

ASSESSMENT

2 January 2023



Send Your Feedback

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SK hynix Inc.

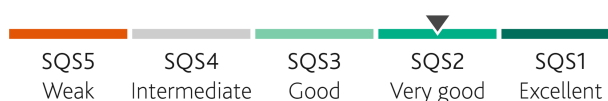
Second Party Opinion – Sustainability-Linked Financing Framework Assigned SQS2 Sustainability Quality Score

Summary

We have assigned an SQS2 sustainability quality score (Very Good) to SK hynix Inc.'s (SK hynix) sustainability-linked financing framework dated 16 December 2022. SK hynix will use the proceeds from the sustainability-linked instrument for general corporate purposes and has selected a key performance indicator (KPI) of "scope 1 and 2 greenhouse gas (GHG) emissions intensity". The main feature of this type of financing is the variation of the instrument's financial characteristics, depending on whether the company achieves predefined sustainability target. The framework is aligned with the five core components of the International Capital Market Association's (ICMA) Sustainability-Linked Bond Principles 2020 and the Loan Market Association's (LMA) Sustainability-Linked Loan Principles 2022¹. The company also incorporates recommended practices under these principles and all identified best practices. The framework demonstrates a significant contribution to sustainability.

Sustainability quality score

SQS2



Alignment with principles

SUSTAINABILITY-LINKED

Overall alignment



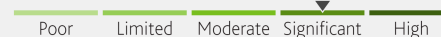
FACTORS

FACTORS	ALIGNMENT
Selection of KPIs	
Calibration of SPTs	
Instrument characteristics	
Reporting	
Verification	



Contribution to sustainability

Overall contribution



Expected impact
Relevance and magnitude

ADJUSTMENTS

ESG risk management	No adjustment
Coherence	No adjustment

Scope

We have provided a Second Party Opinion (SPO) on the sustainability credentials of SK hynix Inc.'s (SK hynix) sustainability-linked financing framework, including the framework's alignment with the ICMA's Sustainability-Linked Bond Principles 2020 and the LMA's Sustainability-Linked Loan Principles 2022. The company selected one KPI "scope 1 and 2 GHG emissions intensity per unit of production" as outlined in Appendix 2 of this report.

Our assessment is based on the last updated version of SK hynix's framework on 16 December 2022, and our opinion reflects our point-in-time assessment of the details contained in this version of the framework, as well as other public and non-public information provided by the company.

We produced this SPO based on our [Framework to Provide Second Party Opinions on Sustainable Debt](#), published in October 2022.

Issuer profile

SK hynix Inc. (Baa2 stable) is a Korean company that designs, manufactures and sells memory chips, such as dynamic random-access memory (DRAM) and NAND flash memory. It is the world's second-largest producer of memory chips. In the first half of 2022, DRAM accounted for 64% of the company's revenue, NAND 33% and others 3%. The company's revenue was KRW26 trillion (\$20 billion) in H1 2022. SK hynix is listed on the Korea Stock Exchange, with a market capitalization of KRW70.2 trillion as of 19 August 2022. As of 30 June 2022, SK hynix was 20.1% owned by SK Square Co., Ltd, a Korean investment company.

Strengths

- » The ambitiousness of the sustainability performance target (SPT) is significant, given that the chosen target goes beyond the company's business-as-usual (BAU) trajectory and relative to its peers.
- » The company's commitment to incorporate both an intermediate target on GHG emissions intensity and an absolute level in the SPT.
- » The timeline, baseline and trigger events are clearly disclosed.
- » Verification will be conducted until the maturity of the instrument.

Challenges

- » While estimating the downstream scope 3 categories may pose challenges to the sector that sells intermediate products, the lack of disclosure on the "use of sold products" in the company's scope 3 GHG emissions may not fully capture the firm's entire carbon footprint.

