1+2 / Scope 1+2+3 Emissions ($MtCO_2e$)	NOx emissions as NO_2 (tonnes)	Energy intensity (GJ/ton ammonia)
2019	3.0	18.5 / 74.2	8,500	33.7
2018	3.0	17.6 / 70.1	9,400	33.9
2017	2.9	16.0 / 65.5	7,800	33.7

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Contents

1 Terms and methodology

The aim of this analysis is to be a practical tool for investors, lenders and public authorities for understanding climate risk. This first iteration provides several key elements of this analysis but should be viewed as a starting point for discussion and further development, rather than a conclusive analysis.

Shading corporate revenue and investments

Our view is that the green transformation must be financially sustainable to be lasting at the corporate level. We have therefore shaded the company's current revenue generating activities. Shaded investments add a forward-looking element and provide insight into future revenue streams and corporate strategy in relation to the green transformation.

The approach is an adaptation of the CICERO Shades of Green methodology for the green bond market. The Shade of Green allocated to a green bond framework reflects how aligned the likely implementation of the framework is to a low carbon and climate resilient future, we have rated investments and revenue streams similarly. To encompass the full scale of potential projects, we have added three "brown" categories. While some projects with fossil fuel elements might be accepted, we are careful to avoid projects that increase the capacity or longevity of fossil fuel infrastructure.

SHADES OF GREEN AND BROWN	EXAMPLES
Dark green is allocated to projects and solutions that correspond to the long-term vision of a low carbon and climate resilient future.	Wind energy projects with a governance structure that integrates environmental concerns.
Medium green is allocated to projects and solutions that represent steps towards the long-term vision but are not quite there yet.	Green buildings with a high level of certification and energy efficiency
Light green is allocated to projects and solutions that are environmentally friendly but do not by themselves represent or contribute to the long-term vision.	Substantially more efficient manufacturing of fossil fuel intensive materials
Light brown for efficiency improvements in projects that are associated with fossil fuel use but do not necessarily promote locking-in of emissions. Changes in the way assets are used may position them in the light green category.	Efficient fossil fuel cargo vessels
Medium brown projects can be lower emissions, but still represent risk of locking-in fossil fuel infrastructure and are exposed to risk of stranded assets.	Efficiency in fossil fuel infrastructure
Dark brown for the heaviest emitting projects, with the most potential for lock-in of emissions and risk of stranded assets.	New infrastructure for coal

While the green shading in our company assessment indicates the over-arching direction of a company's investments in a green finance perspective, more in-depth scrutiny of the investments is required in order to qualify for use of proceeds green financing.

In addition to shading from dark green via light green to dark brown, CICERO Shades of Green also includes a governance score to show the robustness of the governance structure. The company assessment also provides investors and lenders with information on possible alignment to the EU taxonomy as well as companies' environmental governance structure, including an assessment of how companies respond to the TCFD recommendations on climate-related risk disclosure.

We have only shaded revenue or investments to the extent we were able to find sufficient information. Our data sources are company reports, as well as CDP responses supplemented by company responses. We aim to develop a methodology based on publicly available sources.

2 Brief description of Yara's activities, strategies and related policies

Company description

Yara International ASA was the first and is one of the world's largest producers of mineral nitrogen fertilizer. The company encompasses the production of nitrates, ammonia, Urea and other nitrogen-based chemicals. The company is listed on the Oslo Stock Exchange and has its headquarters in Oslo. The company has around 16,000 employees, 28 production sites on six continents, operations in more than 60 countries and sales to about 160 countries. About half of Yara's production capacity, and about 40% of its markets, are in Europe.

Yara's ambition with fertilizers, crop nutrition programs and technologies is to increase yields, improve product quality and reduce the environmental impact of agricultural practices. Its business was divided in three segments: Production, Sales & Marketing and New Business. Effective 1 June 2020, Yara will move from a segment structure to a regional organizational structure. Yara's operations will comprise four profit centers, of which three are regional units and a fourth unit for global production plants and operational excellence including health and safety. In addition, Yara will establish a new Farming Solutions global function.

The company produces both commodity and premium products, but primarily targets growth in the latter. Consequently, Yara produces all upgrade steps of fertilizers based on ammonia, which Yara uses for the production of Urea, Nitric acid, nitrates as well as nitrogen-based compound fertilizers (NPK). Yara is the second largest producer of ammonia globally and the largest producer of NPK.

Yara sells urea, technical ammonium nitrate and calcium nitrate for industrial applications within mining applications, environmental solutions and industrial nitrates. Yara's portfolio of environmental solutions includes total solutions for NOx abatement for industrial plants and transport at both land and sea. The main external revenues within this area are derived from the product AdBlue/Air1, a high concentration urea-based reagent used by heavy-duty diesel vehicles to reduce nitrogen oxide emission.

Climate risk exposure

Today, agriculture causes about one quarter of global greenhouse gas (GHG) emissions, with land use change originating from agricultural expansion being the main culprit[1]. In Norway, 8.6 % of total GHG emissions are agricultural, with slightly falling trend since the 1990s[2]. The lower figure for Norway is partly explained by less agricultural expansion and thus less land use change. Global emissions from the production of mineral fertilizers (indirect emissions from use not included) are ca. 300 million metric tonnes of CO_2 per year[3]. This represents around 0.8 % of global CO_2 emissions[4].

The manufacturing of mineral fertilizers contributes to GHG emissions directly (Scope 1 and 2) and in the application of the product due to soil emissions from microbe metabolism (Scope 3). However, fertilizers are also

[1] https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf
[2] Emission figures from 2018. Source: Miljøstatus.
[3] Graves et al, 2018
[4] Calculated with 36 192 million tonnes of CO_2, the average of 2017 and 2018 global CO_2 emissions according to the Global Carbon Budget

vital in limiting the need to expand farmland and land use changes. Use of nitrogen fertilizers represents both a substantial part of the indirect energy consumption and the potential environmental impact of farming. As a global fertilizer production company, Yara is exposed to physical and transition climate risks.

