






# “The sustainability transparency index of sovereign wealth funds: their asset size, SDG country rankings and cross-region comparison”

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# THE SUSTAINABILITY TRANSPARENCY INDEX OF SOVEREIGN WEALTH FUNDS: THEIR ASSET SIZE, SDG COUNTRY RANKINGS AND CROSS-REGION COMPARISON

## Abstract

Sovereign wealth funds accumulate the largest resources to bridge the financial gap under the Sustainable Development Goals. The basic mechanism for accelerating sustainability progress is the effort of sovereign wealth funds to incorporate environmental, social, governance and ethical criteria and targets of these Goals disclosed in their sustainability reports. This study aims to develop a methodology for assessing the Sustainability Transparency Index in a sample of sovereign wealth funds, as well as to investigate how this transparency is influenced by the size of funds' assets and sustainability progress with a cross-regional comparison. Five groups of sustainability disclosure metrics, such as the main pillars of novel Sustainability Transparency Index, were tested and analyzed for 91 funds using binary variables and normalization method. Three hypotheses regarding the statistical association of funds' sustainability transparency index with the size of the funds' assets, countries' sustainability progress, and the region of a fund were checked for 87 funds using multiple regression. The overall results of the Sustainability Transparency Index show an insufficient level of funds' transparency. Sustainability disclosure in 57% of funds surveyed should be fully enhanced in terms of greater sustainability transparency. There is strong evidence of the correlation between the volume of funds' assets and sustainability transparency as well as the leadership of European funds in a cross-regional comparative study. However, data on the progress of the country's sustainability and the funds' Sustainability Transparency Index are limited and can be used as evidence of the insufficient role of fund transparency in promoting sustainability.

**Keywords** sovereign wealth fund, sustainability, ESG, SDGs, index

**JEL Classification** G23, H54, Q01, E22

## INTRODUCTION

Sovereign wealth funds (SWFs) are considered as major institutional investors across financial markets that can efficiently mobilize resources and generate positive financial returns along with sustainability impact (Rose & Capapé, 2020). With a huge amount of capital, a long investment horizon and the primary goal of sustaining national wealth for future generations, they can be in line with the core values of sustainable development. Wealth transfer by SWFs to meet the needs of future generations (WCED, 1987) is a key issue of socially responsible fund investments (Røste, 2021) and, in addition, a strong focus on investment in Sustainable Development Goals (SDGs) with environmental, social, governance and ethical criteria (ESGE).

According to International Forum of SWFs in 2021, SWFs allocated more than \$7.1 billion in water, renewable energy, agritech, and new energy sources like long-term nuclear fusion projects or geothermal urban solutions (Capapé, 2022). Nevertheless, the amount of financial resources concentrated by SWFs in assets under management (AUM) in 2022 is much higher – \$11.28 trillion. It is comparable with private banking, investment management and institutional investor industries, representing \$37 trillion, \$43 trillion, and \$6.6 trillion in AUM (Thallinger, 2021). Moreover, AUM labeled as ESG are projected to reach \$50 trillion by 2025 (Bloomberg, 2021).

At the same time, the current SDG financing gap, according to the Organization of Economic Cooperation and Development and United Nations Development Program estimates, has increased to \$3.7 trillion in 2020 due to the COVID-19 pandemic (OECD & UNDP, 2021). This pandemic has had a profound impact on all gaps in the SDGs, especially in SDG 4 and 8 (Makarenko et al., 2021). The war in Ukraine has further deepened this gap.

Therefore, SWFs might have huge reserves and promising perspectives to help overcome the SDGs financial gap and accelerate the progress of the goals. The basis for accelerating SDGs is the funds' efforts towards the ESGE criterion and SDGs target disclosed in their sustainability reports.

Sustainability investment market rises sharply, and inconsistent incentives and risks for “greenwashing” are clear for all institutional investors under comprehensive ESGE regulatory landscape (Plastun et al., 2020). In case of SWFs, insufficient transparency might create threats not only to funds' financial performance, but also to the future progress of countries in achieving the SDGs. One recent example is the \$700 billion corruption concerns of the Malaysian SWF Malaysian Development Berhad (1MDB) (Velayutham & Hasan, 2021).

A possible way to solve the current problems with SWFs' sustainability transparency and investment orientation is to create a benchmark to compare regional SWFs with strong SDGs and focus on ESGE. This can help identify issues in SWF sustainability disclosure using the recently developed sustainability transparency index (STI) methodology, as well as improve fund performance and accelerate progress of SWF countries towards the SDGs.

