Identifying Potential Debt for Nature Swap (DNS) Partners in China:

From Hand-Picking to a Scoring Index

International Institute of Green Finance of Central University of Finance and Economics (IIGF)

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About The Nature Conservancy (TNC)

The Nature Conservancy (TNC) is a global environmental nonprofit working to create a world where people and nature can thrive. Founded in the U.S. through grassroots action in 1951, TNC has grown to become one of the most effective and wide-reaching environmental organizations in the world. With the support of over a million members and the dedicated efforts of a diverse team, TNC drives conservation in 81 countries and territories.

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Acknowledgements

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Chapter One

Introduction[1]

Debt for Nature Swap (DNS) is back on the table. As a financial instrument that helps developing countries face high external debt burdens and environmental challenges simultaneously, DNS has been increasingly hitting the headlines in the past few years. The reason behind the rising interest in DNS is rather obvious. On the one hand, amid the biggest surge in global interest rates in four decades, developing countries spent a record $443.5 billion to service their external public and publicly guaranteed debt in 2022 (World Bank, 2023), and the bleak outlook of their sovereign debt service is not likely to improve in the foreseeable future. On the other hand, urgently needed funding support for the global South in dealing with the environmental and developmental crises is far from sufficient. For example, in the average scenario, the annual climate finance needed through 2030 is around $8.1 to $9 trillion, whereas the current pledge is USD 1.3 trillion in 2021/2022 (Buchner et al., 2023). Although it is not realistic to expect DNS to completely balance the massive debt and environmental burden faced by the most vulnerable countries and communities, such transactions at least indicated the right direction to reconcile these two daunting challenges faced by the majority of the developing countries.

China represents an exceptional case for the potential DNS opportunities, due to its unique position as the most important bilateral creditor among many developing countries. It certainly does not have a legal or moral obligation as many Western powers on the economic and environmental development of the global South, since it is neither a colonial power nor a major environmental polluter historically. However, a protracted debt and environmental

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it is neither a colonial power nor a major environmental polluter historically. However, a protracted debt and environmental crisis in the developing world would certainly affect China's global geo-political and geo-economic strategy. Therefore, at least in theory, engaging DNS solutions could benefit China as a major South-South financier and fulfill its grand Belt and Road Initiatives (BRI) ambition (Simmons et al, 2021; Sun and Liu, 2023). ——At the outset, DNS could help consolidate bilateral socio-economic relations as an increasing number of Chinese key trading partners, such as Egypt, Pakistan, Sri Lanka, Ethiopia, and Zambia, have already expressed interest in experimenting DNS. In addition, promoting environmental protection and conservancy is in line with China's green BRI strategy and grand vision of "a global community of shared future" via international cooperation on climate change and sustainable development.

Most existing studies on DNS have been focused on the estimation of the potential size of the DNS market. For example, one most recent estimation is that more than US$100 billion of debt in developing countries could be freed up to spend on restoring nature and adapting to climate change (IIED, 2024). However, besides these encouraging figures, the actual difficulties in grounding DNS deals should be carefully examined, as context-specific challenges are manifested in different creditors and debtors. Among these challenges is the high transactional cost of DNS compared to the volume of the debt involved (Essers et al., 2021). This is particularly acute for those creditors who are dealing with this complex instrument for the first time, often with no proper institutional capacity in place. For example, for the creditor facing different debtors, which specific debtors can potentially be the most suitable DNS partners? What assessment criteria can be applied to avoid arbitrarily hand-picking and enhance the chances of successful negotiations? These are the specific questions to be addressed in this report.

This debtor selection puzzle is particularly acute for China due to the large number of bilateral debtors it needs to handle at the current stage. China has been the largest provider of critical public infrastructures in many developing countries in the past

two decades, under the banner of BRI. Whereas many of these projects delivered tremendous developmental value to the host countries, in a time of collective repayment crisis, the mounting default risks may halt China's capacity to further advance its grand geo-economic strategy. For example, in 2022, Chinese lending to Africa dropped to its lowest level in the past two decades with less than 1 billion USD in total (Moses et al, 2023), indicating significant constraints among Chinese lenders as a result of a sovereign credit crisis among recipient countries and potential solutions such as DNS to lessen the risk exposure for sovereign and commercial debts. Meanwhile, since China is not an OECD member, it does not hold obligations for either debt canceling or providing climate finance to the global South, as most developed countries do. Therefore, its suitability criteria for DNS partners would be significantly variant to the OECD creditors, who had been the most prominent architects of DNS deals in previous rounds of debt crisis.

In our intermediary report on the debtor selection problem in the context of China, we have shortlisted four categorical factors that affect the selection criteria based on our primary and desk research. Among these four categories, the overall debt burden and environmental challenges appear to be the key determinants of the necessity and urgency of entering into the DNS deals, whereas the political risks and bilateral relations appear to be the additional concerns regarding the smooth implementation of DNSs in the long run (Chen, et al., 2023). Based on these preliminary findings, we further expanded the specific indicators under each category as the basis for creating a scoring index for ranking different debtors. We then applied this scoring index to specific debtors and identified the most and least challenging debtor countries for China to engage with DNS negotiations. We also illustrate the DNS suitability score for China's largest bilateral debtors to illustrate their swapping challenges.

Chapter Two

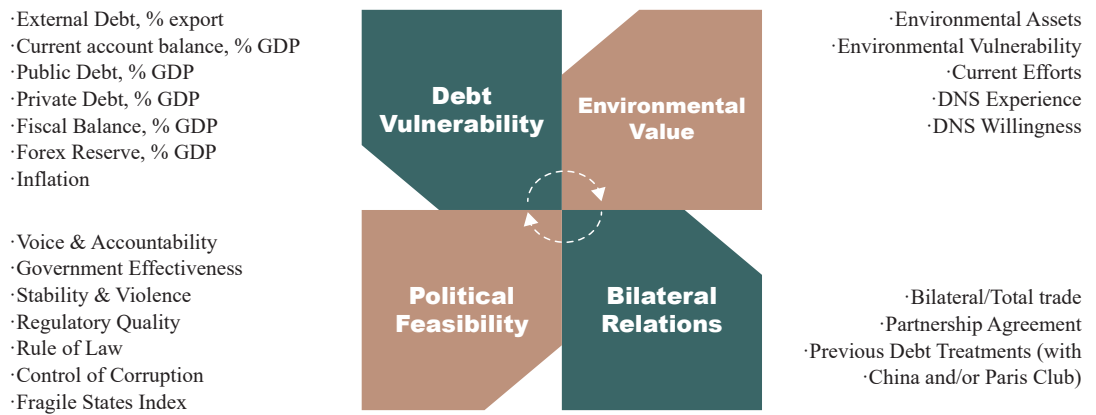# The DNS Partner Scoring Index (DNS-PSI)

As explained, the four broad categories of the scoring index emerged as the first-level variables, based on our preliminary research and review of existing literature. Under these four categories of first-level variables, there are 23 second-level indicators: Debt Vulnerability is composed of 7 indicators, Environmental Value is composed of 5 indicators, Political Feasibility is composed of 7 indicators, and Bilateral Relations is composed of 4 indicators (see Figure 1). Among these secondary variables, datapoints are extracted from existing data sources, whereas some data points are compiled by the authors. We first handpicked 96 developing countries as the basis for the data collection and analysis, with a cut-off date of December 2022. These 96 countries cover all bilateral debtors to China as of 2022, based on the World Bank's International Debt Statistics.