The chemical used as a basis for all synthetic nitrogen fertilizers globally is ammonia. While a steady growth in consumption of nitrogen was observed over recent years[5], the IEA predicts further increase in production in the coming years, mainly led by Asia Pacific. The fertilizers Urea and other synthetic nitrogen fertilisers support approximately 50% of the world's food production.[6]

Ammonia is produced from nitrogen from the air reacting with hydrogen, mostly harvested from natural gas. Ammonia can also be produced by hydrogen and renewable energy, but Yara has not identified this as being economically feasible in a commoditized market as of today, but the company is working to identify value pockets for green products. Yara is currently developing two pilot projects demonstrating zero-emission ammonia production. Yara also sources phosphorous and potash, e.g., for NPK fertilizers. Ammonia could also be used as an emissions-free fuel for shipping.

Both the agricultural sector and industrial fertilizer producers are exposed to climate risk. The Norwegian government, in cooperation with the EU, aims to reduce emissions from agriculture by 40% until 2030, along the targets for other sectors in the EU emissions trading system (ETS). Yara's European fertilizer plants are formally included in the ETS system and are thus required to balance their emissions against emission allowances, which means an exposure to carbon prices.

Due to historical emissions, we are de facto already locked in for approximately 1.5°C global warming.[7] Given today's policy ambition, the world is most likely heading toward 3°C warming in 2100 which implies accelerated physical climate impacts, including more extreme storms, accelerated sea level rise, droughts and flooding.[8] For near-term physical risk, investors and companies must consider the probabilities of physical events and resiliency measures to plan for and protect against the worst impacts. For globalized fertilizer production companies such as Yara the most severe physical impacts will likely be increased flooding, as well as increased storms and extreme weather. Severe impacts on production facilities and supply chains are expected. Developing projects with climate resilience in mind is critical for this sector. Yara also finds it likely that climate change represents upside risks, such as opportunities for green products and higher demand for knowledge-based crop nutrition solutions.

As a fertilizer company, Yara is naturally exposed to physical risks associated with climate change, such as more extreme precipitation events and associated flooding, mudslide and avalanche risks, stronger winds, heat stress and also sea level rise for production facilities close to the ocean. Yara informed us that for the most part local cases of flooding and damaging warehouses / on-site storage has been observed in the past. In addition, Yara is exposed to indirect physical climate risks through their customers, mainly agricultural stakeholder, being exposed to increased physical risks. A lack of ambitious policies at a global level to rapidly reduce greenhouse gas emissions, will increase the frequency of extreme events and increase the probability of physical damage to production facilities and associated infrastructure.

[5] https://www.yara.com/siteassets/investors/057-reports-and-presentations/other/2018/fertilizer-industry-handbook-2018-with-notes.pdf/
[6] https://www.iea.org/reports/tracking-industry/chemicals
[7] https://www.cicero.oslo.no/en/posts/news/scientists-demystify-climate-scenarios-for-investors
[8] https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full_wcover.pdf

In addition to the physical risks, Yara is also exposed to transition risks from stricter climate policies. Yara has identified transition risks associated with, e.g.,

- Policy risks through increased pricing of GHG emission. Yara is one of the largest industrial consumers of natural gas in Europe and its core business of producing fertilizers is energy- and emissions intensive, with no profitable short- to mid-term alternative production processes in view. Higher carbon prices will impact Yara's operating costs directly due to its emissions.
- Technology risks through substitution of existing products and services with lower emissions options. Due to climate change policies, the future viability of the diesel engine is uncertain, meaning this market can diminish. In addition, emerging Carbon Capture and Storage (CCS) technology could materialize as a technology risk.

Key statistics & background figures

Fertilizer production requires large amounts of energy and are very emission intensive, mainly through the use of natural gas. Almost 90% of Yara's energy consumption and 80% of direct GHG emissions are related to ammonia production.

Energy use

In 2019, 87% of Yara's total energy consumption (285 million GJ) were due to ammonia production, 9% due to feed and fuel consumption in other production as well as own electricity production and 4% due to purchased energy (mostly electricity). According to Yara, electricity produced is mostly as a biproduct of steam/pressure production and excess energy from the burning of ammonia to produce nitric acid. Yara also informed us that the company currently does not have an overview of share of renewable energy in the electricity mix purchased, does not produce significant amounts of own renewable energy and does not use Guarantees of Origin certificates.

Natural gas is the main fuel used by Yara, with close to a 95% share of the total fuel use. Yara also consumes fuel oil (mainly in Germany), Liquefied Petroleum Gas (LPG) and wood chips for the production of fertilizers. With 249 million MMBtu of natural gas consumed in 2019, Yara is the largest private industrial consumer of natural gas in Europe. Globally, the largest energy suppliers are Gail (India), Equinor (Norway), Engie (France), RWE (Germany), BP (UK), ENI (Italy), National Gas Company of Trinidad and Tobago (NGC), Comgas (Brazil) and Santos (Australia).

Emissions

Yara's total Scope 1, 2 and 3 emissions amounted to 74.2 $MtCO_2e$ in 2019 (see Figure 1).

Yara's Scope 1 emissions amounted to 17.1 $MtCO_2$ in 2019 (an increase of 11.8% compared to 2015). In 2019, Yara emitted approximately 8.8 million tonnes CO_2e from European plants. Yara takes N_2O emissions into account according to the ISO 14040 Life Cycle Assessment standards and the emission factors provided by the IPCC Fourth Assessment Report (2007).

Yara's Scope 2 emissions due to purchased energy amounted to 1.4 $MtCO_2e$ in 2019. The recent increases in Scope 1 and 2 emissions are mainly due to Yara's recent acquisitions of plants in India and Brazil.