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## 1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

SWFs are major public players in sustainability finance (Affuso et al., 2022; Salack et al., 2022; Schena & Gouett, 2022). For example, bridging the investment gap requires significant funding from SWFs of countries at the global level, as well as their capacity development, policy research, and recommendations on climate change mitigation. SWFs' sustainability disclosure and the overall level of transparency is a crucial point for funds' sustainability funding, operational implementation, monitoring, and the assessment of sustainability and mitigation actions (Salack et al., 2022).

However, the relationship between the SWFs' focus on sustainability and transparency issues is

not well understood in the academic literature. It is not yet clear how non-financial reporting can be completely integrated into major ESG institutional investors (Lykkesfeldt & Kjaergaard, 2022). These authors focused on the complex ESG transparency landscape and stakeholder communication development, using the example of the largest ESG institutional investors in the world (BlackRock and Norway's sovereign wealth fund).

El-Sholkamy and Rahman (2022) have concluded that improved SWF transparency is vital for the achievement of the SDGs. Nevertheless, SWF transparency is a quite new area of research, especially in terms of sustainability.

Separate assessments of SWFs' sustainability transparency have been developed by several well-known organizations and scholars in the field of SWFs:

- GSR scoreboard by Global SWFs covers 100 major SWFs with 25 questions related to Governance, Transparency and Accountability, Sustainability and Responsible Investing, Resilience and Legitimacy with binary variables. But only one SDGs criterion – SDG alignment is covered. Only 9 SWFs reported about this SDG alignment in 2021 (GSR 2021)
  - Linaburg-Maduell Transparency Index by SWF Institute covers 51 SWFs with 10 binary criteria. However, a specific focus in the sustainability field was given only on guidelines in reference to ethical standards (SWF Institute, 2022 a).
  - Bagnall and Truman (2013) create a database of 49 SWFs and 9 government pension funds using the SWF scoreboard that Truman first developed in 2007. This 24-criterion scoreboard covers structure, governance, accountability, transparency and behavior criteria, but only corporate responsibility guidelines and ethical investment have been given special attention in the field of sustainability.
  - Responsible Asset Allocator Initiative has a strong focus on mobilizing capital from the 251 world’s largest SWFs and pension funds towards sustainable investment and SDGs within 10 key principles and 30 criteria related (RAAI, 2022). But only one criterion is devoted to SDGs directly – References to the UN SDGs.
- A slight focus was given to studies devoted to modeling the impact of SWF sustainability transparency, SDGs and financial performance using panel data (Table 1).
- While Graziano and Magni (2022) and Liang and Renneboog (2020) investigate the corporate ESG level of SWF investment and companies’ financial performance, as well as companies’ size, Wurster and Schlosser (2021) focus mainly on ESG scoring of SWFs without modeling the relationship between SWF sustainability and financial performance of funds. A specific focus of SWFs on SDGs is not found in these studies.
- Some examples of modeling the influence of SWF transparency scoring on financial performance show that there is a clear correlation between the degree of fund transparency and compliance with a fiscal anchor over the medium to long term (Toledano & Bauer, 2014). Moreover, there is a “moderate positive relationship”, with a correlation coefficient of 0.52, between the 2021 60 SWFs GSR scores and the average investment returns over the period 2015–2020 (GSR, 2021). But these studies do not focus on SDG specific disclosure, nor the sustainability transparency of SWFs, nor on the relationship with country SDGs progress.

**Table 1.** Academic sources on SWF sustainability and financial performance

Source	Sample	Hypothesis	Methodology	Results	Implications
Graziano & Magni (2022)	11 SWFs	Whether the financial performance of target companies affects the sustainability disclosures by SWFs	Multiple regression analysis	A moderating effect owing to the size variable in the relation between firms’ values and SWFs’ sustainability disclosures	Extends the literature on SWFs and sustainability disclosure, offers original solutions for regulators and practitioners
Liang & Renneboog (2020)	24 SWFs invested in 7,693 companies	Whether and how SWFs incorporate ESG considerations in their investment decisions in publicly listed corporations, as well as the subsequent evolution of target firms’ ESG performance	Heckman selection models, probit panel regressions	SWFs take the ESG performance of target firms into account in their investment decision making	SWFs in general do not actively steer their target firms towards higher levels of ESG
Wurster & Schlosser (2021)	50 SWFs	Whether SWFs disclose sustainability criteria covering environmental, social, economic, and governance aspects into their mandate	Multiply linear regression	No evidence was found of a strong influence of the economic development level, the resource abundance, and the degree of democratization of a country, or the specific size and structure of a fund	Identifying favorable conditions for a higher ESG commitment of SWFs could help initiate pathways to become functional sustainability instruments