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Alignment with principles

SK hynix's sustainability-linked financing framework is aligned with the five core components of the ICMA's Sustainability-Linked Bond Principles 2020 and the LMA's Sustainability-Linked Loan Principles 2022, and incorporates recommended practices under these principles and all identified best practices:

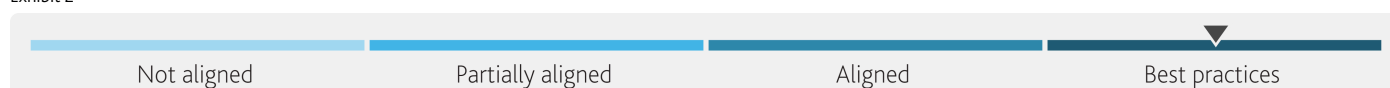
Exhibit 1

- | | | |
|--|---|---|
| <input type="radio"/> Green Bond Principles (GBP) | <input type="radio"/> Social Bond Principles (SBP) | <input type="radio"/> Green Loan Principles (GLP) |
| <input type="radio"/> Social Loan Principles (SLP) | <input checked="" type="radio"/> Sustainability-Linked Bond Principles (SLBP) | <input checked="" type="radio"/> Sustainability Linked Loan Principles (SLLP) |

Source: Moody's Investors Service

Selection of the key performance indicator (KPI)

Exhibit 2



Source: Moody's Investors Service

Definition – ALIGNED

SK hynix has clearly defined and disclosed the characteristics of selecting the KPI, including the units of measurement, the rationale and process for selection, the calculation methodologies and the scope (i.e., the entity(ies) or operations that the KPI applies to). These details will be included in SK hynix's sustainability-linked financing framework, which will be publicly available on the company's website, together with its annual reporting.

Measurability, verifiability and benchmark – BEST PRACTICES

The selected KPI is measurable, externally verifiable and can be benchmarked by relying on external references. The methodology used in connection with scope 1 and scope 2 GHG emissions is based on the definitions in the World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI)'s GHG Protocol Chapter 4 "Setting Operational Boundaries".² The calculation methodology is consistent, and in case of any changes to the calculation methodology, the company commits to an external verifier independently, confirming that the proposed revision is consistent with the initial level of ambition of the relevant SPT. Any changes to the calculation methodology will be communicated to investors/lenders. Historical performance data for at least the previous three years have been disclosed in the company's sustainability report.

Relevance and materiality – ALIGNED

The selected KPI is relevant, core and material to the company's business as 'climate change and GHG emissions' has been identified as the number one topic for SK hynix according to its materiality analysis, and is relevant to its goal of achieving net zero emissions by 2050. In 2021, scope 1 GHG emissions accounted for around 24% of SK hynix's total GHG emissions, while scope 2 accounted for around 45%. While SK hynix discloses its scope 3 GHG emissions data in its sustainability report, the lack of disclosure around downstream, particularly on the "use of sold products" in its scope 3 calculation may result in an incomplete representation of its entire scope 3 emissions. However, we recognise that a vast majority of sector peers currently do not disclose on "use of sold products" in their scope 3 emissions given sector specific challenges of accurately calculating emissions resulting from downstream end product use, and given that according to international standards, such as the GHG Protocol and SBTi, disclosure of this category is not a mandatory item for companies that produce intermediate products.

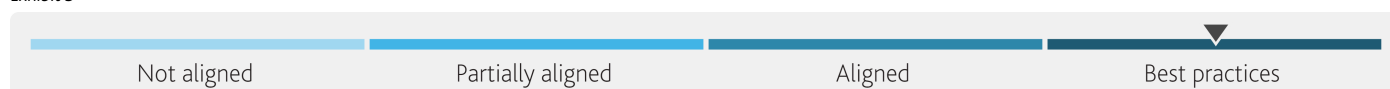
GHG emissions reduction reflects relevant sustainability challenges for the semiconductor sector and for the company's operation locations, Korea and China. Although the semiconductor industry is not among the largest emitters of GHG emissions currently, the Global Warming Potential (GWP) for process gases, a major cause of GHG emissions in the semiconductor manufacturing process, is considerably higher than that of CO₂. According to data as of 2019, China was the world's largest GHG emitter with emission levels of 12.71 Gt CO₂ equivalent (CO₂eq), while Korea was the tenth-largest emitter with levels of 698.46 Mt CO₂eq.³

