University of Notre Dame Global Adaptation Index
Detailed Methodology Report
December, 2013

1. Introduction

Notre Dame-Global Adaptation Index (ND-GAIN) is a free open-source index that shows which countries are best prepared to deal with superstorms, droughts, security risks and other *vulnerabilities* caused by climate disruption, as well as their *readiness* to successfully implement adaptation solutions.

Corporate, NGOs, government, and development decision-makers use ND-GAIN's country-level rankings in 177 countries, based on 17 years of data and 50 indicators, to determine how vulnerable countries are to global changes and how ready they are to adapt, thus informing strategic operational and reputational decisions regarding supply chains, capital projects and community engagements.

The Index moved to the University of Notre Dame in April 2013. It was formerly housed in the Global Adaptation Institute in Washington, D.C. It resides within the Climate Change Adaptation Program of the University of Notre Dame's *Environmental Change Initiative* (ND-ECI), a Strategic Research Initiative focused on "science serving society," and draws resources from across the university.

This report describes ND-GAIN for its December, 2013 release and provides detailed information on the framework, data sources, and data compilation that constitutes ND-GAIN. A revision to ND-GAIN will be released in 2014.

2. Overview of ND-GAIN

All countries will face the challenges of adaptation but some, due to geographical location or socio-economic conditions, are more vulnerable to the impacts of climate change than others. Further, some nations are more ready to deal with these challenges through government action, community awareness and the ability to facilitate private sector responses. ND-GAIN measures both of these dimensions— vulnerability and readiness.

ND-GAIN harnesses multiple vulnerability and readiness indicators into a single index and ranks countries based on this Index. Users can then explore constituent parts of the index to see how the overall score is derived. Is the country more vulnerable or less ready; which are the most vulnerable sectors; where is readiness the weakest? How does the country compare with its neighbors?

2.1 Terminology

Vulnerability: the degree to which a system is "susceptible to, and unable to cope with, adverse effects of climate change." (IPCC, 2007). In ND-GAIN, vulnerability includes three components: exposure, sensitivity and adaptive capacity.[1]

> Exposure: The climate stress faced by a system or individual. In ND-GAIN it is represented by the negative impacts of climate change upon various sectors for each country, or the factors that expose sectors to those impacts.

> Sensitivity: The extent to which a sector within a country will be affected by or responsive to climate exposure. In ND-GAIN, there are sensitivity indicators for multiple sectors of society.

> Adaptive capacity: The degree to which a country is able to cope with or respond to exposed and susceptible stresses. In ND-GAIN, the indicators of adaptive capacity measure to what extent a country is capable to minimize the adverse impact of climate change.

Readiness: The ability of a country's private and public sectors to absorb financial resources and mobilize them efficiently to reduce climate change vulnerability. In ND-GAIN, readiness takes into account economic, governance and social factors.

ND-GAIN has the following features that ensure transparency, reliability of the data source and constant data updates.

- ND-GAIN is structured and modular, with concepts based on established literature.
- In most cases, ND-GAIN has multiple indicators for each of sector or concept. This reduces reliance on a single value for each concept.
- ND-GAIN focuses on sectors crucial to human well-being. It targets those sectors most important to human health and prosperity that also can be improved by actions.
- The data for all indicators of ND-GAIN are available for all ranked countries.
- The data in ND-GAIN are collected and maintained by reliable, authoritative organizations

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[1] Recently the IPCC has redefined vulnerability to separate exposure as a distinct component and vulnerability as only sensitivity and adaptive capacity. This redefinition makes little or no difference to the ND-GAIN so we have retained the older and more commonly used terminology.

- The indicators were selected to be 'actionable' and sensitive to that action. In other words governments, private sector or communities could take action on an issue and expect to see a change in one or more indicators over time.
- ND-GAIN provides a record of change. Indicators contain data from 1995 to the present.