In cases where the 2022 data point is unavailable, we would apply the most adjacent data point from either 2021 or 2020. In case only data predating 2020 is available, the data point will be labelled as "missing", unless the data point value remains unchanged in the past years. the dataset. We then scale and convert raw data sets to percentile-ranked values, ranging from 0 to 100 for each sub-category. Given the higher importance of Debt Vulnerability and Environmental Value within the DNS arrangement, 30% of the weight is attached to these two variables, and 20% of weight is attached to the Political Feasibility and Bilateral Relations variables. Consequently, the DNS Partner Scoring Index is computed as the weighted average of the percentile rankings across the four variables.

Within each category, the score for each country is determined by the arithmetic

average of different indicators respectively. For instance, the score of a specific country under the "Debt Vulnerability" category is derived from averaging the percentile ranks of the seven indicators.

Figure 1: The DNS Partner Scoring Index (DNS-PSI)

·External Debt, % export
·Current account balance, % GDP
·Public Debt, % GDP
·Private Debt, % GDP
·Fiscal Balance, % GDP
·Forex Reserve, % GDP
·Inflation

·Voice & Accountability
·Government Effectiveness
·Stability & Violence
·Regulatory Quality
·Rule of Law
·Control of Corruption
·Fragile States Index

Debt Vulnerability

Environmental Value

Political Feasibility

Bilateral Relations

·Environmental Assets
·Environmental Vulnerability
·Current Efforts
·DNS Experience
·DNS Willingness

·Bilateral/Total trade
·Partnership Agreement
·Previous Debt Treatments (with
·China and/or Paris Club)

1.Debt Vulnerability

Sovereign debt is generally understood as acquired through issuing bonds, bills, or taking loans from international lenders. The IMF's Government Finance Statistics defines sovereign debt as debt contracted by the national government through legal agreements. Although sovereign debt primarily refers to external public debt, it may also include domestic public debt backed by the nation's credit.

i | The Indicators

Sovereign debt vulnerability is used to measure the magnitude of a country's sovereign debt risk and the likelihood of defaults. For any matured economies, sovereign debt vulnerability is primarily influenced by internal factors such as economic growth, real interest rates, and fiscal policies[2]. Issues of inflation are often manifested as overheated economies that can lead to economic downturns, magnifying debt risks. A rise in real interest rates can trigger a decline in the value of financial assets, incurring more interest payments, and consequently weakening the government's debt servicing capacity. In efforts to reduce debt levels, governments would implement austerity policies to raise tax revenues and stabilize macroeconomic leverage ratios. However, such an approach can also induce the country into a vicious cycle of "debt deflation" (House et al., 2020).

Developing economies are featured with less resilient economic foundations that are more sensitive to external shocks. These countries typically possess a significant portion of their debt denominated in foreign currency and serve as current liabilities. Sudden or severe fluctuations in exchange rates can greatly increase the likelihood of default. Against the backdrop of interest rate hikes by central banks in Europe and the United States, if emerging economies choose to maintain consistent macroeconomic policies, the increase in real interest rates on foreign currency debt often leads to a rise in domestic real interest rates, exacerbating debt burdens and negatively impacting the real economy. However, if there is a significant difference in economic cycles compared to the United States, the narrowing of interest rate differentials between emerging countries and the Federal Reserve could result in capital outflows

2 According to IMF, developed countries include 41 countries and regions: Andorra, Australia, Austria, Belgium, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong (China), Iceland, Ireland, Israel, Italy, Japan, South Korea, Latvia, Lithuania, Luxembourg, Macau (China), Malta, Netherlands, New Zealand, Norway, Portugal, Puerto Rico, San Marino, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan (China), United Kingdom, and United States.

and currency depreciation due to the inherent vulnerability of sovereign credit in emerging economies. In such cases, the negative effects of inflation far outweigh the positive effects, easily triggering liquidity crises.

The change of government leverage on debt service can be expressed as:

$$\Delta d_t = d_t - d_{t-1} = \frac{r_t - g_t}{1 + g_t} d_{t-1} - p_t + e_t \qquad \text{(1)}$$

Whereas d_t is the government leverage of time t, that is, the public debt-to-GDP ratio, which is the indicator reflecting the sovereign debt vulnerability of developed economies. r_t is the real interest rate, g_t is the growth rate of real GDP. p_t is the ratio of fiscal balance to nominal GDP, that is, the fiscal adjustment, e_t represents other potential factors that may affect the debt-to-GDP ratio, such as bailouts for the private sector.

From equation (1), it is evident that changes in government leverage have a positive correlation with real interest rates and a negative correlation with GDP growth rate and the ratio of fiscal balance to GDP.

The datasets for this category are sourced from the IMF's World Economic Outlook Database, International Debt Database, and World Bank. The implicit assumption is that the future values of all relevant indicators for developed economies will align with the IMF's forecasts.

Assuming no influence from other factors ($e_t = 0$) if we want to keep the government leverage ratio constant,i.e., $\Delta d_t = 0$, then:

$$p_t = \frac{r_t - g_t}{1 + g_t} d_{t-1} \qquad \text{(2)}$$

$$\Delta p_t = p_t - p_{t-1} = \frac{r_t - g_t}{1 + g_t} d_{t-1} - p_{t-1} \qquad \text{(3)}$$

Δp_t represents the change in the required fiscal balance for maintaining a constant government leverage ratio. A larger value of this indicator indicates that the government needs to implement more progressive fiscal policy measures to stabilize the leverage ratio. In this scenario, the greater constraints that government faces on its fiscal policy, the more vulnerable of its sovereign debt service is as a result.

However, previous studies suggested that adjusting the scale of fiscal balances does not significantly reduce the likelihood of sovereign default in emerging economies (Schaltegger, 2015). Therefore, following the approach proposed by Ahmed et al. (2017), this paper constructs an index of sovereign debt vulnerability in emerging markets. The sovereign debt vulnerability index, constructed using the arithmetic mean method, addresses the limited degrees of freedom in multiple regressions while incorporating several macroeconomic variables, which comprise seven indicators, namely:

(1) External debt-to-exports ratio;

(2) Ratio of current account balance to GDP;

(3) Ratio of general government total debt to GDP

(4) Ratio of private credit to GDP over 2017-2022;

(5) Ratio of fiscal balance to GDP

(6) Ratio of foreign exchange reserves to GDP

(7) Average annual inflation rate over 2021-2023.
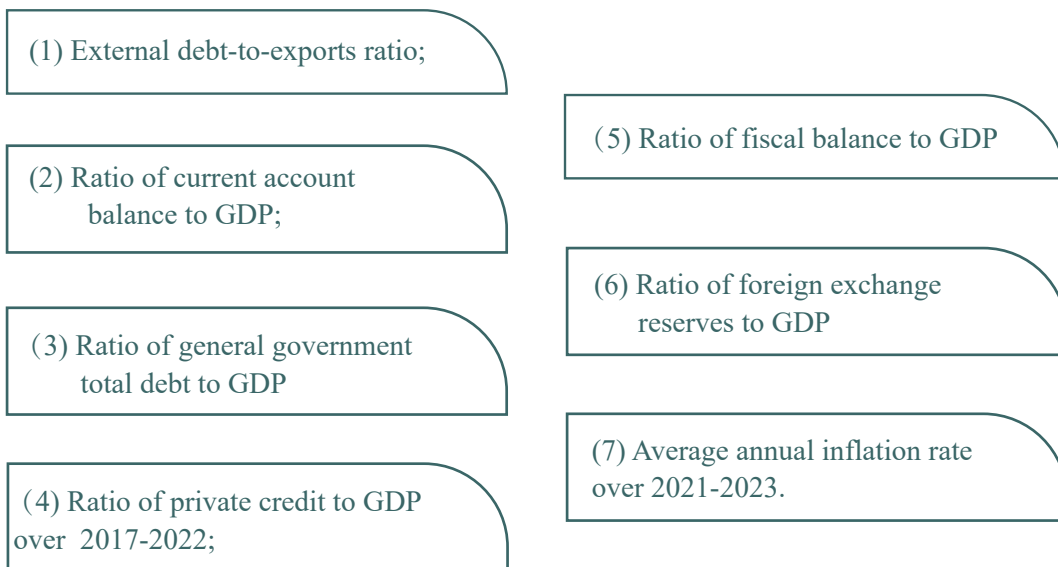
The rationale behind each indicator is shown below:

- ## External Debt-to-Exports Ratio

The higher the proportion of external debt relative to exports, the greater the risk of increased fiscal burden. A rising external debt-to-exports ratio suggests that a country's external debt is growing faster than its capacity to earn foreign currency through exports, which can make it difficult to meet debt service obligations. A high external debt-to-exports ratio makes the country more vulnerable to such external shocks. IMF views this indicator as a crucial measure of debt sustainability. For instance, according to the HIPC Initiative, its decisions on assistance are determined based on the ratio of public debt to exports (150%) or to fiscal revenue (250%).

- ## Ratio of General Government Total Debt to GDP

High macro leverage ratios may strain government finances, limiting future spending capacity and increasing the risk of sovereign debt default. A country's ability to repay debt affects its default probability, leading to higher interest rates on externally denominated dollar debt, increasing sovereign yield spreads, and raising the country's

borrowing costs in international capital markets. Higher macro leverage ratios imply heavier interest burdens and correspondingly greater risks of sovereign debt default.

- ## Private Credit to GDP Ratio over 2017-2022

Excessive credit amplifies contagion risks in a time of financial instability, affecting the entire real economy system. Rapid private credit expansion exacerbates the likelihood of debt crises by creating asset bubbles. Offshore private bonds account for a significant portion of private sector debt for emerging economies, which normally increase currency and interest rate risks. Moreover, increased private credit is often accompanied by reduced investment in the real economic sector, impacting total factor productivity and weakening the future growth potential of the economy (Miao and Wang, 2018).

The ratio is calculated as follows: suppose the value for the year of 2022 is X2022, and for 2017 is X2017. Then the average growth rate is (X2022/X2017-1)/5. In case the value of 2022 is missing, 2021 data is used, and the average growth rate is calculated as (X2021/X2017-1)/4, and so on. If only data preceding to 2017 is available, this value is recorded as missing for this country. The average growth rate captures the trend of private leverage (Davis et al., 2016).

• Average Annual Inflation Rate over 2021-2023

If central banks decide to inflate some of the debt or resort to direct monetization of future deficits, it could result in inflation expectations becoming unanchored. Higher inflation signifies an increased risk of debt vulnerability. While high inflation reduces the real value of outstanding debt denominated in domestic currency in the short run, it also increases the instability of future debt repayment, affecting economic stability (Brandao-Marques et al. 2023).

• Ratio of Fiscal Balance to GDP

This figure reflects a government's ability to manage its spending and revenue in relation to the overall size of the economy. A higher ratio of fiscal balance to GDP indicates that the government can repay existing debt without incurring new debt, thereby having more maneuver space to address economic shocks and reduce debt risk.

• Ratio of Current Account Balance to GDP

The ability to generate foreign exchange income from exports affects the capacity to repay external debt denominated in foreign currencies. A surplus in the current account implies a country has a more stable debt repayment capacity and a lower dependence on external financing. Conversely, a deficit indicates a tendency for an economy to overconsume, thus undermining long-term sustainability. A large and persistent current account deficit indicates the country needs foreign capital inflows

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• Ratio of International Reserves to GDP

Adequate international reserves can enhance a country's payment capacity and reduce the risk of debt repayment. If a country experiences greater reserve losses or needs to access funds from the IMF, it is considered more vulnerable.

To construct the debt vulnerability index for emerging markets, we first rank each variable for the developing countries from the least vulnerable to the most vulnerable. For instance, a country with the highest ratio of government debt to GDP is ranked as N, indicating the highest vulnerability, whereas a lower ratio corresponds to lower vulnerability. After sorting the ranking, each country has seven indicators, which will be arithmetically averaged to get a synthesis rank as the indexed value for this category. Consequently, a higher value indicates higher debt vulnerability. It's to lower vulnerability. After sorting the ranking, each country has seven indicators, which will be arithmetically averaged to get a synthesis rank as the indexed value for this category. Consequently, a higher value indicates higher debt vulnerability. It's worth noting that this index only represents the relative level of debt vulnerability of a specific debtor country at the time of assessment. It is neither absolute nor permanent and subject to adjustment in time.

ⅱ The Ranking for Debt Vulnerability

Based on the above indicators, we have studied the sovereign debt vulnerability of countries that have creditor-debtor relationships with China. The most and least debt-vulnerable countries in the global South are shown in Table 1 and Table 2. We also handpicked the ten most indebted countries to China in 2022 and assessed their debt vulnerability (Table 3). The top 10 most debt-vulnerable countries are Sri Lanka, Lebanon, Malawi, Yemen, Pakistan, Jordan, Burundi, Rwanda, Sierra Leone, and Senegal. These countries often face higher challenges such as notable economic recession, inadequate foreign reserves, and high levels of public/private debt, which contribute to a higher vulnerability ranking.

Table 1. Top 10 or Most Debt-Vulnerable Debtor Countries

Country	Ranking of debt vulnerability	Score of debt vulnerability	External debt, % export	General government total debt, % GDP	Average growth rate of private credit to GDP ratio for 2017-2022	Average annual inflation rate for 2021-2022	Fiscal balance, % GDP	Current account balance, % GDP	International reserves, % GDP
Sri Lanka	1	92.97	357.61	115.54	0.06	17.06	-10.19	N/A	0.004
Lebanon	2	90.83	513.63	-43.94	-0.13	108.65	-6.13	-9.64	0.152
Malawi	3	83.45	285.31	81.26	0.03	20.16	-7.55	-6.94	N/A
Yemen, Rep.	4	79.05	N/A	81.15	N/A	19.92	-4.54	-19.11	N/A
Pakistan	5	77.01	320.23	77.11	0.03	16.74	-7.75	-0.66	0.003
Jordan	6	76.97	192.40	91.19	0.03	8.37	-7.32	-7.02	N/A
Burundi	7	76.17	309.81	62.84	0.36	18.05	-0.28	-13.33	0.005
Rwanda	8	75.27	321.42	62.05	0.03	9.58	-5.48	-11.73	0.013
Sierra Leone	9	73.80	184.95	80.02	0.05	28.93	-7.28	-4.00	0.015
Senegal	10	73.75	466.71	79.59	0.02	5.94	-4.94	-15.15	N/A

As for the least debt-vulnerable countries, most of them have positive current account balances, which appears to be a significant factor in reducing sovereign debt vulnerability. Furthermore, these countries exhibit relatively stable asset price levels, with inflation rates consistently below 10%, except for Iran. It is worth noting that the absence of data for the international reserves ratio to GDP for Sri Lanka may affect the accuracy of the ranking (see Table 2).