Several approaches to SWF transparency are highlighted by international finance and regulatory institutions:

- International Forum of SWFs (36 SWFs) and Santiago Principles (Generally Accepted Principles and Practices for SWFs (GAPP, IWG, 2008)) can be recognized as good proofs of SWF transparency and accountability, but they have not changed from 2008 and do not give a snapshot of SWF sustainability adherence at all.
- International Monetary Fund Guide on Resource revenue transparency (IMF, 2007) with 4 pillars of SWF transparency. IMF Guide was published in 2007 before the SDGs were adopted, and there are only a few transparency matters described (for example social or environmental expenditure should be clearly defined and described in the budget documentation).
- One Planet SWF Principles (OPSWF Framework, OPSWF, 2021) submitted by 18 SWFs has a substantial focus on SWF preventing the climate change and just few sustainability issues (particularly around energy solutions).

Other standards in the area of SWF transparency include the Guidance to Recipient Countries from the OECD (2008) and Commission of the European Communities within a communication aiming to promote “a common response to the challenges posed by SWFs” (Commission of the European Communities, 2008). But they are focused on transparency of SWF investments, not on their sustainability disclosure.

This study focuses on the very conduct of SWF sustainability transparency, overcoming limitations in scientific and regulatory sources, articulating disclosure of information about SWFs’ efforts towards the SDGs, ESGE criterion, and their adherence to good practice in sustainability transparency.

This paper aims to develop a methodology for SWFs’ STI, to investigate how SWF sustainability transparency is influenced by their asset size, SDG

progress in a country of residence, and to make a cross-regional comparison.

In this regard, a preliminary stage of research is creating the SWF database with sustainability related information (SDGs incorporation, sustainability policy, reporting, including sustainability investments in portfolio) and a questionnaire to assess SWFs’ STI with binary variables and the normalization method (Makarenko, 2020).

Finally, three hypotheses about correlation of SWF sustainability transparency with asset size, country progress in implementing SDGs and fund’s region were checked using a multiple regression framework based on Wurster and Schlosser (2021).

First, it is vital to realize that there is a profound difference in terms of the size of SWFs. While several funds manage their portfolios well over 100 million USD, most of them record a lower figure as for their assets under management (AUM), and it is even not uncommon that an SWF manages less than USD 10 million. Naturally, different sizes of AUMs might have implications for the management of SWFs, as the larger SWFs might face different responsibility than the smaller ones. In this regard, an emphasis on sustainability and transparency might be more required by stakeholders of the largest funds, despite the lack of evidence of such a claim found by Wurster and Schlosser (2021):

*H1: A greater emphasis on sustainability transparency conduct is associated with larger SWFs.*

Second, it is supposed that a country’s conduct as for achieving the SDGs can have some relevance for the management of the corresponding SWF in terms of sustainability transparency. Basically, both a sustainability focus of an SWF and a more advanced implementation of SDGs can be considered as a forward-looking conduct that aims to support multigenerational solidarity and create a greater long-term wealth of countries. Thus, it is the goal of this paper to explore this connection that has so far been neglected in the related literature:

*H2: A greater emphasis on sustainability transparency in terms of SWF’s conduct is asso-*

*ciated with a greater progress of the corresponding country as for the achievement of SDGs.*

Third, there might be also different preferences as for sustainability and transparency of SWFs in different world regions (Europe, Asia, Africa, Australia and Oceania, Middle East, North America, Latin America). In this regard, the current literature also does not offer any guidance. Therefore, a generally formulated hypothesis can be considered:

*H3: There are differences in the sustainability transparency conduct of SWFs across regions of the world.*

Overall, the three hypotheses aim to provide new insights into what influences the recent sustainability and transparency conduct of SWFs, taking into account both fund-specific and country-specific factors.

## 2. DATA AND METHODOLOGY

### 2.1. STI scoring

To develop an STI index, SWFs were selected from the list of SWF Institute (SWF Institute, 2022b). An initial SWF sample includes 105 funds. Each SWF has its own website, and there has been an attempt to obtain original data (e.g., sustainability and ESG reports, ESG disclosure, investment, voting and stakeholder engagement policies with SDGs focus) for the latest accessible period of their sustainability disclosure (2020–2021).

For the 14 SWFs, the sites were unavailable at the moment of site observance. So, the final sample of 91 SWFs for tracing an STI questionnaire in 17 questions includes 1,547 data points to be analyzed.