Two kinds of indicators are explicitly *not* included in ND-GAIN. The first is GDP per capita. GDP is commonly used in indices relating to development and poverty (e.g., the Human Development Index of UNDP), but many developing countries believe that they are penalized when it is used together with indicators of capacity, sensitivity, etc. that correlate with GDP. Despite the exclusion of GDP, ND-GAIN does show a high correlation with a county's economic status, and a version of ND-GAIN is available that adjusts the index score using GDP per capita (see section 6 below). This suggests that ND-GAIN is measuring country well-being. Second, ND-GAIN does not include data on the impact of recent climate-related disasters. Instead, external disaster data provide an independent source of information for possible index validation.

2.2 ND-GAIN Score

The ND-GAIN score for each country is composed of *readiness* and *vulnerability*. The *vulnerability* score is calculated from 36 indicators grouped by sectors under the components of exposure, sensitivity and adaptive capacity, and the *readiness* score is calculated from 14 measures grouped under economic, governance and social readiness. Each indicator is scaled to give a score between 0 and 1. Scores are then averaged within vulnerability and readiness and scaled to a value of 0 to 100 (see section 5). In vulnerability, all scores are weighted equally; in readiness, indicators are weighted (see section 4 below). The overall ND-GAIN score for a country is the *readiness* score minus the *vulnerability* score:

(Readiness score – Vulnerability Score + 1) * 50= ND-GAIN Score

2.3. ND-GAIN Matrix

In addition to the ND-GAIN score, the ND-GAIN Matrix is a scatter plot of *vulnerability* against *readiness* (Fig. 1). The plot is divided into four quadrants using the median scores for each of vulnerability and readiness. Half the countries

3

fall to the left of the readiness median and half to the right; similarly, half fall above the vulnerability median and half below[2].

Red (Upper Left) Quadrant: Countries with high vulnerability to climatic change but low level of readiness. They have needs for investment and innovations to improve readiness and urgency for action. Unless the government, international organizations and the private sector move quickly to improve the ability to adapt, significant human suffering will likely result.

Yellow (Lower Left) Quadrant: Countries that are not highly vulnerable, but not ready for investment. These countries will be less likely to suffer from climate impacts but need to use the time they have to prepare. Some private investors may be attracted to these countries, but they are less viable investment targets than countries with higher readiness.

Blue (Upper Right) Quadrant: Countries in this quadrant are highly vulnerable but are ready to accept adaptation investment. There is strong urgency to act and there are likely to be many opportunities for the private sector to invest in adaptation relative to the red or yellow quadrants.

Green (Lower Right) Quadrant: These countries have both low vulnerability and are ready and open for investments. They require relatively little help and have relatively fewer adaptation challenges.
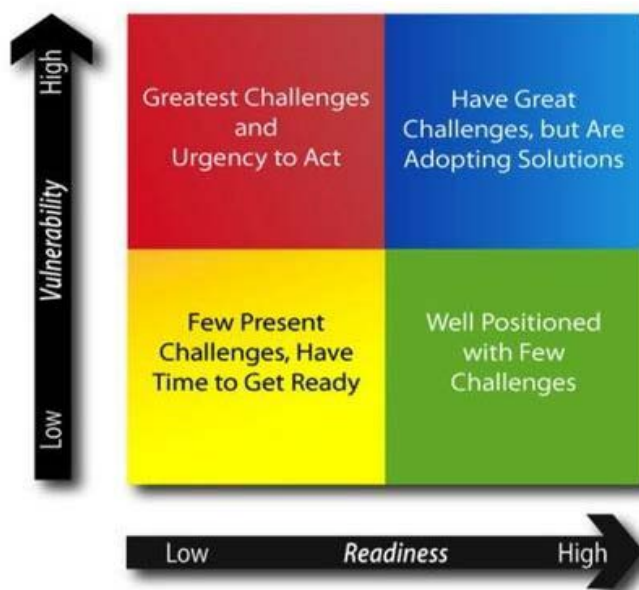

Figure 1 The ND-GAIN Matrix

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[2] Note that this does not mean that there will be the same number of countries in each quadrat. Highly ready, often wealthy, countries tend to have lower vulnerabilities and vice versa, so proportionately more countries fall in the green and red quadrants.