Table 2. Bottom 10 or Least Debt-Vulnerable Debtor Countries

Country	Ranking of debt vulnerability	Score of debt vulnerability	External debt, % export	General government total debt, %GDP	Average growth rate of private credit to GDP ratio for 2017-2022	Average annual inflation rate for 2021-2022	Fiscal balance, % GDP	Current account balance,% GDP	International reserves, % GDP
Guatemala	86	28.60	130.25	27.84	0.00	5.78	-1.36	2.88	0.021
Tajikistan	87	28.11	121.47	30.93	0.00	6.42	-1.05	-0.74	0.037
Eswatini	88	27.81	54.49	37.81	-0.01	4.49	-1.14	2.19	0.009
Iraq	89	27.37	32.17	44.15	0.04	5.15	-1.25	2.59	0.037
Nicaragua	90	26.84	186.18	41.34	-0.07	7.95	0.70	4.54	0.028
Viet Nam	91	26.14	37.93	34.03	0.04	2.75	-1.61	5.12	0.021
Algeria	92	25.92	10.21	49.49	-0.03	8.60	-0.10	2.16	0.037
Iran, Islamic Rep.	93	25.77	13.14	28.33	-0.05	42.49	-2.34	4.40	N/A
Cambodia	94	24.04	86.95	25.85	0.22	3.46	-0.65	1.32	0.060
Turkmenistan	95	19.16	N/A	4.70	-0.04	9.65	1.30	4.75	N/A

According to the World Bank DSSI database, the most indebted countries to China in 2022 and their ranking of debt vulnerability is presented in Table 3. Pakistan tops the list with a debt amounting to a significant 26.6 billion USD. It is noted that there is no clear correlation between the ranking of debt vulnerability and their actual indebted amount to China.

Table 3. Top 10 Countries Indebted to China (2022) and Their Debt Vulnerability Ranking

| Country	Ranking of Debt Vulnerability	Score of debt vulnerability	Ranking Debt China	Debt to China 2022, Current US$ billions
Pakistan	5	77.01	1	26.60
Angola	45	49.89	2	20.98
Sri Lanka	1	92.97	3	8.84
Ethiopia	28	60.29	4	6.82
Kenya	23	62.34	5	6.69
Zambia	13	69.71	6	6.08
Bangladesh	62	43.77	7	6.05
Lao PDR	19	64.90	8	5.25
Egypt, Arab Rep.	12	71.59	9	5.21
Nigeria	43	51.57	10	4.29

2.Environmental Value

Environmental values in this study are defined by both intrinsic and instrumental value: Intrinsic value refers to the inherent worth of the environment, independent of its usefulness to humans (Naess, 2019; Rolston, 1988), whereas instrumental value refers to the way the environment benefits human development, often measured in monetary terms (Costanza, 2000). For DNS, both intrinsic and instrumental values are important as the debtors as developing countries have urgent needs to improve both environmental and human development. In addition, environmental values are important because they serve as the ideological root for any policy changes or stakeholders' perceptions when engaging in negotiations on assessing environmental and natural resources.

i The Indicators

Successful DNS implementation requires a long-term commitment from both the creditor and debtor country, since the transaction may last years if not decades. It is a test of both countries' dedication to debt and environmental sustainability. DNS would work well only when the debtor country prioritizes both the conservation of its ecosystems and the enhancement of the welfare of the people. Hence, indicators selected in this category would reflect the potential of environmental assets in the given debtor country, and its government's ambition for achieving both environmental and developmental goals. From the urgency perspective, the level of environmental vulnerability is another important criterion on which sectors should be prioritized when considering DNS arrangement. We argue that these indicators would demonstrate the determination of environmental conservation and human development, suggesting strong policy endorsement and coherence throughout the DNS negotiation and implementation cycle.

In addition, it is believed that countries with DNS existing experience, or have exhibited a strong willingness to experiment with DNS arrangement in recent years are believed as positive signals for reaching successful DNS deals. Specifically, the Environmental Values category is composed of four indicators:

(1) Environmental assets

(2) Environmental vulnerability

(3) Current effort (for conservation)

(4) DNS experience and willingness
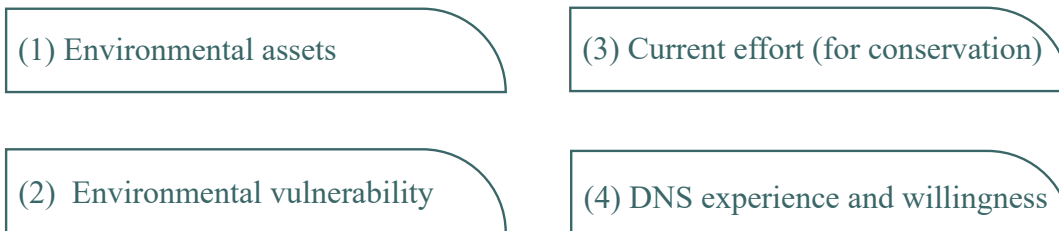
• Environmental Assets

The data points for the Environmental Assets indicator are sourced from the Global Sustainability Competitiveness Index (GSCI) published by Solability, a Swiss-Korean joint think-tank. Its Natural Capital model incorporates the essence of resources that allow a country to be completely self-sustaining: land, water, climate, biodiversity, food production and capacity, and energy and mineral resources. Countries are given a score between 0 and 100 in terms of water, biodiversity, or other environmental resources. These data points reflect a country's abundance and potential value of natural conservation and environmental protection that can be swapped in theory. The assumption is that a country with more abundant environmental assets is more suitable for DNS.

• Environmental Vulnerability

The Environmental Vulnerability indicator was assessed by applying the Global Adaptation Initiative Country Index (ND-GAIN), hosted by Notre Dame University. NG-GAIN summarizes a given country's vulnerability and readiness for climate change and assesses the vulnerability of a country by considering six life-supporting sectors: food, water, health, ecosystem services, human habitat, and infrastructure.

Each sector's vulnerability is measured by the exposure of the sector to climate-related or climate-exacerbated hazards; the sensitivity of that sector to the hazardous impacts and the adaptive capacity (University of Notre Dame, 2022). The greater a country's vulnerability to climate risks and environmental shocks, the greater the necessity and urgency for implementing nature conservation projects, hence more suitable for DNS.

• **Current Effort**

The Current Effort indicator is based on the data extracted from the Environmental Performance Index published by Yale University, which measures national efforts to protect environmental health, enhance ecosystem vitality, and mitigate climate change (Yale University, 2022). High-scoring countries exhibit longstanding and continuing support by strong and coherent environmental policies. It should be noted that this is an indicator not just about state ambition but state capacity too. For example, most developing countries, which usually face significant financial and technical constraints to invest in environmental infrastructures, rank considerably low in this index. As a result, the lower a country's current efforts score, the greater the necessity and urgency for DNS.

• **DNS experience and willingness**

Data on DNS experience and willingness are gathered by desk research in 2024 to identify debtor countries with previous DNS settlements, or senior government officials' open statements that expressed interest to consider DNS. If affirmative, these indicators are assigned a value of 1; otherwise, they receive a value of 0. For instance, Egypt has engaged in several debt swaps deals with Italy and Germany since 1994 and has signed a Memorandum of Understanding (MoU) with China indicating an interest in exploring debt swap opportunities. Consequently, Egypt is marked with '1' under both indicators.

ii The Ranking for Environmental Assets

Based on the Environmental Value data, we listed the most and least environmental-ly valuable countries to develop DNS transactions (Table 4 and Table 5). In addition, we handpicked the ten most indebted countries to China in 2022 and assessed their environmental value (Table 6).