Content analysis and questionnaire survey with binary variables and normalization method (Makarenko, 2020) were used for this purpose.

The basis for creating a questionnaire of SWFs' STI is the IMF Guidance (IMF, 2007) primarily addressed to SWF transparency, GAPP (IWG,

2008), addressed to general SWFs' activity principles, OPSWF Framework (OPSWF, 2018), addressed to SWFs' climate change targeting and ESG. Compliance with the main principles in SWF transparency and sustainability from IMF Guidance, GAPP is presented in Appendix A (Tables A1 and A2).

To develop an STI questionnaire, the four main pillars of IMF (2007) were adjusted. Sustainability and SDG focus might be more deepened with concise and clear presenting of SWFs' roles, sustainability strategies and investment policy aimed at overcoming SDGs' financial gap, specific and regular sustainability reports with SDGs efforts, open investment decision making process with sustainability voting rules, independent assurance and verification of sustainability reporting disclosed.

The correspondence with GAPP was saved. Also, three main principles of the OPSWF Framework were added to emphasize the additional sustainability context of GAPP and IMF.

For example, GAPP 4 Principle concerning SWFs' clear and publicly disclosed policies, rules, procedures is in line with the first pillar of IMF, 2007 and laid down as a basis for development holistic SWFs' ESGE/Sustainability Policy questionnaire criteria. This policy is the key set of fund rules and directions towards sustainability. It is also in line with the Alignment Principle of OPSWF that incorporates climate (sustainability) considerations into SWFs' investment horizons and decision-making.

GAPP 11 Principle regarding the timely preparation of SWFs' annual reports and financial statements in accordance with recognized standards and the third Pillar of the IMF, 2007 refers to the frequency of sustainability reporting, as well as other adherence questionnaire criteria. The questionnaire criteria are addressed not only to SWFs' financial statements, but also to sustainability reporting as a whole.

GAPP 12 Principle concerning auditing the SWF's operations and financial statements annually in accordance with recognized standards and the fourth pillar of the IMF, 2007 are the basis of assurance questionnaire criteria. In this criterion,

the importance of independent verification by third party is emphasized to not only SWFs' financial statements, but also to all sustainability related information disclosed as a guarantee for their credibility and transparency for stakeholders. GAPP 11 and GAPP 12, and the questionnaire criterion are in line with the Ownership and Alignment Principle of OPSWF.

The final scale for STI scoring according to the proposed method can be presented as follows:

1. A [80;100];
2. B [60;80];
3. C [40;60];
4. D [20;40];
5. E [0;20].

## 2.2. STI related hypothesis testing

The previous part has described how to build a novel index capturing the extent of sustainability and transparency conduct of SWFs. As a next step, it may be interesting to examine potential explanatory factors that drive the conduct of SWFs in this regard globally.

To test hypotheses, a sample of 86 SWFs was used due to data comparability. Indicators such as Total Assets (billion \$) and SDG value, Country SDG ranking in 2022 were not available for all funds and their country of residence.

Since the purpose of the paper is to explore the drivers of SWFs' sustainability transparency conduct, a multiple regression framework seems to be a natural choice, as in Wurster and Schlosser (2021). The model to be estimated can be formulated as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \dots + \beta_n X_{ni} + \varepsilon_i, \quad (1)$$

where  $Y_i$  denotes an explained variable that captures the sustainability and transparency conduct of the  $i$ -th SWF,  $\beta_0$  is the constant,  $X_{ji}$  for  $j = 1, \dots, n$  denote the explanatory variables for the  $i$ -th SWF and their corresponding regression coefficients  $\beta_{ji}$  for  $j = 1, \dots, n$  and  $\varepsilon_i$  can be expressed as the error term for the  $i$ -th SWF.

As for the explained variable  $Y$ , the aim is to include not only the ultimate score of the STI index,

but its components as well. As there are five broader categories that together constitute the STI index (general sustainability focus; ESGE aspects; SDGs aspects; assurance aspects; secondary indicators), there shall be six sets of regression results in total.

Next, having a rather small sample consisting of 86 observations, the aim is potentially not to include too many explanatory variables, which might lead to multicollinearity issues in the multiple regression setting. Therefore, one might resort to the technique of Bayesian Model Averaging (BMA) that is, for instance, used in meta-analytical research such as Havranek et al. (2016). This method allows you to uncover which explanatory variables are the most suitable to explain the dependent variable in the multiple regression model setup. This means that from a set of pre-determined potentially relevant explanatory variables, the BMA method will render only some – if any at all – as statistically significant predictors of the chosen explained variable.