Yara's Scope 3 emissions totaled at 55.7 $MtCO_2e$ in 2019. 78% of Scope 3 emissions result from use of fertilizers and the rest from purchased fuels and raw materials as well as transport. Traded products or blended products based on third party components were not included in Scope 3 estimations, neither were any industrial uses of Yara products.

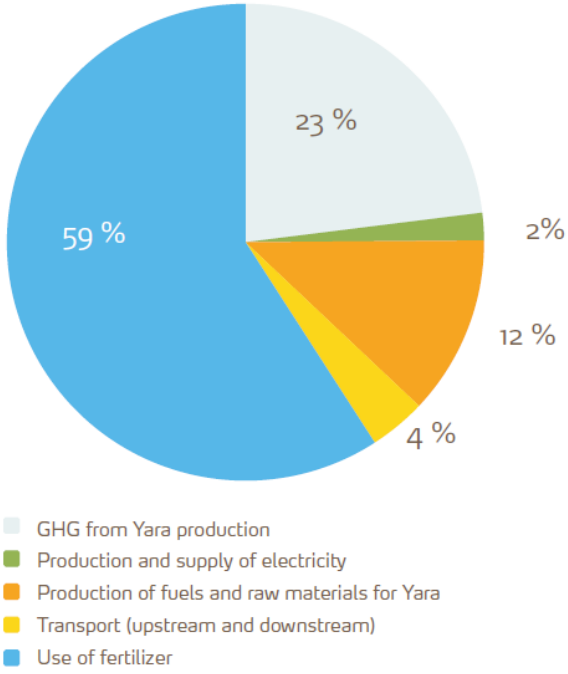


Figure 1: Yara's Scope 1, 2 and 3 greenhouse gas emissions from fertilizers produced by Yara (Source: Yara GRI report 2019, p. 64)

Yara's fertilizers have a carbon intensity below industry average according to Yara. The company also informed us that their best plants are better than EU average, while some plants are slightly worse. This is linked to the import of ammonia from non-EU plants, mainly FSU countries. For Yara's own improvement performance an emission intensity KPI has been defined that is not directly comparable to other industry values since it is not based on a full LCA. According to data validated by DNV-GL, the current EU average is between 3.3 and 3.5 tCO_2e/t N-fertilizer (incl. CO_2 captured in the product which will be released when in applied in agriculture).[9] The carbon footprint for the different fertilizer grades are verified by a third party. This includes emissions from third-party ammonia purchased.

Yara has also other emissions to air from its plants. In 2019, 8,500t of NO_2 were emitted (NO_2 has an acidifying impact when precipitated to water). While Yara continues to install abatement technology and reducing its emissions in its plants, NO_2 emissions have overall increased compared to 8,300t in 2015 mainly due to the acquisition of production plants.

Spreading urea on agricultural land for crop nutrition leads to CO_2 emissions from the hydrolysis of the urea. According to the EU ETS, this CO_2 is reported as emissions from the production process (the carbon originates from the processing of fossil fuel in the ammonia step). Spreading of nitrogen-based fertilizers also leads to N_2O emissions from the microbial processes in the soil (N_2O has a global warming potential of 265:1 compared to CO_2)

[9] https://www.fertilizerseurope.com/wp-content/uploads/2020/01/The-carbon-footprint-of-fertilizer-production_Regional-reference-values.pdf

Environmental Strategies and Policies

Yara has set up a long-term climate ambition defined for 2050 including becoming climate neutral by 2050 (Scope 1, 2 and 3 incl. accounting for climate benefit measures such as reduced land use change or soil carbon) as well as sustainability targets for the next decade. Yara has a strategic target to reduce CO_2e emissions intensity for Scope 1, 2 and upstream Scope 3 emissions from production by 10% by 2025 (2.7 tCO_2e/t f N-fertilizer produced) compared to 2018. According to Yara, these improvements will come from Scope 1 as no opportunities have been identified in Scope 3 as of now. Regarding energy use, Yara has set some product specific targets and aims for an annual energy usage decrease for Urea production and NH_3 fertilizer production. None of the energy related targets were achieved in 2019 due to operational reasons.

Yara currently anticipates using an internal carbon price within the next two years. In addition, Yara works together with external stakeholders in order to define a below 2-degree pathway for Yara's industry and to reach for a Science Based Target (SBT) for the company. Yara's most significant initiative to reduce GHG emissions so far is the development and installation of N_2O catalyst technology at its nitric acid plants. This technology removes about 90% of the N_2O emissions in Yara's plants and is also commercially available to third parties. Due to the significant reductions in GHG emissions from catalyst technology, Yara can offer nitrate fertilizers with lower climate impact.

In addition to the recently established business unit Climate Neutral Solutions, Yara has established a Circular Economy business unit and the new unit Digital Production which is tasked with improving energy efficiency with the help of digital solutions.

Yara has ISO 14001 certification covering all relevant parts of its operations in place. Yara has 6 out of 20 sites certified according to ISO 50001 and aims to have all sites certified by 2022. In 2019, Yara has breached air/water emission permits 15 times mainly through exceeded emission levels compared to 14 breaches in 2018. A target of reduction of breaches will be set in 2021. According to Yara, a target of zero breaches is not possible, since, e.g., a trip in production can trigger higher emissions for a duration of minutes/hour(s), causing a breach to hourly emissions limits which are set according to normal operating conditions.

Yara is engaging in research regarding its impact on climate change. Among others, Yara works with Oxford University on measuring and valuing externalities from agriculture and the food system. Furthermore, Yara contributes to the update process of the GHG Protocol for reporting procedures. Yara is aware of the large share of emissions through applications of fertilizers and has sought R&D partnership with Irish Teagasc to reduce those emissions and conducts active R&D for green nitrates and green ammonia production.