Table 4. Top 10 or Most Environmentally Valuable Debtor Countries (Unit: index score)

Country	Ranking of Environmental Value	Score of Environmental Value	Environmental Assets	Environmental Vulnerability	Current Effort	DNS Experience	DNS Willingness
Congo, Dem. Rep.	1	88.20	95.70	90.50	54.80	1	0
Central African Republic	2	83.23	74.40	92.60	82.70	0	0
Albania	3	82.66	97.80	24.20	91.30	1	1
Ecuador	4	82.40	79.70	43.10	89.20	1	1
Bolivia	5	80.88	98.90	38.90	66.60	1	0
Zimbabwe	6	80.42	75.50	65.20	87.00	0	0
Zambia	7	79.68	81.90	55.70	64.50	1	0
Gabon	8	78.86	60.60	40.00	97.80	1	0
Congo, Rep.	9	78.00	84.00	72.60	66.60	0	0
Tonga	10	76.46	44.60	97.80	79.50	0	0

Table 5. Bottom 10 or Least Environmentally Valuable Debtor Countries (Unit: index score)

Country	Ranking of Environmental Value	Score of Environmental Value	Environmental Assets	Environmental Vulnerability	Current Effort	DNS Experience	DNS Willingness
Syrian Arab Republic	87	41.20	34.00	48.40	#N/A	0	0

Table 5. Bottom 10 or Least Environmentally Valuable Debtor Countries (Unit: index score)

Country	Ranking of Environmental Value	Score of Environmental Value	Environmental Assets	Environmental Vulnerability	Current Effort	DNS Experience	DNS Willingness
Grenada	88	38.53	2.10	20.00	93.50	0	0
Viet Nam	89	37.70	58.50	53.60	1.00	0	0
Turkmenistan	90	33.47	40.40	3.10	56.90	0	0
Mongolia	91	32.97	63.80	13.60	21.50	0	0
Iran, Islamic Rep.	92	26.63	17.00	17.80	45.10	0	0
Turkiye	93	24.43	62.70	4.20	6.40	0	0
Morocco	94	20.50	26.50	16.80	18.20	0	0
Algeria	95	19.87	23.40	14.70	21.50	0	0
Iraq	96	17.57	6.30	36.80	9.60	0	0

Table 6. Top 10 Countries Indebted to China (2022) and Their Environmental Value Ranking

Country	Ranking of Environmental Value	Score of Environmental Value	Ranking of Debt to China	Debt to China 2022, Current US$ billions
Pakistan	77	45.28	1	26.60
Angola	55	55.10	2	20.98
Sri Lanka	56	54.48	3	8.84
Ethiopia	43	68.16	4	6.82
Kenya	37	62.04	5	6.69
Zambia	7	80.42	6	6.08
Bangladesh	84	41.90	7	6.05
Lao PDR	48	57.37	8	5.25
Egypt, Arab Rep.	46	58.32	9	5.21
Nigeria	60	53.03	10	4.29

3.Political Feasibility

For the creditor countries, the success of DNS depends heavily on the governance and political risks in the debtor country. Most DNS deals are initiated and supervised by governments or affiliated agencies, even though non-state actors can play a crucial role at various stages. It is essentially a public-private partnership (Hansen, 1989; Post 1990), which tests the effectiveness of the government institutions and their coordination capacities within the bureaucratic segments and with the non-state spheres. It is also noted that the environmental value that emerged out of the DNS deals should also be properly verified and validated, which often requires certain state-backed legitimacy processes. Preventing an environmental 'rent-capture' is therefore essential. Lastly, any environmental protection or conservation projects need to take into consideration of political stability as DNS activities in the conflict zone can be difficult to operate, if possible at all. For example, the political instability in Egypt between 2011-2014 has caused significant delays in implementing its debt swap programs with Italy.

i The Indicators

The data points under the Political Feasibility category are largely extracted from the World Bank's Worldwide Governance Indicators (WGI), which is known as a global compilation of data capturing household, business, and citizen perceptions of the quality of governance in more than 200 countries and territories (World Bank, 2022). Besides, we also incorporated the Fragile State Index (FSI) by The Fund of Peace, which captures the social, economic, and political pressure faced by states (The fund of peace, 2023). Specifically, the Political Feasibility category is composed of seven indicators:

(1) Voice and accountability

(2) Political stability and absence of violence/terrorism

(3) Governance effectiveness

(4) Regulatory quality

(5) Rule of law

(6) Control of corruption

(7) Fragile state index

- **Voice and Accountability**

This variable captures perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and free media.

- **Political Stability and Absence of Violence/Terrorism**

This variable captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism.

- **Governance Effectiveness**

This variable captures perceptions of the quality of public and civil service, and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

- **Regulatory Quality**

This variable captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

- **Rule of Law**

This variable captures perceptions of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

- **Control of Corruption**

This variable captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as the capture of the state by elites and private interests.

- **Fragile State Index (FSI)**

This is an annual ranking of countries based on the pressures they face that impact their levels of fragility. Scores are apportioned for every country based on twelve key political, social, and economic indicators and over 100 sub-indicators. A reduced score indicates an improvement and greater relative stability, just as a higher score indicates greater instability.

ii The Ranking for Political Feasibility

Based on the WGI and FSI data, we listed the most and least politically feasible countries to develop DNS transactions (Table 7 and Table 8). In addition, we hand-picked the ten most indebted countries to China in 2022 and assessed their political feasibility (Table 9).

Table 7. Top 10 Most Politically Feasible Debtor Countries for DNS (Unit: index score)

Country	Political Feasibility Ranking	Political Feasibility Score	Voice & Accountability	Stability, Violence & Terrorism	Governance Effectiveness	Regulatory Quality	Rule of law	Control of Corruption	Fragile States Index
Mauritius	1	96.66	91.50	92.60	100.00	100.00	98.90	93.60	100.00
Costa Rica	2	95.90	100.00	95.70	88.40	98.90	94.70	94.70	98.90
Grenada	3	94.20	92.60	96.80	87.30	95.70	95.70	95.70	95.60
Cabo Verde	4	93.44	97.80	93.60	85.20	93.60	93.60	100.00	90.30
Dominica	5	93.00	95.70	100.00	80.00	94.70	97.80	96.80	86.00
Samoa	6	91.76	98.90	97.80	95.70	72.60	100.00	97.80	79.50
Jamaica	7	89.37	90.50	86.30	98.90	91.50	85.20	89.40	83.80
Montenegro	8	85.34	85.20	73.60	84.20	97.80	78.90	84.20	93.50
North Macedonia	9	83.99	80.00	84.20	81.00	96.80	81.00	75.70	89.20
Vanuatu	10	83.98	94.70	94.70	55.70	80.00	91.50	87.30	N/A

Table 8. Bottom 10 or Least Politically Feasible Debtor Countries for DNS (Unit: index score)