In relation to Hypothesis 1, the level of AUM was considered for the choice using the BMA technique, along with three asset size dummy variables: large (over 100 million AUM), medium (over 10 to 100 million AUM), and small (under 10 million AUM).

As for Hypothesis 2, the dataset offers both a consideration of a country's SDG progress as a score and as a rank of the country in the worldwide list.

Finally, as for Hypothesis 3, the creation of dummy variables for each region (Europe, Asia, Africa, Australia and Oceania, Middle East, North America, and Latin America) seems to be a natural step. Last but not least, the BMA technique might lead to a choice of a different set of explanatory variables for each of the six regressions that are considered – for the main STI variable and for its five aforementioned subcomponents.

## 3. RESULTS AND DISCUSSION

The process of creating a database for assessing SWFs' STI demonstrated a significant variety of forms and types of information on the implementation of ESGE and SDGs criteria in the activities

of funds. The dominant approach is a chaotic disclosure of information – on a separate page on the fund's website, as part of the annual report, as part of the non-financial report, the strategic plan of the fund's or principles of investment portfolio management. The most transparent funds are characterized by a systematic, good-structured and well-presented (e.g., in an interactive manner) disclosure of this information in sustainability or mainly ESG reports.

### 3.1. STI scoring

The results of the STI scoring of 91 SWFs for 2020–2021 are very clear (Table 2). The average value of the STI for the SWF sample is 38,3%. This shows a rather low level of SDGs' values and ESGE criterion perception by SWFs as well as an overall low level of sustainability transparency conduct.

Strikingly, 56.6% of SWFs in the sample have demonstrated a low level of sustainability transparency conduct and can be marked as D and E-ranked funds. The lower the STI, the pure the sustainability transparency disclosure of a fund.

Thus, D and E-ranked funds have an STI score close to 0. In general, SWFs assigned to these two groups mainly focus on certain ESGE disclosures.

The qualitative analysis of the main questionnaire pillars (general sustainability focus, ESGE aspects, SDGs aspects, assurance aspects, secondary indicators) for SWFs by an STI score distinguishes the current study from Graziano and Magni (2022), Liang and Renneboog (2020), and Wurster and Schlosser (2021). These pillars show a set of dependences and common features for the A, B and C-ranked SWFs, while D and E-ranked funds provide minor pillar disclosure or its absence.

General sustainability focus criterion is covered by all A-ranked SWFs (9% of funds), including formalized ESG or Sustainability Policy, regular sustainability or ESG reporting, as well as ESGE/SDG scoring (voting) rules for decision-making and stakeholder involvement and material request incorporation. The main difference of B-ranked funds (7%) is lower regularity and fragmentation of sustainability related disclosure. For the C-ranked funds, difficulties in scoring (voting)

**Table 2.** STI scoring results

Rank	Score	Number of funds	Share, %	SWFs
A	82,4-100,0	9	10,0	Korea Investment Corporation, New Zealand Superannuation Fund, COFIDES, Ireland Strategic Investment Fund, Khazanah Nasional, Samruk-Kazyna, Alberta Investment Management Corporation, Norway Government Pension Fund Global, GIC Private Limited
B	70,6-76,5	7	7,8	Future Fund, HKMA IP, Mubadala, PIF, Temasek, ICD, Turkey Wealth Fund
C	41,2-58,8	24	26,7	APFC, FAP, Mumtalakat, SOFAZ, NMSIC, NSIA, CIC, KIA, QIA, LIA, Oman Investment Authority, Elliniki Etaireia Symmetochon kai Perioysias, Fonds de Réserves pour Générations Futures, Fonds souverain intergénérationnel du Luxembourg, FONSI, Fund for Reconstruction and Development of Uzbekistan, Hong Kong Future Fund, Kenfo, OBAG, Palestine Investment Fund, Royal Bafokeng Holdings (Pty) Limited, Sentosa Development Corporation, Solidium Oy, NSW Generations Fund
D	23,5-35,3	20	22,2	ESSF, Timor-Leste Petroleum Fund, Wyoming Retirement System, Heritage and Stabilization Fund ADIA, Pula Fund, FSDEA, ADQ, Agaciro, Fonds Souverain de la Republique Gabonaise, Idaho EFIB, Keren LeEzrahei Yisra'el, Malta Government Investments, Mauritius Investment Corporation Ltd, Oklahoma Tobacco Settlement Endowment, Société Fédérale de Participations et d'Investissement-Société Fédérale de Participations, The National Development and Social Fund, TPSF, Utah School & Institutional Trust Funds Office, Wyoming State Loan and Investment Board
E	0,0-17,8	31	34,4	Alabama Trust Fund, National Council for Social Security Fund, Sovereign Fund of Egypt, Emirates, Investment Authority, Kazakhstan National Fund, Brunei Investment Agency, Armenian National Interests Fund, Azerbaijan Investment Holding, Bahrain Future Generations Reserve Fund, Colorado Public School Fund Investment Board, Fund for Productive Industrial Revolution, Peru Fiscal Stabilization Fund, Monaco Constitutional Reserve Fund, Fujairah Holding, Ghana Heritage Fund, Ghana Stabilisation Fund, Ghana Infrastructure Investment Fund, CNIC Corporation Limited, Japan Investment Corporation, Indonesia Investment Authority, Louisiana Education Quality Trust Fund, Little Red River Cree Nation Sovereign Wealth Fund, Mongolia Future Heritage Fund, Guyana Natural Resource Fund, Fondo Mexicano del Petroleo, Kiribati Revenue Equalization Reserve Fund, Sharjah Asset Management, Regional Investment Company of Wallonia, Tuvalu Trust Fund, University of Texas Investment Management Company, Western Australian Future Fund