Yara has signed the UN Global Compact and is a founding member of the Food and Land Use Coalition. In addition, Yara is a member of the World Business Council for Sustainable Development (WBCSD) as well as of the One Planet Business for Biodiversity (OP2B) and an active member of the Business for Nature Coalition. Yara is also member of a list of groups, such as the European Sustainable Phosphorous Platform (ESPP), The Platform for Accelerating the Circular Economy (PACE), the European Biogas Association (EBA), the International Water Association (IWA), the Global Alliance for Climate Smart Agriculture (GACSA) and the Private Sector Mechanism at the UN Committee of World Food Security (CFS).

Yara actively engages with its customers and partners in the value chain on climate-related issues. This includes a campaign to encourage innovation to reduce climate change impacts for customers. This encompasses farmer workshops, demonstration field trials, digital tools and communications, train-the-trainer programs, precision farming technology and more. Yara does not require farmers to report on impacts, but Yara conducts own quality checks to demonstrate improvements. However, Yara expects to gradually improve the visibility of climate

performance at farm level through digital tools. Yara already calculates climate performance in field trials regularly.

Governance

When assessing the governance of Yara, CICERO Green looks at the overarching structures and procedures for decision making connected to climate risk analysis in Yara, climate-related strategy and policy formulation and implementation of these, including policies towards sub-contractors and use of LCA, handling of resilience issues and quality of reporting. Please note this is not a substitute for a full evaluation of the governance of Yara, and does not cover, e.g., corruption.

Yara's Board of Directors has the oversight of climate performance, risks and strategies and these are integrated in the reports to the AGM. The board provides strategy updates twice a year inclusive company performance on energy climate and environmental performance metrics. The Executive Vice Presidents of the new Regions hold line responsibility for company performance on GHG emissions.

Yara has a Corporate Risk function that also covers climate, and reports to the Risk Committee which is chaired by the CEO. The overall sustainability reporting process is owned by Yara's VP Sustainability Governance, reporting to the CFO. Sustainability governance and performance is overseen by the Board's Audit and Sustainability Committee.

Yara evaluates investments in assets against extreme weather events and mitigates risks associated with transition risks Yara is exposed to, e.g.,

- Policy risks through increased pricing of GHG emission: As a mitigation measure, Yara has established a business unit Climate Neutral Solutions which is tasked with approaching net zero emissions across the entire value chain Yara's operations.
- Technology risks: Yara has an Environmental Solutions business. Part of this business is catalyst reagent fluids for cleansing emissions from diesel engines. Yara supports the transition to a low-emission future, and runs innovation programs to identify new business opportunities to mitigate risks through exposure to diesel engines.

To counter climate risks, Yara has various sustainability policies and risk focused groups within the company. In addition, Yara has a multi-step process in place in order to manage climate-related risks:

- Risk appetite: The Board of Directors defines Yara's risk appetite annually.
- Country, plant level and business unit level: Country and plant managers identify and assess key risks as well as mitigation strategies.
- Company segment level: Same process as above at the segment managers level. This leads to risk pictures and risk mitigation plans which are reported to the CFO and Risk manager, who will update Yara Executive Management.
- Yara level: Based on the segment risk pictures and escalated risks, the CEO is responsible for the annual Yara level risk evaluation which aims to identify and assess key risks.

Yara has not yet implemented the TCFD recommendations and is not systematically using climate scenarios, but is planning to report according to TCFD as of 2021. Scenario analysis is used to analyze how different future states can impact a business. Yara anticipate implementing scenario analysis within the next two years. In the context of climate risk, scenario stress testing is useful for analyzing some risks and timeframes. To prepare for transition

risk and long term physical impacts, a range of scenarios from 2ºC to 4ºC should be considered. It is not necessary to conduct elaborate scenario testing to prepare for physical climate change over the next 10 years.

Reporting

Yara has a long-standing track-record of reporting key environmental indicators. Yara reports key indicators in its annual report and publishes a GRI report annually. Additionally, Yara reports to the CDP. Currently, Yara does not yet report transparently on its investment and revenue streams in order to allow for assessment of their climate impact. Yara informed us that it is likely that this will be implemented in the future.

Yara's GRI report covers governance, strategy, risks & opportunities, and other metrics such as energy consumption and intensity, biodiversity, water consumption and effluents, emissions and waste. The report also includes descriptions of calculation methodologies. Yara provides detailed breakdowns of its emissions, e.g., by scope, activity and country.

Yara reports in its annual report for 2019:

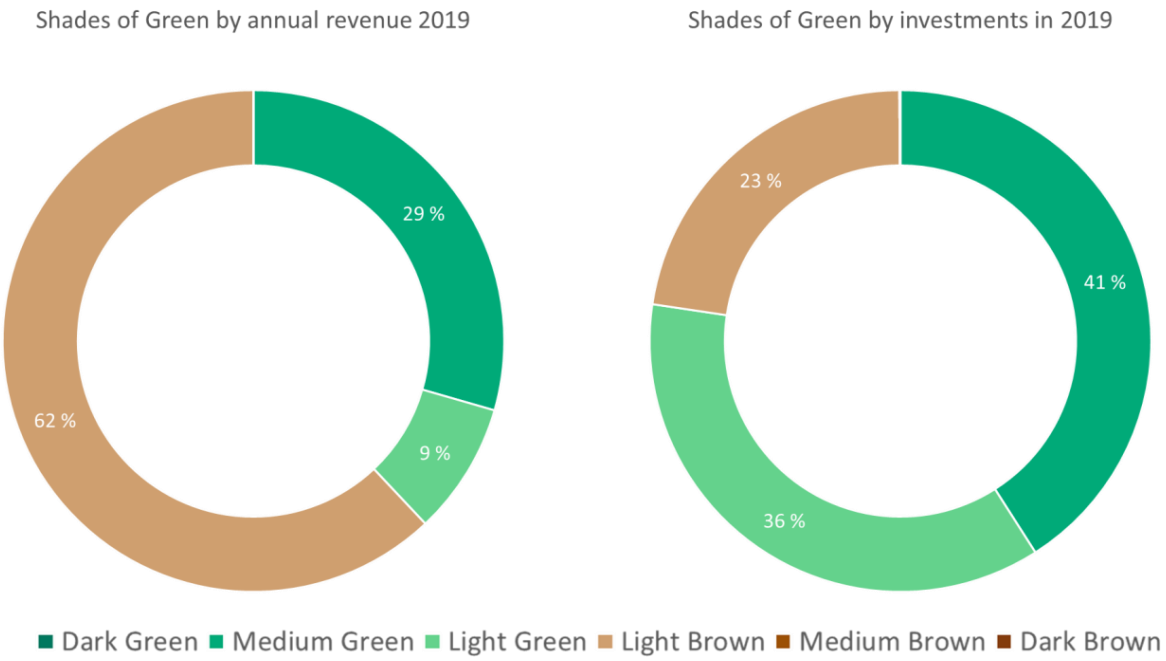
- Overall direct CO_2 emissions
- Carbon intensity
- Overall energy consumption
- NO_x, SO_x, dust emissions
- Raw material consumption of natural gas, phosphate, potash
- Water withdrawal
- Fines and penalties for environmental breaches (USD 229,000 in 2019)