Country	Political Feasibility Ranking	Political Feasibility Score	Voice & Accountability	Stability, Violence & Terrorism	Governance Effectiveness	Regulatory Quality	Rule of law	Control of Corruption	Fragile States Index
Burundi	87	15.33	12.60	21.00	14.70	27.30	13.60	3.10	15.00
Iraq	88	15.20	29.40	4.20	13.60	15.70	4.20	16.80	22.50
Chad	89	10.47	9.40	15.70	11.50	17.80	9.40	4.20	5.30
Eritrea	90	9.83	2.10	25.20	4.20	0.00	3.10	10.50	13.90
Central African Republic	91	8.70	20.00	6.30	5.20	7.30	5.20	12.60	4.30
Myanmar	92	8.69	3.10	5.20	7.30	11.50	7.30	18.90	7.50
Sudan	93	7.64	8.40	8.40	6.30	5.20	14.70	7.30	3.20
Congo, Dem. Rep.	94	7.34	22.10	10.50	3.10	6.30	6.30	2.10	1.00
Yemen, Rep.	95	2.77	7.30	3.10	1.00	2.10	2.10	1.00	0.00
Syrian Arab Republic	96	1.86	1.00	0.00	2.10	3.10	1.00	0.00	2.10

Table 9. Ten Most Indebted Countries to China (2022) and their Political Feasibility Ranking

Country	Ranking of Political Feasibility	Score of Political Feasibility	Ranking of Debt to China	Debt to China 2022, Current US$ billions
Pakistan	70	33.56	1	26.60
Angola	67	36.74	2	20.98
Sri Lanka	42	54.93	3	8.84
Ethiopia	74	30.94	4	6.82
Kenya	46	50.57	5	6.69
Zambia	40	57.81	6	6.08
Bangladesh	69	34.20	7	6.05
Lao PDR	54	43.29	8	5.25
Egypt, Arab Rep.	62	41.14	9	5.21
Nigeria	81.5	24.06	10	4.29

4.Bilateral Relations

The economic and diplomatic relations between creditor and debtor countries would affect the implementation of DNS. For example, if both parties have significant economic ties and considerable bilateral trade volumes, then the likelihood of both parties entering into a DNS arrangement can be presumably higher. Likewise, good diplomatic relations also help to facilitate the DNS deal by overcoming the coordination hurdles and reducing the transactional costs. Bilateral relations are particularly crucial for newly emerged bilateral creditors like China. In addition, the relations between debtor countries and other creditors also matter, as the likelihood of any given debtor country entering into a multilateral sovereign debt rescheduling process would significantly reduce bilateral creditor's enthusiasm for considering DNS.

i The Indicators

The Bilateral Relation category comprises four indicators:

(1) Bilateral trade with China as the percentage of both parties' total trade volume

(2) Duration of the diplomatic relations with China

(3) Type of diplomatic relation or partnership with China

(4) Likelihood of the debtor country entering Paris Club resettlementor part nership with China

The first three indicators are positively co-related to the Bilateral Relations ranking whereas the last indicator is negatively co-related.

• Bilateral Trade Volume

The bilateral trade volume is measured by two indicators: the bilateral trade of goods and services between China and the debtor country as a percentage of the debtor country's total trade, and as a percentage of China's total trade.

• Duration of Diplomatic Relations with China

The duration of diplomatic relations is calculated as 2024 minus the year of estab-lishment of diplomatic relations.

• Type of Diplomatic Relations or Partnership with China

We categorize China's diplomatic relations on a scale of 1 through 7, denoting varying degrees of closeness. This system employs different terminology to signify a hierarchy of diplomatic partnerships. According to sources including BBC (2023), Xiang (2023), Men & Liu (2015), and Myers & Barrios (2021), these relationships can generally be grouped into three tiers:

(a) Strategic Partnerships: designations preceded by "strategic" imply heightened engagement. Examples include "permanent/all-weather strategic partnership," "comprehensive/global/all-round strategic partnership," and "ordinary strategic partnership."

(b) Partnerships without the "strategic" label, such as "friendly partnership" and "comprehensive partnership."

(c) Relationships lacking the "partnership" descriptor, like "new type of major power relationship" and "mutually beneficial relationship based on common strategic interests."

• Likelihood of Paris Club Resettlement

This variable is predicted by the number of historic debt treatments of the debtor countries with the Paris Club creditors, consolidated from the debt treatments announcements published Paris Club website. This variable is negatively correlated with the Bilateral Relations variable, that is, the more often a country has had its debt restructured with the Paris Club, the less suitable it is for DNS programs with China.

ii The Ranking for Bilateral Relations

Based on the above indicators, we listed the top 10 and bottom 10 countries for Bilateral Relations (Table 10 and Table 11). In addition, we picked the ten most indebted countries to China in 2022 and assessed their bilateral relations (Table 12).

Table 10. Top 10 Debtor Countries with Most Positive Bilateral Relations

Country	Ranking of Bilateral Relations	Score of Bilateral Relations	Trade with China, % Debtor Country's Total Trade	Trade with China,% China's Total Trade	Type of Diplomatic Relations with China	Duration of Diplomatic Relations with China, years	Number of Debt Treatments with Paris Club
VietNam	1	84.66	29.44	4.41	6.0	74	1
Mongolia	2	83.60	74.30	0.31	5.0	75	0
Myanmar	3	82.96	40.21	0.40	6.0	74	2
LaoPDR	4	79.96	36.77	0.13	6.0	63	0
Pakistan	5	73.42	23.22	0.40	7.0	73	7
Iraq	6	73.08	30.21	0.94	4.5	66	1
Cambodia	7	71.76	22.93	0.28	6.0	66	3
Iran, Islamic Rep.	8	69.94	26.88	0.28	5.0	53	0
Congo, Dem.Rep.	9	69.00	57.08	0.36	6.0	63	14
Indonesia	10	67.96	26.75	2.64	5.0	74	8

Table 11. Bottom 10 Debtor Countries with Least Positive Bilateral Relations

Country	Ranking of Bilateral Relations	Score of Bilateral Relations	Trade with China, % Debtor Country's Total Trade	Trade with China,% China's Total Trade	Type of Diplomatic Relations with China	Duration of Diplomatic Relations withChina, years	Number of Debt Treatments with Paris Club
Nicaragua	87	23.76	4.98	0.016	4.5	39	6
North Macedonia	88	23.64	2.20	0.009	2.0	31	2
Dominican Republic	89	23.13	17.02	0.001	N/A	6	4
Central African Republic	90	23.00	12.38	0.002	1.5	60	11

Country	Ranking of Bilateral Relations	Score of Bilateral Relations	Trade with China, % Debtor Country's Total Trade	Trade with China,% China's Total Trade	Type of Diplomatic Relations with China	Duration of Diplomatic Relations withChina, years	Number of Debt Treatments with Paris Club
Burkina Faso	91	22.06	6.98	0.011	1.5	51	6
Niger	92	21.42	12.65	0.012	1.5	50	12
Lesotho	93	20.28	4.87	0.002	1.5	41	1
Montenegro	94	16.62	3.72	0.004	1.5	18	1
Grenada	95	15.00	4.82	0.000	1.5	39	3
Malawi	96	14.50	8.55	0.005	1.5	17	5

Table 12. Top 10 Countries Indebted to China (2022) and their Bilateral Relations Ranking

Country	Ranking of Bilateral Relations	Score of Bilateral Relations	Ranking of Debt to China	Debt to China 2022, Current US$ billions
Pakistan	5	73.42	1	26.60
Angola	21	61.02	2	20.98
Sri Lanka	14	64.8	3	8.84
Ethiopia	39	52.06	4	6.82
Kenya	11	67.72	5	6.69
Zambia	20	61.18	6	6.08
Bangladesh	38	52.32	7	6.05
Lao PDR	4	79.96	8	5.25
Egypt, Arab Rep.	18	62.9	9	5.21
Nigeria	31	55.48	10	4.29

5.Synthesis Ranking

The synthesis ranking of the debtor countries is based on the weighting of four categorical rankings on Debt Vulnerability (30%), Environmental Value (30%), Political Feasibility (20%), and Bilateral Relations (20%). We listed the top 10 and bottom 10 countries for the synthesis ranking (Table 13 and Table 14). In addition, we picked the ten most indebted countries to China in 2022 and assessed their synthesis ranking (Table 15). The complete synthesis ranking is in the Appendix 1. It is noted that Eritrea's Debt Vulnerability data is missing, it was dropped eventually in the index. There are a total of 95 debtor countries in the final ranking index.