rule are inherent. Only six funds out of 24 provide detailed guidance on the exclusion of companies of their portfolio according to the ESGE criteria.

Comparing the disclosure of ESGE and SDGs aspects, it is worth underlining higher SDG alignment and prioritization by A-ranked SWFs than B-ranked. Unlike GSR, 2021 and RAAI, 2022, the current study pays a sufficient attention to SDG incorporation and prioritization in funds' sustainability disclosures, and not just "mentioning" them. ESGE aspects were completely covered by A-ranked funds, while B-ranked funds are mostly concentrated on ESG criterion, and just few of them have a strong ethical code of conduct and anti-corruption practice<sup>1</sup>. For C-ranked funds, the ESG criterion is more preferable in their activity, than the ethical one. At the same time, the occurrence of the ESG criterion is less common compared to A and B-ranked funds. Therefore, it is important to consider all ESGE aspects for SWFs, and not only certain criteria like in the SWF Institute (2022a), or Bagnall and Truman (2013), which focus mainly on ethical investment.

While the majority of SWFs verify mostly financial aspects of their activity, this study considers this fact as an additional proof of their openness and transparency. Regarding the assurance aspects, in contrast to D and E-ranked funds, C-ranked SWFs tend to provide more credible information to their stakeholders. 18 C-funds out of 24 publish a third-party assured opinion on information disclosed. A- and B-ranked funds provide third party assurance not only for financial statements, but also for sustainability disclosure metrics.

Secondary indicators prove the importance of funds' membership in institutional groups and their adherence to the principles and standards in the sustainability field. But the observed tendency in this STI pillar is not the same like in previous categories. Some of low-ranked funds are indexed by the LMT index<sup>2</sup>. And COFIDES, A-ranked SWF, is even not included in this index. Thus, a general level of transparency is not always a prerequisite of SWFs' sustainability and transparency.

### 3.2. STI related hypothesis testing

For 86 observed SWFs, three hypotheses on SWFs' sustainability transparency conduct were tested using the multiple regression model (Table 3).

Several general remarks should be made. First, the intercept is statistically significant in every estimation at least at the 10% level. This can be interpreted in the way that there is an average level of score among SWFs for the STI, as well as for its subcomponents. Moreover, other statistically significant coefficients can be regarded as deviations from that average level captured by the intercept. Next, the set of relevant explanatory variables as delivered by the BMA technique differs across estimations and ranges from one factor (in estimation 5) to as much as four factors (in estimation 2). At the same time, regression diagnostics indicates desirable multicollinearity results and they also provide evidence against the hypothesis that there are omitted variables in any of the estimations.<sup>3</sup>

As for the results for each of the regressions 1 to 6, several points can be noted. Regarding the overall STI score, European SWFs dominate over funds from other regions. Moreover, SWFs with over than USD 100 million AUM also record significantly higher scores. On the contrary, the smallest funds (10 million USD AUM or less) achieve lower STI scores. Second, in the general sustainability score category, SWFs from Europe also record higher values than funds from other regions, especially those from the Middle East. Moreover, the segment of the very largest and medium funds seems to be more focused on sustainability transparency in terms of their conduct, compared to small funds. Third, it holds for the adherence to ESG principles that a better ranking as for the SDG alignment seems to play the most significant role in this regard. Also, the largest SWFs seem to be ahead of other funds as for the ESG adherence. Fourth, SDGs aspects are taken seriously, especially in case of European SWFs and those SWFs with over than 100 million USD AUM.