Best practices identified

- » There is continuity or traceability, with independent verifiers, in case of a change in the methodology used to measure KPI(s)
- » The calculation methodology is consistent and in case of any methodology change, the company will have an external verifier independently confirm that the proposed revision is consistent with the initial level of ambition of the relevant SPT
- » The KPI(s) definition(s) explicitly rely on external references, allowing them to be benchmarked
- » Disclosure of the externally verified historical performance of KPI(s); for example, covering at least the previous three years

Calibration of sustainability performance targets

Exhibit 3



Source: Moody's Investors Service

Consistency and ambition – BEST PRACTICES

The selected SPT is consistent with the issuer's sustainability strategy, which is to achieve net zero emissions by 2050 as part of a companywide vision to address climate change. This includes maintaining Scope 1 and 2 absolute GHG emissions in 2030 at 2020 levels.

The SPT shows significant improvement compared with the company's BAU. A 57% reduction in GHG emissions intensity by 2026 from a 2020 baseline is equivalent to a -13.1% average annual variation for 2021-26. This figure is higher than SK hynix's BAU of an average annual variation of around -5% for 2018-21. The company is also committed to maintaining its absolute GHG emissions level in 2030 at the 2020 baseline level, which is higher than its BAU of a past average annual increase in its absolute emissions of 6% for 2019-21 or 8% for 2016-21.

The SPT is benchmarkable to sector peers' performance and references the GHG Protocol for calculating scope 1 and 2 GHG emissions. SK hynix demonstrates a higher level of ambition than its sector peers. Sector peers were selected based on top companies within the semiconductor industry, specifically with respect to the DRAM and NAND flash memory segments. Given the capital-intensive nature of the memory chip manufacturing business that requires continuous economies of scale to increase the barriers of entry and improve pricing power, the company's capital spending will continue to rise for infrastructure investment related to future plant site acquisitions and power plant construction, and high spending on wafer equipment. Despite such rising capital spending, SK hynix is dedicated to cutting emissions through various activities, such as using lower-GWP alternatives in process gases to reduce its GHG emissions intensity.

Means to achieve the SPT are disclosed in the framework and are considered credible.

Disclosure – BEST PRACTICES

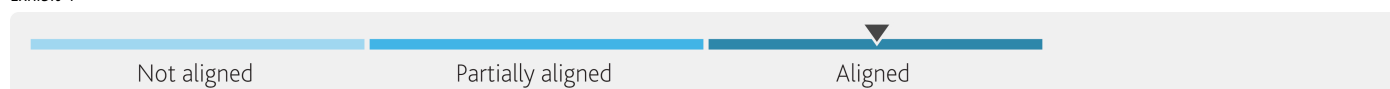
The timeline (2023-26) and baseline year (2020) will be disclosed in the annual sustainability report, which will be made publicly available. For sustainability-linked loans, SK hynix may opt to report non-publicly to lenders or other relevant counterparties. Information regarding the trigger event date, adjustment mechanisms and extent of potential pricing adjustments will be stipulated on the bond or loan transaction documentation, in addition to referencing SK hynix's framework.

Best practices identified

- » The means for achieving the SPT is disclosed, as well as other key factors beyond the company's direct control that may affect the achievement of the SPT and strategic information which would decisively impact the achievement of the SPT
- » The means for achieving the SPT are considered credible
- » The timeline, baseline, and trigger events are disclosed
- » The selected baseline is relevant and reliable