Yara commits to regular reporting at least on an annual basis based on the GRI. The reporting will be published at the company's homepage. The carbon footprint for the different fertilizer grades as well as Yara's Scope 1, 2 and 3 emissions are verified by a third party. The climate-related information in the GRI report is externally verified.

Yara has the ambition of reporting according to TCFD guidelines as of 2021. However, advanced scenario analysis is expected to be implemented only after implementation.

3 Assessment of Yara's green activities and policies

According to CICERO Green's methodology Shades of Green or Brown should be allocated to the revenue stream and investments according to how these streams reflect alignment of the underlying activities to a low carbon and climate resilient future and taking into account governance issues. (See notes and methodology page for further details on shading).



With these provisions, we find that in 2019, 29% of Yara's revenue resulted from NPK, nitrates and calcium nitrates which are considered Medium Green. This represents the revenues from these products but from which an approximate value of ammonia used as an input for NPK production has been deducted. 9% are related to other chemicals as well as services and sales that are shaded Light Green. 62% result from activities rated Light Brown. Therefore, up to 38% of Yara's revenue in 2019 came from activities that receive some Shade of Green.

CICERO Green allocates a Dark Green shading to revenue streams stemming from fertilizer products and services that are part of a fully decarbonized and climate resilient future. These technologies already exist but are not fully commercially viable yet. Currently, Yara does not have substantial revenue streams shaded Dark Green.

A Medium Green shading is allocated to revenue streams stemming from fertilizer products and services that feature technology that supports the transition to decarbonized and climate resilient future. Yara's production of nitrate, nitric acid, NPK and other nitrogen chemicals which features approximately 90% less N_2O emissions and is also commercially available to third parties, is shaded Medium Green. The production of these fertilizers could be part of a 2050 solution, but is not yet Dark Green as, first, they require ammonia as input which is largely produced based on natural gas and, second, fertilizer production is ideally coupled with ultra-precision final application on the fields.

Light Green shadings are allocated to revenue streams that substantially improve climate impacts compared to business-as-usual, but do not in itself represent a bridging or long-term solution. Parts of Yara's business activities are industrial services and sales to clients outside of the agricultural business as well as chemicals that are sold to industrial clients. These revenues are shaded Light Green as Yara aims at improvements with urea, technical ammonium nitrate and calcium nitrate for industrial applications within mining applications, environmental solutions and industrial nitrates, solutions for NOx abatement for industrial plants and transport at both land and sea as well as AdBlue/Air1 a high concentration urea-based reagent used by heavy-duty diesel vehicles to reduce nitrogen oxide emission. Parts of these activities can feature substantial risks of lock-in and rebound and are rated Light Green, but could feature Light Brown elements if a more detailed analysis is conducted.

In addition to parts of Yara's industrial services, Light Brown shadings are allocated to revenue streams from all other products, mainly from ammonia, Urea and third party products. Revenues shaded Light Brown include the ammonia value of the nitrogen component in the products at market reference price. While CICERO Green recognizes the role fertilizers play in a decarbonized society, the 2050 solution should allow for a zero emission solution, zero emission input materials (e.g., ammonia) and ultra-precision application of fertilizers by the agricultural end users.

In 2019, none of Yara's investments are allocated to technology that are part of a 2050 solution which would result in Dark Green shading. However, Yara has invested, e.g., in zero emission transport vessels for its NPK transport as well as ammonia production that is based on hydrogen produced with renewable energy, which is considered Dark Green. Both investments clearly represent a long-term solution. Yara's investments in sites that produce nitric acid and NPK related assets are rated Medium Green. This extends to all investments streams that supports Yara's nitrate, nitric acid and NPK production, such as, e.g., the acquisition of phosphate mines. According to Yara, investments in 2019 are by 41% going towards nitrate, nitric acid and NPK related assets and are, therefore, rated Medium Green. In addition, investments into sites with ammonia production that is based on hydrogen is rated Medium Green if the emission intensity is significantly better than industry best practices. 36% % of investments are rated Light Green associated with Yara's mining activities as well as into a shipping terminal for Yara's green ammonia. While Yara's mines still feature fossil fuels and feature climate risks, Yara's activities imbed these assets into a trajectory toward a 2050 solution. However, Yara informed us that while the company is overall short on phosphorous in some of its markets and buying from other sources in addition to Yara's own mining capacity, Yara is not always using its mining products in the own NPK production. 23% of Yara's investments are characterized as Light Brown, mostly related to acquisitions and sites with Urea and ammonia production as well as shipping. Fossil fuel infrastructure investments that are not directly tied to the actual production of NPK, nitrates, nitric acid or hydrogen based ammonia are rated Light Brown. Investments into assets that yield revenue streams that are associated with different Shades of Green are split up according to the assets value attribution. E.g., if 90% of an asset value is based on production of NPK and 10% is producing other fertilizers, 90% of investments in this asset is rated Medium Green, 10% is rated Light Brown (more about the shading methodology in the paragraphs below). In this case, only the investments in Rio Grande and Ponta Grossa have been split up in Medium Green and Light Brown.