1 Future Fund, HKMA IP, Mubadala, Turkey Wealth Fund.

2 Abu Dhabi Investment Authority, Fundo Soberano de Angola, Social and Economic Stabilization Fund, Heritage and Stabilization Fund, Pula Fund, Timor-Leste Petroleum Fund, Wyoming Retirement System, Alabama Trust Fund, Kazakhstan National Fund, Sovereign Fund of Egypt, Emirates Investment Authority, National Council for Social Security Fund, Brunei Investment Agency.

3 The regressions diagnostics are available upon request. At the same time, other tests as for homoscedasticity were run as well and also do not point to any inaccuracies as for the conducted regressions.

**Table 3.** Results of multiple regression assessments of the factors of SWFs' sustainability transparency conduct

Explained variables / Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
	STI score	General sustainability focus	ESGE aspects	SDGs aspects	Assurance aspects	Secondary indicators
Intercept	6.8 *** (0.7)	0.4 * (0.2)	3.1 *** (0.3)	0.4 *** (0.1)	1.4 *** (0.1)	0.8 *** (0.1)
AUM						0.004 ** (0.001)
Large fund	3.9 *** (1.2)	2.6 *** (0.4)	0.8 ** (0.4)	0.8 *** (0.2)		
Medium fund		1.2 *** (0.3)				
Small fund	-3.0 *** (0.9)				-0.5 ** (0.2)	
SDG rank			-0.013 *** (0.004)			
Europe	3.8 *** (1.2)	1.3 *** (0.4)		0.7 *** (0.3)		
Middle East		-0.8 ** (0.4)				

Note: \*\*\*, \*\*, and \* denote statistical significance at the 1, 5, and 10% level, respectively. Standard errors are in parentheses.

On the other hand, a country's ranking as for SDG implementation does not seem to play a significant role as for the corresponding SWF's SDG considerations. Fifth, there is evidence that worse score as for the assurance criteria is achieved by the smallest SWFs. And finally, the only statistically relevant determinant of the score as for the secondary indicators seems to be the volume of AUM, i.e. the score in this category seems to increase linearly with higher values of AUM.

To relate back to the hypotheses, there might be reasonable inclination not to reject Hypothesis 1, as belonging to the largest category or having more AUM seems to increase the score of sustainability transparency conduct in virtually all categories. In other words, the largest SWFs with more than 100 million AUM seem to be the leaders in terms of adherence to sustainability and transparency conduct.

As for Hypothesis 2, SDG rank seems to influence only the score in the ESGE category, but

interestingly not in the same way as in the SDG category. Thus, only limited evidence was found about the state of a country's SDG implementation having any impact on the conduct of the corresponding SWFs in terms of sustainability transparency.

Finally, as for Hypothesis 3, the results suggest superiority of European SWFs as for the overall STI score, as well as for the general sustainability focus and SDG aspects. On the other hand, with the exception of one estimation where Middle Eastern SWFs fared worse compared to the average (estimation 2 on the general sustainability focus), there does not appear to be any statistically significant difference compared to other regions of the world (Asia, Africa, North America, Latin America, Australia and Oceania). However, European SWFs in general seem to be ahead of the rest in terms of sustainability transparency conduct and could serve as role models for SWFs from other regions of the world in this regard.

## CONCLUSION

SWFs as large institutional investors can activate their efforts in overcoming a rising SDG funding gap. The main problem preventing the progress of SDGs is insufficient transparency of SWFs and their inconsistent ESGE and sustainability reporting disclosure.

The current study is an attempt to make new, more concentrated snapshot of the main SWF sustainability transparency criterion by creating a completely new dataset based on a questionnaire methodology that results in an STI.

There are two stages of the study conducted. The first is preliminary, related to the creation of a database of SWF with sustainability related information of 91 SWFs, development of a questionnaire methodology based on IMF, GARP and OPSWF principles and five groups of the sustainability disclosure metrics (general sustainability focus; ESGE aspects; SDGs aspects; assurance aspects; secondary indicators) such as main pillars of this novel STI. At this stage, binary variables and normalization method were used.

The second is the secondary, related to STI scoring and testing hypothesis for 87 SWFs about statistical association of STI with funds' asset size, funds' country progress in SDGs, and funds' region using a multiple regression framework methodology.