3. Technical Description of Vulnerability

Guidance on the indicators to be included within vulnerability was given by the Advisory Board and Council of Scientists prior to 2013 (Table 1). Revisions of the indicators are planned for a 2014 release.

The vulnerability portion of ND-GAIN includes both climate risk ("exposure" and "sensitivity") and adaptive capacity (see terminology above). Vulnerability focuses on sets of sectors covering the core issues relating to people's well-being; water, food, health, ecosystem services, human habitat, and infrastructure (Table 1). Because individual indicators are imperfect due to constraints on data selection (e.g., data availability, data quality, etc.), each sector has two indicators for each of exposure, sensitivity, and adaptive capacity. ND-GAIN does not include more than two indicators per cell in the Table below because the risk of double-counting due to indicator correlation increases with the number of indicators. So the current framework allows two indicators of each sector for one component but no more. Appendix 1 details the rationale and data sources of each vulnerability indicator. All indicators within vulnerability are weighted equally by taking the arithmetic mean of each sector and the arithmetic mean of all sectors.

Table 1 Vulnerability Indicators

Sector	Climate Risk		Adaptive Capacity
	Exposure	Sensitivity	
Water	Projected change in precipitation (**High**)[3]	Internal and external freshwater extracted for all uses (**High**)	Population with access to improved water supply (**Low**)
	Projected change in temperature (**High**)	Mortality among under 5 yr.-olds due to water-borne diseases (**High**)	Population with access to improved sanitation (**Low**)
Food	Projected change in agricultural (cereal) yield	Population living in rural areas (**High**)	Agricultural capacity fertilizer consumption, machinery, and %

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[3] The marker "High" and "Low" refer to the direction of the relationship between each indicator and the overall vulnerability score. The indicator is marked "High" when the indicator contributes positively to vulnerability, i.e. high indicator value leads to high vulnerability score. The indicator is marked "Low" when it contributes negatively to vulnerability, i.e., high indicator value leads to low vulnerability score. (Keep in mind that high vulnerability scores are less desirable.) See section 5 below.

	(High)		land in irrigation) **(Low)**
	Coefficient of variation in cereal crop yields **(High)**	Food import dependency **(High)**	Children under 5 suffering from malnutrition **(High)**
Health	Estimated impact of future climate change on deaths from disease **(High)**	Health workers per capita **(Low)**	Longevity **(Low)**
	Mortality due to communicable (infectious) diseases **(High)**	Health expenditure derived from external resources **(High)**	Maternal mortality **(High)**
Human Habitat	Urban concentration in largest city **(High)**	Urban population living in Slums **(High)**	Value lost due to electrical outages **(High)**
	Urban Risk **(High)**	Excess urban growth **(High)**	Quality of trade and transport infrastructure **(Low)**
Ecosystem Service	Projected Biome Threat **(High)**	Ecological Footprint **(Low)**	Protected biomes **(Low)**
	Dependency on natural capital **(High)**	Threatened species **(High)**	International Environmental Conventions **(Low)**
Infrastructure (Coastal)	Land less than 10 m above sea-level **(High)**	Population living less than 10 m above sea-level **(High)**	Measured on the Readiness Axis
Infrastructure (Energy)	Population with access to reliable electricity **(Low)**	Energy at risk **(High)**	Measured on the Readiness Axis
Infrastructure (Transport)	Frequency of floods per unit area **(High)**	Roads paved **(Low)**	Measured on the Readiness Axis

4. Technical Description of Readiness

Readiness measures the ability of a country's private and public sectors to absorb investment resources and successfully apply them to reduce climate change vulnerability. This focus is similar in spirit to the World Bank's Country Policy and Institutional Assessment (CPIA) measurements, which determine development assistance for low-income countries.

Readiness includes social, economic and governance indicators (Table 2). The components of readiness are not weighted equally. Economic Readiness is 50% of the readiness score; governance is 25%; and social readiness is 25%. The economic component receives a disproportional weight because the Index of Economic Freedom (IEF), the lone economic readiness indicator, provides much more information than the other indicators. The IEF is an aggregate of 10 separate factors ranging across such issues as international trade, financial markets, business, labor, corruption and property rights. By contrast there are only two fairly specific indicators in the both the governance and social components. Each of those four indicators receives 12.5 percent weights.