The Light Green category includes investments in and revenue from products that reduce local pollution problems. In some instances, the customer's use could be brown depending on the context such as scrubber technology for fossil fuel where alternative exists. In addition, CICERO Green encourages Yara to continuously implement zero-emission phosphate mining technology and best available technology to source raw materials in a responsible way.

Governance Assessment

When assessing the governance of Yara, CICERO looks at three elements: 1) Strategy, goals, policies including policies towards sub-contractors and use of LCA; 2) handling of resilience issues; and 3) reporting. Based on these

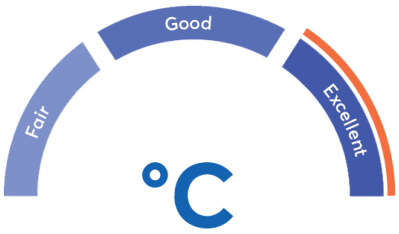
aspects, an overall grading is given on governance strength falling into one of three classes: Fair, Good or Excellent. Please note this is not a substitute for a full evaluation of the governance of Yara, and does not cover, e.g., corruption.

Yara has a set up a new business unit solely dedicated to focus on the company's decarbonization and circular economy. In addition, Yara has set up carbon intensity targets for its fertilizer production. However, Yara has breached air/water emission permits 14 times through exceeded emission levels.

While Yara has not yet formally implemented TCFD recommendations or systematically using climate scenarios, Yara is aware of physical and transition climate and environmental risks it is exposed to and is actively managing them. Yara considers acute and chronic physical risks, especially regarding production units in coastal regions and areas prone to flooding and cyclones. In addition, transition risks, especially through CO_2 pricing and the exposure to substantial natural gas consumption, are considered.

Yara has a long-standing track-record of reporting key environmental indicators. Yara reports in accordance with the GRI and publishes an annual report that makes performance improvements easily visible to investors, e.g. reporting plants' carbon intensity over multiple years. Yara could further improve reporting on natural resource use biodiversity and lifecycle impacts.

Assessing these elements, CICERO green concludes that Yara is getting an excellent score on all of the elements and is therefore given an overall governance score of **Excellent.**



Strengths

It represents a clear strength that Yara has a strong decarbonization ambition including a separate business unit focusing on decarbonization. Yara is aware of its exposure to fossil fuels and has implemented technology that reduces N_2O emissions of NPK production by more than 90% and that is made available to third parties which has a substantial impact on lowering Yara's climate impact. Yara is clearly one of the most advanced major fertilizer producers globally in terms of climate awareness.

It is a strength that Yara is actively contributing in several international alliances and is actively conducting research on low-carbon solutions incl. reducing climate impact through application of the fertilizer products by the end users. This includes investments in high-precision farming – a key contribution to reduce emissions from the agricultural sector and reduce broader environmental impact of fertilizer products.

Yara actively invests in 2050 solutions, such as ammonia production from hydrogen sourced with renewable energy and fossil free transport solutions. We encourage Yara to increase investments in these technologies and to make these technologies and solutions available to third parties.

Weaknesses

It is a weakness that Yara is basing large parts of its business on fertilizer production which are currently based on consumption of substantial amounts of natural gas.

In addition, it is a weakness that Yara has not yet implemented the TCFD recommendations and is not yet systematically using climate scenarios.

Pitfalls

According to Ecofys, indirect emissions are roughly 28% higher than direct emissions of fertilizer production. In addition, the IPCC underlines the magnitude of indirect emissions from the application of nitrogen containing fertilizers[10]. Thus, optimizing the amount of fertilizer needed and avoiding overfertilization, as well as taking temperature and other soil conditions into account can reduce indirect emissions. Significant rebound effects in Scope 3 emissions through application of more fertilizer products exist. CICERO Shades of Green encourages Yara to increased focus on reduced emissions resulting from final application of the fertilizers. Yara informed us that Yara has several in-house PhD thesis ongoing on this topic.

Yara does not require farmers to report on impacts. While Yara conducts own quality checks to demonstrate improvements, closing the reporting gap and ensuring reduced consumption of fertilizers from the farmers can ensure a steeper decline in Scope 3 emissions, which represent the majority of Yara's total emissions. However, Yara expects to gradually improve the visibility of climate performance at farm level through digital tools.

While Yara's revenue from industrial and maritime abatement technology is rated Light Green, it nevertheless represents a pitfall that these local pollution abatement technologies could lock in greenhouse gas emissions in the long term. Examples are retrofitting old vessels with scrubbers to comply with the IMO regulations and old natural gas power plants to comply with emissions regulations. We encourage the company to carefully assess these risks of lock-in in each individual case. In addition, Yara informed us that the Environmental Solutions group partly retrofits coal fire power plants with scrubber technology.

Yara informed us that nitrates and chemicals can be used for fertilizer applications as well as industrial applications. While CICERO Green recognizes the substantial improvements in production emissions, the final use of the end product can have implications on the shading of the product. Currently, NPK, nitrates and calcium nitrates are shaded Medium Green, whereas other chemicals are shaded Light Green. Chemicals could be used in the fossil fuel industry, but the company informed us that, e.g., nitric acid is sold for food processing, cleaning and disinfection. For a potential future green bond issuance, a split of final use would support a clearer distinction of the Shade of Green.