Table 13. Top 10 Debtor Countries Most Suitable for DNS
(Unit: index score)

Country	Ranking of DNS Partner Score	DNS Partner Score	Debt Vulnerability	Environmental Value	Political Feasibility	Bilateral Relations
Senegal	1	68.7	73.8	60.3	75.2	67.5
Sri Lanka	2	68.2	93.0	54.5	54.9	64.8
Zambia	3	67.4	69.7	75.5	57.8	61.2
Brazil	4	65.3	61.9	72.5	64.0	60.8
Argentina	5	64.4	65.8	70.6	71.4	45.9
Sierra Leone	6	62.6	73.8	73.2	44.8	47.9
Ecuador	7	62.5	52.8	82.4	61.7	47.9
Maldives	8	62.5	61.7	61.4	72.7	55.2
Ghana	9	62.0	57.9	57.6	82.2	54.8
Albania	10	61.7	36.6	82.7	82.8	46.8

Table 14. Bottom 10 Debtor Countries Least Suitable for DNS (Unit: index score)

Country	Ranking of DNS Partner Score	DNS Partner Score	Debt Vulnerability	Environmental Value	Political Feasibility	Bilateral Relations
Comoros	86	40.7	44.9	52.8	25.8	31.1
Guatemala	87	40.6	28.6	46.2	42.1	48.7
Chad	88	39.8	39.1	60.3	10.5	39.6
Tajikistan	89	38.5	28.1	46.6	25.7	54.8
Nicaragua	90	37.3	26.8	63.8	26.9	23.8
Turkmenistan	91	34.8	19.2	33.5	30.8	64.3
Iran, Islamic Rep.	92	33.8	25.8	26.6	20.5	69.9
Algeria	93	33.8	25.9	19.9	41.7	58.5
Syrian Arab Republic	94	31.9	32.7	41.2	1.9	46.8
Iraq	95	31.1	27.4	17.6	15.2	73.1

Table 15. Top 10 Countries Indebted to China (2022) and DNS Partner Score Ranking

Country	Ranking of DNS Partner Score	DNS Partner Score	Ranking of Debt to China	Debt to China 2022, Current US$ billions
Pakistan	23	58.1	1	26.60
Angola	56	51.0	2	20.98
Sri Lanka	2	68.2	3	8.84
Ethiopia	52	52.7	4	6.82
Kenya	12	61.0	5	6.69
Zambia	3	67.4	6	6.08
Bangladesh	81	43.0	7	6.05
Lao PDR	11	61.3	8	5.25
Egypt, Arab Rep.	16	59.8	9	5.21
Nigeria	69	47.3	10	4.29

Chapter Three

Conclusion: Towards an Enhanced DNS Suitability Index

Despite the rising rhetoric and discussion about the promising potential of DNS or related instruments for addressing developing countries' looming debt and environmental crises, the actual implementation of DNS transactions remains limited. Emerging bilateral creditors such as China, India, and Turkey face significant institutional and capacity constraints to take on the DNS experiment. A key challenge for these lenders is the lack of assessment methodologies to identify the most suitable partners for negotiating and achieving potential DNS solutions.

In this report, we aim to address this concern by developing a DNS Partner Scoring Index (DNS-PSI), which comprises four sub-categories of indicators. We ranked all debtor countries to China based on this scoring index, which illustrates the suitability of different debtor countries to engage in DNS experiments with China. To the best of our knowledge, this is an unprecedented attempt to construct such a rather comprehensive index-based system to assess the suitability of DNS parties. This tool is particularly relevant for emerging bilateral creditors with growing sovereign debt portfolios and international obligations in achieving global sustainable development goals.

We recognize that DNS-PSI requires further refinement as it stands now. For example, the debt vulnerability category requires an overhaul to include additional debt sustainability indicators, such as foreign exchange rates, and to differentiate between low-income countries and those with market access. Moreover, inter-temporal analysis should be designed to discern short-term, medium-term, and long-term vulnera-

bilities, which can reveal potential DNS opportunities across different timeframes. Further refinements are necessary in other categories as well. For instance, in the bilateral relations category, indicators like foreign direct investment (FDI) and trade complementarity could provide valuable insights alongside trade volume.

The index needs to be revised and updated regularly in the future, given the constantly changing political and economic situations in both parties. We also hope that our efforts could inspire further research on this issue, whether through consolidating the model or methodology, or examining its applications with other emerging bilateral creditors and their DNS initiatives. The DNS-PSI can serve as a starting point for the development of other debt swap indexes, such as debt-for-development swaps (DDS) and debt-for-climate swaps (DCS).

Based on the preliminary findings, it is noted that further works are also needed on specific debtor countries that are suitable for experimenting DNS. Comprehensive analysis is required to identify country-specific DNS options and establish proper financial arrangements for the potential deals. Finally, capacity building is essential, as most debtor countries must strengthen their institutions to effectively facilitate and coordinate DNS transactions. This effort should involve both state and non-state entities given DNS' essential feature as a public-private partnership.

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Appendix 1. The Complete DNS Partner Score Ranking

Debtor Country	Debt Vulnerability	Environmental Value	Political Feasibility	Bilateral Relations	Synthesis Score	Synthesis Score Ranking
Senegal	73.75	60.25	75.20	67.48	68.74	1
Sri Lanka	92.97	54.48	54.93	64.80	68.18	2
Zambia	69.71	75.53	57.81	61.18	67.37	3
Brazil	61.94	72.50	64.04	60.82	65.31	4
Argentina	65.83	70.58	71.37	45.90	64.38	5
Sierra Leone	73.80	73.17	44.76	47.88	62.62	6
Ecuador	52.83	82.40	61.67	47.90	62.48	7
Maldives	61.67	61.35	72.67	55.18	62.48	8
Ghana	57.90	57.60	82.16	54.82	62.05	9
Albania	36.64	82.66	82.79	46.78	61.70	10
Lao PDR	64.90	57.37	43.29	79.96	61.33	11
Kenya	62.34	62.04	50.57	67.72	60.97	12
Rwanda	75.27	55.13	74.04	34.10	60.75	13
Jordan	76.97	47.75	73.64	40.20	60.18	14
Tanzania	46.20	73.58	58.47	62.22	60.07	15
Egypt, Arab Rep.	71.59	58.32	41.14	62.90	59.78	16
Bolivia	73.32	76.10	42.26	31.96	59.67	17
Costa Rica	44.51	66.40	95.90	34.84	59.42	18
Tonga	41.59	73.97	83.65	39.00	59.20	19
Kazakhstan	36.09	72.15	68.96	63.86	59.03	20
Fiji	46.09	65.88	83.61	42.90	58.89	21
Serbia	40.00	67.17	74.76	55.34	58.17	22
Pakistan	77.01	45.28	33.56	73.42	58.08	23
Zimbabwe	66.33	75.90	16.53	60.38	58.05	24
Malawi	83.45	63.40	52.83	14.50	57.52	25
Cabo Verde	48.94	61.54	93.44	24.94	56.82	26
Lebanon	90.83	53.90	21.97	42.52	56.32	27