Instrument characteristics

Exhibit 4



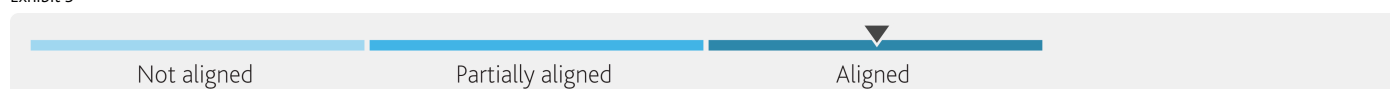
Source: Moody's Investors Service

Variation of structural characteristics – ALIGNED

The financial characteristics of the instrument are clearly defined and will be disclosed to investors/lenders. Depending on SK hynix's performance in relation to the applicable SPT as per the SPT observation date, this trigger event may result in a bond coupon or loan interest rate step-up and/or step-down. Such an adjustment mechanism, including but not limited to the trigger event date, the reporting and verification reporting date(s), and the extent of the potential pricing adjustment, will be stipulated on the bond or loan transaction documentation, in addition to referencing SK hynix's sustainability-linked financing framework.

Instrument characteristics

Exhibit 5



Source: Moody's Investors Service

Transparency of reporting – ALIGNED

SK hynix commits to report annually on its sustainability strategy and the progress on the SPT in relation to the respective KPI. This reporting will be made publicly available through SK hynix's sustainability report, which will be published annually on the company's website. For sustainability-linked loans, SK hynix may opt to report non-publicly to lenders or other relevant counterparties, according to the relevant agreement.

The intended scope and granularity of reporting are clear and cover all the required elements. The company has stated that reporting will cover a list of sustainability-linked financial instruments outstanding; the annual performance of the KPI, as per the relevant reporting period and when applicable, including the calculation methodology and baselines when relevant; and for the year(s) on which the SPT observation date falls on, a statement to confirm if SK hynix has achieved the SPT or not. Reporting will also cover information on any relevant updates to SK hynix's sustainability strategy and/or governance with an impact on the KPI and SPT, and information about potential recalculations of baselines, if any.

Furthermore, SK hynix intends, where feasible and possible, to report on the qualitative and/or quantitative explanations of the evolution of the performance on the KPIs on an annual basis, and illustration of the positive sustainability benefits of the performance improvement.

Verification

Exhibit 6



Source: Moody's Investors Service

Verification process – BEST PRACTICES

SK hynix commits to an independent and external verification of the performance of its KPI against the SPT on an annual basis or in relation to any SPT observation date until the maturity of the sustainability-linked financial instrument(s). The verification will be performed by a qualified external reviewer with relevant expertise, such as an auditor or an environmental consultant. The verification report will be made publicly available. For sustainability-linked loans, the external review reports will be disclosed publicly depending on the agreement of the participating institutions.

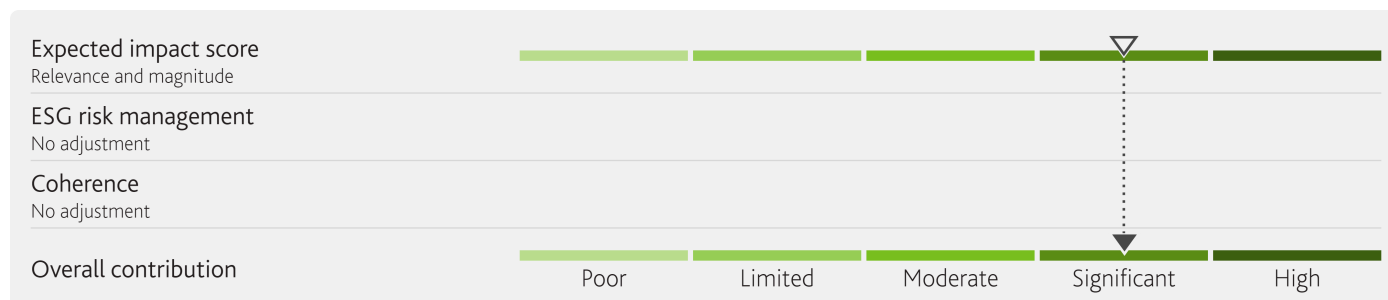
Best practices identified

- » Verification will be conducted until maturity of the bond

Contribution to sustainability

The framework demonstrates a significant expected contribution to sustainability.