CICERO Shades of Green encourages Yara to consider monitoring and reporting on raw material sourcing, air quality impact and biodiversity impact in greater detail and communicate this in the annual report. In addition, the positive climate impact of its New Business segment remains unclear. While many of Yara's services and sales in this category can yield substantial efficiency improvements and are rated Light Green, some of them could actually increase climate footprint through, e.g., installation of scrubbers as well as associated rebound effects through reduced local pollution in shipping and trucking. We encourage Yara to be extra transparent on revenue and investments in this segment and to closely monitor the impact of these categories.

Yara could further improve reporting on natural resource use, biodiversity and lifecycle impacts. E.g., it remains unclear how Yara's products affect biodiversity due to nitrogen and phosphorus flows to the biosphere and oceans and how exactly Yara's products affect soil carbon stocks. In addition, life cycle data for some products is based on older data and does not include emissions released from fertilizer application. In addition, reporting natural resources could be improved, as potentially scarce and hard to substitute resources, such as phosphorous, can feature significant sourcing emissions. CICERO Shades of Green encourages Yara to consider monitoring and reporting raw material sourcing, air quality impact and biodiversity impact in greater detail.

[10] IPCC https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_11_Ch11_N2O&CO2.pdf

Yara informed us that while the company is overall short on phosphorous in some of its markets and buying from other sources in addition to Yara's own mining capacity, Yara is not always using its mining products in the own NPK production. This constitutes the pitfall that some of the mined phosphorous – from currently Light Green rated investments – might not actually contribute to a green value chain.

EU Taxonomy

The proposed EU taxonomy for sustainable finance [11] includes thresholds for the fertilizer sector, briefly summarized as follows:

- Manufacturing of nitric acid is eligible if the GHG emissions are below 0.302 tCO_2e/t
- Manufacturing of ammonia is eligible if scope 1 emissions are lower than 1 tCO_2/tAmmonia and combined CO_2 emissions (scope 1 emissions as well as scope 2 emissions from electricity consumed) are lower than 1,3 tCO_2/tAmmonia.

Furthermore, the EU taxonomy notes the main significant harm criteria of these two products:

- polluting emissions to air (especially nitrogen oxides (NOx), and ammonia (NH3)) from the production process;
- vulnerable ecosystems might be damaged by the construction and/or operation of the production facilities.
- the use of water resources for production purposes (especially for cooling processes) in water stressed areas; and
- the generation of hazardous wastes (e.g. spent catalyst material).

It is currently unclear how this will apply to Yara's activities as not all aspects of the EU taxonomy in relation to Yara's activities could be studied. Most of Yara's ammonia and Urea production does not comply with the EU taxonomy threshold. However, according to Yara, the ammonia plants that produce with purchased hydrogen from neighboring plants already have significantly lower emissions than the proposed EU taxonomy threshold even if additional Scope 3 emissions for the hydrogen production are taken into account (e.g., in Freeport).

In addition, ammonia production based on green hydrogen will most likely comply with the EU taxonomy. According to Yara, nearly all nitric acid plants comply with the EU taxonomy threshold of 0.302 tCO_2e/t. The company informed us that only two plants currently are non-compliant and that these will be upgraded, soon.

The company is also in the initial stages to conduct a screening of all plants with regards to the EU taxonomy's proposed "Do no significant harm" criteria and social safeguards.

The EU taxonomy does not specify how thresholds should be applied if companies are vertically integrated. In addition, there are no further specifications regarding end user application of fertilizer products and chemicals and minimizing resulting greenhouse gas emissions. Currently it appears that 38% of Yara's revenue would comply with the taxonomy and 41% of Yara's investments and potentially additional 36% invested in Yara's mining activities. However, this is dependent on to which extent investments in infrastructure that only indirectly supports

[11] Taxonomy: Final report of the Technical Expert Group on Sustainable Finance, March 2020. https://ec.europa.eu/knowledge4policy/publication/sustainable-finance-teg-final-report-eu-taxonomy_en

nitric acid, NPK or nitrates production would qualify (e.g., acquisition of and investments in mines) and if all of the EU taxonomy's criteria are met in detail.

Conflicts occur if, e.g., the company produces ammonia and subsequently uses the ammonia in a separate plant for nitric acid production. While the ammonia production largely does not comply with the EU taxonomy thresholds, the nitric acid production itself complies. In CICERO Green's perspective, Yara implemented a Medium Green solution for the nitric acid and NPK production that is still based on fossil fuel based ammonia and that has some supporting fossil fuel infrastructure. With Yara's nitric acid and NPK solutions, no significant lock in risk is represented. However, CICERO Green sees lock-in effects in the ammonia and Urea production and shaded them Light Brown as these feature significant emissions. The ammonia production based on natural gas is currently not EU taxonomy compliant, and a Urea production line requires more CO_2 from the ammonia step of the process than the EU Taxonomy threshold. CICERO Green encourages the issuer to rigorously develop zero-emission solutions for ammonia and Urea production and/or explore alternatives as well as to implement zero-emissions mining processes.

Appendix 1: Source List

Document Number	Document Name	Description
1	Annual Report 2018 and 2019	K2A's Green Equity Framework dated January 2020
2	Yara's GRI Report 2019	
3	CDP Response 2019 – Climate Change	Yara's response to CDP in 2019
4	Yara – Cicero start up meeting	Startup meeting presentation provided by Yara
5	Yara's revenue and investment breakdowns	

Appendix 2: Background

Today, agriculture causes about one quarter of global greenhouse gas (GHG) emissions, with land use change originating from agricultural expansion being the main culprit[12]. In Norway, 8.6 % of total GHG emissions are agricultural, with slightly falling trend since the 1990s[13]. The lower figure for Norway is partly explained by less agricultural expansion and thus less land use change.