Debtor Country	Debt Vulnerability	Environmental Value	Political Feasibility	Bilateral Relations	Synthesis Score	Synthesis Score Ranking
Dominica	52.30	56.20	93.00	23.78	55.91	28
Vanuatu	36.61	63.45	83.98	44.96	55.81	29
Myanmar	60.52	63.10	8.69	82.96	55.41	30
Congo, Dem. Rep.	48.21	85.25	7.34	69.00	55.31	31
Dominican Republic	54.20	58.85	81.74	23.13	54.89	32
Mozambique	62.97	65.85	32.34	48.20	54.76	33
El Salvador	56.70	65.50	58.37	30.23	54.38	34
Ukraine	64.84	62.33	42.84	38.04	54.33	35
Uganda	61.83	67.17	41.67	36.18	54.27	36
South Africa	49.00	43.73	73.23	58.98	54.26	37
Indonesia	32.59	52.03	76.13	67.96	54.20	38
Mauritius	46.76	44.47	96.66	36.80	54.06	39
Samoa	40.76	47.80	91.76	45.20	53.96	40
Gabon	34.83	74.60	48.74	56.42	53.86	41
Congo, Rep.	44.73	74.40	25.14	64.96	53.76	42
Kyrgyz Republic	57.06	57.28	36.96	60.28	53.75	43
Jamaica	32.39	62.33	89.37	36.88	53.66	44
Mongolia	39.29	32.97	76.33	83.60	53.66	45
Gambia, The	66.19	45.97	61.96	38.06	53.65	46
Philippines	45.24	51.75	62.80	57.92	53.24	47
Armenia	41.10	66.34	71.14	32.86	53.03	48
Suriname	41.71	62.23	67.29	41.82	53.01	49
Nepal	54.79	44.13	52.89	63.56	52.96	50
Niger	63.98	70.73	40.89	21.42	52.88	51
Ethiopia	60.29	60.20	30.94	52.06	52.75	52
Tunisia	54.44	47.95	68.46	40.06	52.42	53
Guyana	43.71	62.13	74.33	24.16	51.45	54
Benin	53.47	41.60	63.43	49.22	51.05	55
Angola	49.89	55.10	36.74	61.02	51.05	56
Cote d'Ivoire	45.37	68.78	57.49	25.32	50.80	57
North Macedonia	43.84	53.10	83.99	23.64	50.61	58
Montenegro	46.27	54.13	85.34	16.62	50.51	59
Madagascar	59.50	63.08	36.76	29.42	50.01	60
Uzbekistan	51.21	41.30	50.26	59.64	49.73	61
Burkina Faso	67.88	52.33	43.60	22.06	49.20	62

Debtor Country	Debt Vulnerability	Environmental Value	Political Feasibility	Bilateral Relations	Synthesis Score	Synthesis Score Ranking
Viet Nam	26.14	37.70	63.08	84.66	48.70	63
Burundi	76.17	52.20	15.33	31.64	47.91	64
Sudan	69.30	49.63	7.64	51.38	47.48	65
Belarus	38.04	63.77	31.43	52.70	47.37	66
Papua New Guinea	33.24	56.07	47.47	55.30	47.35	67
Honduras	42.36	70.20	41.61	26.27	47.34	68
Nigeria	51.57	53.03	24.06	55.48	47.29	69
Yemen, Rep.	79.05	44.25	2.77	47.92	47.13	70
Cambodia	24.04	56.93	41.59	71.76	46.96	71
Central African Republic	51.79	83.23	8.70	23.00	46.85	72
Liberia	57.30	45.03	36.56	44.08	46.83	73
Guinea	47.10	60.07	23.14	50.04	46.79	74
Togo	53.33	51.33	45.06	30.88	46.59	75
Grenada	42.90	38.53	94.20	15.00	46.27	76
Mauritania	48.60	56.15	37.96	36.02	46.22	77
Cameroon	43.05	61.63	24.06	41.22	44.46	78
Eswatini	27.81	63.85	43.70	41.05	44.45	79
Turkiye	49.56	24.43	52.56	57.14	44.14	80
Bangladesh	43.77	41.90	34.20	52.32	43.01	81
Morocco	41.79	20.50	68.27	46.74	41.69	82
Mali	53.65	49.67	24.80	27.66	41.49	83
Lesotho	39.62	46.00	58.16	20.28	41.37	84
Djibouti	33.47	52.90	32.99	43.48	41.20	85
Comoros	44.86	52.80	25.77	31.08	40.67	86
Guatemala	28.60	46.18	42.06	48.73	40.59	87
Chad	39.11	60.30	10.47	39.64	39.85	88
Tajikistan	28.11	46.57	25.70	54.80	38.50	89
Nicaragua	26.84	63.83	26.86	23.76	37.33	90
Turkmenistan	19.16	33.47	30.77	64.26	34.79	91
Iran, Islamic Rep.	25.77	26.63	20.51	69.94	33.81	92
Algeria	25.92	19.87	41.67	58.46	33.76	93
Syrian Arab Republic	32.66	41.20	1.86	46.80	31.89	94
Iraq	27.37	17.57	15.20	73.08	31.14	95

Appendix 2. Summary of Indicators

First level indicator	Second level indicator	Data source	Database	Type of indicator
1.Debt vulnerability	1.External debt, % export	IMF	Regional economic outlook (2004)	Continuous
	2.General government total debt, %GDP	IMF	Global Debt Database	Continuous
	3.Average growth rate of private credit to GDP ratio for 2017-2023	IMF	Global Debt Database	Continuous
	4.Average annual inflation rate for 2021- 2023	World Bank	Global Database of Inflation	Continuous
	5.Fiscal balance, % GDP	IMF	Public finances in modern history database (2004)	Continuous
	6.Current account balance, % GDP	World Bank	World Development Indicators	Continuous
	7.International reserves, % GDP	IMF	International financial statistics	Continuous
2.Environmental value	1. Environmental assets	SolAbility	The Global Sustainable Competitiveness Index - Natural capital abundance	Continuous
	2.Environmental vulnerability	University of Notre Dame	Notre Dame Global Adaptation Initiative (GAIN)-Global climate risk vulnerability	Continuous
	3.Current effort	Yale University	Environmental performance index	Continuous
	4. DNS/DDS experience	Publicly available data	Authors' compilation	Binary
	5. DNS/DDS willingness	Publicly available data	Authors' compilation	Binary
3.Political feasibility	1.Voice and accountability	World Bank	Worldwide Governance Indicators	Continuous
	2.Political stability and absence of violence/terrorism	World Bank	Worldwide Governance Indicators	Continuous

First level indicator	Second level indicator	Data source	Database	Type of indicator
3.Political feasibility	3.Government effectiveness	World Bank	Worldwide Governance Indicators	Continuous
	4.Regulatory quality	World Bank	Worldwide Governance Indicators	Continuous
	5. Rule of law	World Bank	Worldwide Governance Indicators	Continuous
	6.Control of corruption	World Bank	Worldwide Governance Indicators	Continuous
	7.Fragile states index	The Fund for Peace	Fragile States Index	Continuous
4.Bilateral Relations	1.Bilateral trade with China, % total trade with the world	IMF	Direction of Trade Statistics	Continuous
	2.Duration of diplomatic relations with China	MOF	MOF	Continuous
	3.Type of diplomatic relations with China	MOF	MOF	Ordinal
	4.Number of debt treatments with Paris-Club members	World Bank; Paris Club	International Debt Statistics	Continuous