Exhibit 7



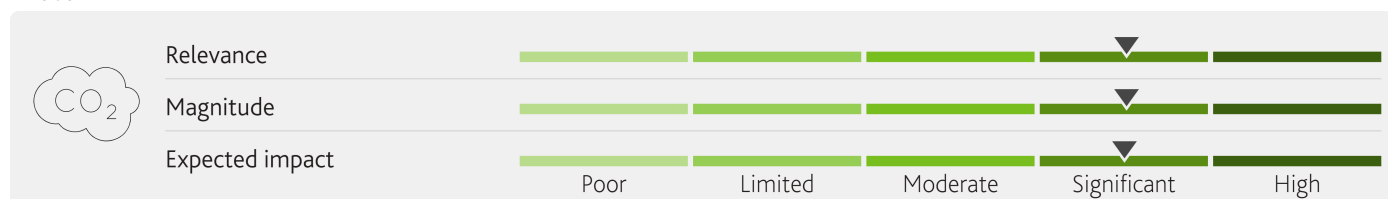
Source: Moody's Investors Service

Expected impact

The expected impact of the KPI and SPT on SK hynix's sustainability objectives is significant. A detailed assessment is provided below.

Scope 1 and 2 GHG emissions intensity per unit of production

Exhibit 8



Source: Moody's Investors Service

The relevance of the KPI, scope 1 and 2 GHG emissions intensity per unit of production (tCO₂eq/100 million gigabits), is significant. GHG emissions reduction is a relevant sustainability challenge for the semiconductor sector and for the company's operation locations, Korea and China. While the semiconductor industry is not among the largest emitters of GHG emissions currently, the GWP of process gases — which are heavily used in the semiconductor manufacturing process and account for the majority of the sector's GHG emissions — is considerably higher than that of CO₂. The selected KPI is also relevant to the sustainability challenges faced by the company based on its 2022 materiality assessment, which identified "climate change and GHG emissions" as a topic of the highest priority, and is also in line with the company's goal of achieving net zero emissions by 2050.

The scope of coverage of the KPI is considered significant as scope 1 (24%) and scope 2 (45%) covers the majority of SK hynix's emissions as of 2021⁴. The KPI does not include scope 3 emissions, which may account for a material portion of a semiconductor company's total GHG footprint. In addition, while SK hynix discloses its scope 3 GHG emissions data in its sustainability report and commits to further improving the level of scope 3 disclosure by expanding the number of assessed categories and refining the calculation methods in the future, it does not include "use of sold products" in its scope 3 calculation at this stage, which can account for a material portion of a firm's total scope 3 emissions as the energy efficiency of products plays a key factor to reducing energy use and mitigating emissions. However, given sector specific challenges of accurately calculating emissions resulting from downstream end product use, a vast majority of sector peers currently do not disclose "use of sold products" in their scope 3 disclosure. We also recognize that according to international standards such as the GHG Protocol⁵ and SBTi, disclosure of this category is not a mandatory requirement for companies that manufactures intermediate products, and indirect use-phase emissions are not within the minimum boundary for the "use of sold products" category⁶.

The magnitude of the ambition of the SPT is significant, based on a combination of benchmarking approaches. The SPT — a 57% reduction in GHG emissions intensity (tCO₂eq per unit/100 million gigabits) by 2026 from a 2020 baseline level (9,552 tCO₂eq per

unit/100 million gigabits) — is equivalent to an average annual variation of -13.1%. This compares with the company's BAU of an average annual variation of around -5% for 2018-21. At the same time, the company is also committed to maintaining its absolute GHG emissions level in 2030 at the 2020 baseline level, despite its expansion plan of adding new manufacturing sites in Yongin, Korea, which will further add to its carbon footprint. This compares with its BAU of an average annual increase in its absolute GHG emissions of 6% for 2019-21 or 8% for 2016-21. Hence, SK hynix's target to reduce its GHG emissions intensity by 2026 and to maintain its absolute GHG emissions level in 2030 shows a significant improvement relative to the company's BAU.