For the economic component, readiness emphasizes business formation and function. A high degree of economic freedom brings positive economic values such as a high per capita income or appreciable economic growth (Mitchelle 2010[4]). Economic freedom implies easy and quick setup of new businesses, access to new capita, and other business opportunities. To cope with condition changes, countries with higher economic freedom will be more ready than others to adjust to changing conditions and exploit emerging opportunities.

For governance, good policies lead to fairer processes for selecting and replacing political administrations and less abuse of public office for private gain (Kaufmann et al., 2009). Therefore, resources are more likely to flow (or flow effectively) through a country with efficiency and little bribery.

Finally, for the social component of readiness, countries with residents who effectively participation in resource allocation and collaborate with people in other parts of the country or world, are predicted to fare better than in countries with weaker social structures.

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[4] For more theoretical foundations based on which IEF is constructed: http://www.heritage.org/index/about

Economic readiness in ND-GAIN is measured by IEF[5]. Each IEF indicator is a combined measure drawn from multiple sources, for example, the time needed to start a business (which is a factor of Business Freedom and drawn from Doing Business indices), the trade-weighted average tariff rate (a factor of Trade Freedom, from World Development Indicators), etc. Information (either qualitative or quantitative) from various sources is then given scores according to scales created by IEF. For example, to measure the extent of non-tariff barriers (NTBs), 5 scores (0, 5, 10, 15, 20) are given according to a country's trade policy regime, including rules that hinder free trade in different ways, e.g. the imports restrictions of various types like quantity restriction, price restriction, regulatory restriction, etc. IEF calculates each component using a function that is unique to the specific component and captures the relationships among the factors. For example, a country's Trade Freedom is calculated by subtracting the NTB penalty, based on a five-score range, from the normalized trade-weighted average tariff rate. Appendix 2 lists of factor, functions and data sources for IEF metrics.

Three indicators of governance are included from the Worldwide Governance Indicators[6].Voice and Accountability, Political Stability and Non-Violence, and Control of Corruption. WGI scores for country are a compilation of indicators. The information for these indicators is derived from 31 sources that report the experiences and opinions of citizens, entrepreneurs, and experts in the public, private, and NGO sectors from around the world. To aggregate the data into WGI measures, data are first rescaled to the 0-1 range. The Unobserved Component Model (UCM) is used for each measure to construct a weighted average of the individual indicators. The UCM assumes that the observed data from each source are a linear function of the unobserved level of governance, plus an error term. By doing so, WGI is able to (1) capture the deeper underlying notion of governance that is hard to observe; (2) ensure the comparability among different data points. The measure is finally aggregated by constructing a weighted average of the individual indicators, with weights reflecting the pattern of correlation among data sources. Appendix 2 gives the data sources of the three WGI indicators selected for ND-GAIN.

Social readiness in ND-GAIN includes human capital, access to communications and WGI's Rule of Law. Human capital is measured by the availability of a highly educated population (level of tertiary education) and IEF's labor freedom. The greater the percentage of highly educated people, the more likely potential problems

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[5] The information is extracted from IEF methodology document
http://www.heritage.org/index/book/methodology
[6] The information here is extracted from WGI documentations
http://info.worldbank.org/governance/wgi/index.aspx#doc

will be anticipated, and prevention and/or emergency plans will be drawn up. Data for tertiary education is the percentage of the total population enrolled in the tertiary school (http://data.worldbank.org/indicator/SE.TER.ENRR). Access to communications, for example mobile phones and access to the internet, enable people to work and live in a more efficient manner (e.g. electronic transactions, mobile banking, finding destinations). In emergencies mobile phones can assist in more effectively organizing warnings and relief efforts (enhancing coordination of efforts, providing health care in remote areas, quickly identifying locations most in need, enforcing transparency, creating and accessing valuable information). Data for communication access is the mobile cellular subscriptions per 100 people (http://data.worldbank.org/indicator/IT.CEL.SETS.P2)

WGI's Rule of Law attempts to capture whether or not new resources will be used efficiently. If resources are brought into a society with weak rule of law, chances are good that they will be less efficiently used than in a society where agreements are dependable. It measures a social condition more than the governance, but the distinction between rule of law and indicators of governance readiness is still subtle.