There is one specific feature of sustainability related disclosure in the investigated sample – the higher the STI score is, the most concentrated sustainability (ESGE) reporting is. Moreover, high-ranked SWFs, such as A- and B-level funds, demonstrate a comprehensive set of their policies, strategies and voting rules in sustainability investment, implementation of all ESGE criteria, sound assurance and membership in professional bodies. Moreover, A-ranked funds have strong SDGs alignment with SDG prioritization and adherence to other sustainability standards such as climate-related ones. This implies that these A and B-ranked funds can be used as benchmarks of sustainability transparency to another groups. Unfortunately, these funds represent only 18% of the sample, and D and E-ranked funds with low level of STI constitute 57% of funds investigated. Thus, the crucial point in accelerating SDG progress is enhanced SWFs' sustainability transparency. Additional evidence for this is limited data on the impact of SDG implementation in a country of SWF residence on the SWFs' sustainability transparency. As for other two hypotheses tested, there is strong evidence in favor of the size of funds represented by their AUM, as the largest SWFs with more than 100 million AUM can be recognized as leaders in sustainable development transparency.

A comparative analysis of STI was also conducted in a cross-regional perspective (Asia, Africa, Australia and Pacific, Latin America, North America, Europe, Middle East). In general, European SWFs can be recognized as leaders in sustainability transparency ahead of other SWFs. Their conduct and efforts in five pillars of STI could serve as a model for enhancing SWF sustainability transparency in other regions.

## AUTHOR CONTRIBUTIONS

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# APPENDIX A

**Table A1.** Main principles of SWF transparency and sustainability

Santiago Principles (GAPP), IWG, 2008	IMF Guidance on Good Fiscal Transparency Practices for Resource Revenue Management, IMF (2007)			
	Clarity of Roles and Responsibilities (I)	Open Budget Processes (II)	Public Availability of Information (III)	Assurances of Integrity (IV)
P 1	+	+		
P 2	+		+	
P 3	+			
P 4	+		+	
P 5			+	
P 6	+		+	
P 7	+			
P 8	+			
P 9		+		
P 10			+	
P 11			+	
P 12				+
P 13				+
P 14		+	+	
P 15			+	
P 16		+	+	
P 17			+	+
P 18		+	+	
P 19		+		
P 20		+		
P 21		+		
P 22		+		
P 23		+	+	+
P 24				+

**Table A2.** Author’s questionnaire for SWF Sustainability Transparency Index STI

Type	Question	Variables		References			
		0	1	GAPP, IWG, 2008	IMF, 2007	OPSWF, 2018	
Primary question	General sustainability focus	ESGE/Sustainability Policy	Absence or separate provision	Holistic Policy	P1, 18	I, II	A
		Regularity of Sustainability Reporting	Reporting is not disclosed or sporadic minor disclosure	Regular (more than 3 year period of publication)	P5, P 11, P 17	III, II	A, O
		ESGE/SDG scoring (voting) rules for decision-making	Absence	Comprehensive set of rules	P 21	II	O
		Stakeholder involvement and material request incorporation	Absence or certain stakeholders request	Clear list of stakeholder and their informational request	P 5, P 11, P 14, P 20	II	I
	ESGE aspects	Economic	Absence or minor disclosure	Comprehensive disclosure	P 14 P 15, P 19	II, III	I
		Social	Absence or minor disclosure	Comprehensive disclosure	P 15	II, III	I
		Governmental	Absence or minor disclosure	Comprehensive disclosure	P 6-9, P 16	II, III	I
		Ethical and anti-corruption	Absence or minor disclosure	Comprehensive disclosure	P 12	II, III	A, I
	SDG aspects	SDG alignment	Absence or slight sustainability context	Clear alignment with SDG and their targets	P 15, P 23	II, III	A,I
		Relevant SDGs	Absence or slight sustainability context	Strong focus and priority of SDGs	P 15, P 23	II, III	A,I
		Specific climate-related target	Absence or slight climate-related context	Strong focus and priority of targets	P 15, P 23	II, III	A,I
	Sustainability Assurance aspects	Type of opinion	Negative opinion or refusing	Positive opinion	P 12, P 13	IV	A, O
		Type of provider	No verification	International company (mid-tier or B4), National audit office	P 12, P 13	IV	A, O
	Secondary questions	IFSWF membership	Absence	Membership status	All	I-IV	A, I
	LMTI	Absence	Positive index value	All	III, IV	A, I	
OPSWF membership	Absence	Membership status	All	-	All		
Other standards adherence	Absence	Some of recognized standards	P 11, P 15	III, IV	A		

Note. Alignment – A, Ownership – O, Integration – I.