For the case of Norway, around 30% of agricultural emissions are due to fertilization. This includes organic fertilizers such as manure from cows, and industrially produced mineral fertilizers. For organic fertilizers, emissions occur in the form of methane while it is stored. These emissions amount to 340 000 tCO_2e, or ca. 7.6% of agricultural emissions, and 0.7% of total Norwegian emissions.[14]. Emissions also occur from the spreading of manure, where 20-70% of the ammonia contained in manure evaporates (global average, IPCC) and forms nitrous oxide (N_2O has a global warming potential of 265:1 compared to CO_2). These emissions amounted to 600 000 tCO_2e, or ca. 13% of agricultural emissions, and ca. 1.2 % of total Norwegian emissions[15]. In total, manure stands for ca. 21% of agricultural emissions, and 2% of total Norwegian emissions.

For the use of mineral fertilizers at farm level, emissions occur after the fertilizer has been applied to the soil. Some of the nitrogen contained in the fertilizer is not taken up by plants, reacts with the soils and forms nitrous oxide. The intensity of these emissions depends on soil conditions – however, it has been stated that these indirect emissions from nitrogen containing mineral fertilizers are higher than the direct emissions from the production of the fertilizer.[16] These indirect nitrous oxide emissions from mineral fertilizer amount to 480 000 tCO_2e, or ca. 11% of agricultural emissions and ca. 0,9% of total Norwegian emissions.[17] In addition, while fertilizers such as NPK are considered efficient they nevertheless can contribute to depletion of soil of other micro-nutrients.

Direct and indirect emissions from fertilization as described above makes up ca. 32% of agricultural emissions, and ca. 3% of total national emissions. This group of emissions ranks second to direct methane emissions from ruminants, which amount to 51% of agricultural emissions and 4.4% of national emissions.

Global emissions from the production of mineral fertilizers (indirect emissions from use not included) are ca. 300 million metric tonnes of CO_2 per year[18]. This represents around 0,8 % of global CO2 emissions[19]. Industrial fertilizer production (essentially NH_3) accounts for 1% of world energy consumption and uses 3-5% of the worldwide natural gas. For Norway, mineral fertilizer production emitted 1.16 million tonnes of CO_2e in 2015, which contributed 2.2% to the total Norwegian CO_2e emissions that year. The fertilizer sector in Norway stands for a considerable part of industrial demand for natural gas.

Although methods to produce ammonia without natural gas, using hydrogen based on renewable electricity ("green" hydrogen), have pioneered the production of mineral fertilizers in the 19th century, these methods are

[12] https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf
[13] Emission figures from 2018. Source: Miljøstatus.
[14] Miljødirektoratet, miljøstatus, based on 2018 emission figures
[15] Miljødirektoratet, miljøstatus, based on 2018 emission figures
[16] Ecofys and IPCC
[17] Miljødirektoratet, miljøstatus, based on 2018 emission figures
[18] Graves et al, 2018
[19] Calculated with 36 192 million tonnes of CO2, the average of 2017 and 2018 global CO2 emissions according to the Global Carbon Budget

currently not commercially viable, according to industry actors and a report commissioned by the industry organisation Fertilizer Europe.[20] This report, compiled by energy consultancy Ecofys, examines alternatives to reduce greenhouse gas emissions and draws a roadmap for the industry until 2050. It states that the cheap availability of "green" hydrogen and its application at scale is not expected before 2050. The IEA includes the use of 50 Mtoe of electrolytic hydrogen for ammonia production and other industries in 2050 in its Sustainable Development Scenario[21], however expected dates for availability are not further specified. The Ecofys report concludes that the main focus should be on efficiency improvements in the current, natural-gas based method. According to the report, improvements of roughly 20% in modern European plants are possible over the current standard in Europe. In addition to energy efficiency improvements the report states two other routes to reduce greenhouse gas emissions from ammonia production, the introduction of CCS/CCU and improvements to how fertilizer is used at farm level. The IEA also reports that CCUS could be applied at relatively low costs to ammonia production due to the pure stream of CO_2 from the process.[22] Regarding the use of fertilizer at farm level, overfertilization results in unabsorbed nitrogen in the soil and the formation of nitrous oxide. These indirect emissions represent a considerable share of the overall emissions connected to fertilizer. The Ecofys report claims that indirect emissions are roughly 28% higher than direct emissions. In addition, the IPCC underlines the magnitude of indirect emissions from the application of nitrogen containing fertilizers[23]. Thus, optimizing the amount of fertilizer needed and avoiding overfertilization, as well as taking temperature and other soil conditions into account can reduce indirect emissions.

[20] Ecofys report
[21] Weo 2019, page 89
[22] IEA WEO 234
[23] IPCC https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_11_Ch11_N2O&CO2.pdf

Appendix 3: About CICERO Shades of Green

CICERO Green is a subsidiary of the climate research institute CICERO. CICERO is Norway's foremost institute for interdisciplinary climate research. We deliver new insight that helps solve the climate challenge and strengthen international cooperation. CICERO has garnered attention for its work on the effects of manmade emissions on the climate and has played an active role in the UN's IPCC since 1995. CICERO staff provide quality control and methodological development for CICERO Green.

CICERO Green provides second opinions on institutions' frameworks and guidance for assessing and selecting eligible projects for green bond investments. CICERO Green is internationally recognized as a leading provider of independent reviews of green bonds, since the market's inception in 2008. CICERO Green is independent of the entity issuing the bond, its directors, senior management and advisers, and is remunerated in a way that prevents any conflicts of interests arising as a result of the fee structure. CICERO Green operates independently from the financial sector and other stakeholders to preserve the unbiased nature and high quality of second opinions.

We work with both international and domestic issuers, drawing on the global expertise of the Expert Network on Second Opinions (ENSO). Led by CICERO Green, ENSO contributes expertise to the second opinions, and is comprised of a network of trusted, independent research institutions and reputable experts on climate change and other environmental issues, including the Basque Center for Climate Change (BC3), the Stockholm Environment Institute, the Institute of Energy, Environment and Economy at Tsinghua University and the International Institute for Sustainable Development (IISD).