Table 2 Readiness Indicators

Component	Indicator
Economic	IEF Business freedom **(High)**[7]
	IEF Trade freedom **(High)**
	IEF Fiscal Freedom **(High)**
	IEF Government Spending **(Low)**
	IEF Monetary Freedom **(High)**
	IEF Investment Freedom **(High)**
	IEF Financial Freedom **(High)**
Governance	WGI Voice & Accountability **(High)**
	WGI Political Stability & Non-Violence **(High)**

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[7] The marker "High" and "Low" refer to the direction of the relationship between each indicator and the overall readiness score. The indicator is marked "High" when the indicator contributes positively to the readiness, i.e. high indicator value leads to high readiness score. Otherwise, the indicator is marked "Low" (Keep in mind that high readiness scores are more desirable.). See section 5 below.

9

	WGI Control of Corruption **(High)**
	Tertiary Education **(High)**
Social	IEF Labor Freedom **(High)**
	Mobiles per 100 persons **(High)**
	WGI Rule of Law **(High)**

5. Post-processing of the data

5.1. Data standardization

In preparing each release of ND-GAIN, data were scanned for obvious errors and data omissions, and all data were standardized so that all indicators had values between 0 and 1. This does not change the distribution of the original data but puts all indicators on the same scale for comparison and compilation.

A simple standardization approach was used to scale between a lower and an upper threshold value (Table 3). Values below or beyond these thresholds were automatically scaled to 0 (meaning the least vulnerable or the least ready) or 1 (meaning the most vulnerable or the most ready). Usually the thresholds were set to be equivalent to the maximum or minimum values. However, a rule of "saturation" was applied to some metrics when a number lower than the maximum (or higher than the minimum) has a value over (or under which) meaningful differences among countries cannot be discerned. For example, 50% was set to be the upper threshold for mortality from communicable disease, although some countries have higher rates. This means that a country would not be considered less vulnerable if it reduces the rate from 80% to 60% for instance. Instead, only when the rate is reduced to below 50% does it have an impact on the score of vulnerability. This method accounts for extreme outliers that would otherwise dramatically skew the distribution.

In addition to standardizing between 0 and 1, indicators were oriented to consistently point in the same direction. For example, more mortality from communicable disease means high vulnerability whereas more health workers per capita means low vulnerability. The two must point in the same direction to be compiled into a combined score.

10

Input of each indicator, therefore, is standardized according to the formula:

$$Score = abs(Direction - \frac{Input - Lower\ Value}{Upper\ Value - Lower\ Value}).$$

Table 3 Lower and upper values and direction for each indicator

Indicator	Lower value	Upper value	Direction
Vulnerability			
Projected proportional change in precipitation (%)	0	100	0
Internal and external freshwater water extracted for all uses (%)	0	100	0
Population with access to improved water supply (%)	0	100	1
Projected change in temperature (deg C)	1.5	5.5	0
Mortality (per 100,000) among under 5 yr-olds due to water-borne diseases	0	1500	0
% Population with access to improved sanitation	0	100	1
Projected change (index) in agricultural (cereal) yield (%)	0	10	0
% rural population	0	100	0
Agric Capacity (index based on access to farm mechanization, fertilizers and irrigation)	0	Fertilizer: 200 Machinery: 200 Irrigated land: 50%	1
Coefficient of variation in cereal crop yields	0	0.5	0
Food import dependency (%)	0	100	0
Children under 5 suffering from malnutrition (%)	0	10	0