SK hynix's SPT also demonstrates a higher level of ambition than that of its sector peers as the company has set an interim goal to reduce its GHG emissions intensity by 57% by 2026, earlier than its peers which have targeted maintaining their absolute GHG emissions level by 2030. The strategy to achieve the SPT will mainly include transitioning to renewable energy, reducing process gas-related GHG emissions in the manufacturing process, and improving overall energy efficiency and energy conservation, all of which are credible means of emissions mitigation commonly utilized in the semiconductor sector.

We acknowledge that there currently does not exist any clear sector decarbonization guidance from bodies like the Science Based Targets initiative (SBTi) for the semiconductor industry, and as such, we are not able to provide a credible view on the full extent of the company's temperature alignment to Paris Agreement goals.

ESG risk management

We have not applied a negative adjustment for environmental, social and governance (ESG) risk management to the expected impact score. The company is committed to monitoring and improving its ESG performance with clear responsibilities outlined for relevant departments, including the Sustainability Management Committee at the board level, and ESG Management Committee, Carbon Management Committee and Climate Change Roundtable at the management level.

Coherence

We have not applied a negative adjustment for coherence to the expected impact score. The coherence of KPIs with the company's sustainability strategy is embedded in our analysis of the relevance and magnitude within the Contribution to Sustainability section.

The sustainability objectives under SK hynix's framework are consistent with the firm's broader sustainability strategy to achieve net zero emissions by 2050 as part of a companywide vision under its "PRISM" framework to address climate change with a clear pathway. In addition, "climate change and GHG emissions" has been identified as the topic of highest importance for SK hynix, according to its materiality assessment, in addition to being a topic of high priority for its shareholders, stakeholders and regulators.

Appendix 1 - Mapping eligible categories to the United Nations' Sustainable Development Goals

The KPI included in SK hynix's framework is likely to contribute to one of the United Nations' Sustainable Development Goals (SDGs), namely:

Exhibit 9

UN SDG 17 Goals	Key Performance Indicators	SDG Targets
GOAL 13: Climate Action	Scope 1 & 2 GHG emissions intensity	13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Source: Moody's Investors Service

The mapping of the United Nations' SDGs in this SPO takes into consideration the eligible project categories (or KPIs) and associated sustainability objectives/benefits documented in the company's financing disclosures, as well as resources and guidelines from public institutions, such as the ICMA's SDG Mapping Guidance and the UN's SDG targets and indicators.

Appendix 2 - Summary of KPI in SK hynix's framework

Exhibit 10

KPIs		Description	FY2020 (Baseline)	FY2026 (Target)
1	Scope 1 and 2 GHG emissions intensity	Reduction of Scope 1 and 2 GHG emissions intensity (tCO ₂ eq/100 million gigabits)	9,552 tCO ₂ eq/100 million gigabits	at least 57% reduction compared to a 2020 baseline under the commitment that absolute emission of 2030 is maintained as same as the level of 2020

Source: Moody's Investors Service

Moody's related publications

Second Party Opinion analytical framework:

» [Framework to Provide Second Party Opinions on Sustainable Debt](#), October 2022

Topic page:

» [ESG Credit and Sustainable Finance](#)

To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.

Endnotes

- 1 The Sustainability-Linked Loan Principles are jointly published by Loan Syndications and Trading Association (LSTA), Loan Market Association (LMA) and Asia Pacific Loan Market Association (APLMA).
- 2 <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>
- 3 <https://www.wri.org/insights/interactive-chart-shows-changes-worlds-top-10-emitters>
- 4 GHG emissions from recently acquired manufacturing sites such as the Dalian Fab that acquired in December 2021 and Key Foundry that acquired in 3Q2022 are not currently included in the scope.
- 5 https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf
- 6 <https://sciencebasedtargets.org/resources/files/Net-Zero-Standard.pdf>

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