11

Estimated impact of future climate change on deaths from disease (index based on DALYs)	0	0.4	0
Health workers (per 1,000 population)	0	25	1
Longevity (year)	35	85	1
Mortality due to communicable (infectious) diseases (%)	0	50	0
Health expenditure derived from external resources (%)	0	100	0
Maternal mortality (%)	0	4	0
Biome threat (%)	0	12	0
Ecological footprint (ha)	-5	5	1
Protected biomes (%)	0	100	1
Dependency on natural capital (%)	0	0.5	0
Threatened species (composite measure)	0	1	0
International treaties (composite measure)	0	0.6	1
Urban concentration (%)	10	80	0
Slums (%)	0	70	0
Electrical outages (%)	0	10	0
Urban risk (composite measure)	0	80	0
Urban excess growth (compared with expected urban population growth)	-1	1	0
Trade transport (composite measure)	0	5	1
Land less than 5 m above sea-level (%)	0	100	0
Population living less than 5	0	100	0

m above sea-level (%)			
Population with access to reliable electricity (%)	0	100	1
Energy at risk (index based on energy imports and hydropower generation) (%)	0	100	0
Frequency of floods per unit area (index based on observed floods) (per 100,000 km^2)	0	100	0
Paved roads (%)	0	100	1
Readiness			
IEF Business freedom	0	100	0
IEF Finance freedom	0	100	0
IEF Fiscal Freedom	-2.5	2.5	0
IEF Government Spending	-2.5	2.5	1
IEF Investment Freedom	-2.5	2.5	0
IEF Monetary Freedom	0	90	0
IEF Trade Freedom	0	70	0
WGI Political Stability & Non-Violence	-2.5	2.5	0
WGI Voice & Accountability	0	100	0
WGI Control of Corruption	0	1	0
IEF Labor Freedom	0	1	0
Tertiary Education (%)	0	100	0
Mobiles per 100 persons	0	100	0
WGI Rule of Law	0	50	0

5.2. Missing data

Our analysis shows that a country can have up to a third of its vulnerability measures missing and still reflect a reasonable estimate of its vulnerability in ND-GAIN. The random omission of one third of measures has only a small impact on the top and bottom rankings. For example the countries ranked at about 25th highest

13

or lowest vulnerability still had 60% chance of being in the highest or lowest 25. Those ranked in the top or bottom 10 have almost 100% chance of remaining in the top 25. This test of robustness suggests that a quarter to a third of a country's measures are allowed to be missing for any component of the Index before dropping its score from the Index. Table 4 shows the tolerance for missing indicators, i.e. the number of indicators that are allowed to be missing for each sector/component. The third column reflects the total number of indicators in each sector/component, and the fourth column the tolerance of missing indicators.

Table 4 Tolerance for missing Indicators

Measures	Sector/ Component	No. of indicators	No. of indicators allowed to be missing (up to 25%)
Vulnerability	Water	6	2
	Food	6	2
	Health	6	2
	Ecosystem Services	6	2
	Human Habitat	6	2
	Infrastructure	6	2
	Exposure	13	3
	Sensitivity	13	3
	Capacity	10	3
Readiness	Economic	7	2
	Governance	3	1
	Social	4	1
Vulnerability overall		36	9
Readiness overall		14	4

14

ND-GAIN Score		50	Both vulnerability and readiness are needed

6. Adjustment for GDP

In exploring the relationship between ND-GAIN with other global indicators, a significant linear correlation is found between ND-GAIN scores and GDP per capita for all years. This allows us to create a linear model that represents the time-wise relationship between the two variables. In this context, the "GDP adjusted ND-GAIN score" is defined as the distance of a country's measured ND-GAIN score to the expected value for its GDP per capita, as represented by a regression line between GDP per capita and ND-GAIN score. Positive values reflect better resilience than expected.

The strong correlation with GDP per capita is also present for the Vulnerability and Readiness scores. Thus, for a given year, the "GDP adjusted Vulnerability" is the distance of a country's measured readiness to the expected value for its GDP per capita (the same for Readiness). Positive values reflect lower vulnerability (higher readiness) than expected. The year-by-year calculation of the regression and distance from the expected value allows us to determine changes in the relationship over time.

7. Trend Analysis

From ND-GAIN score, a trend analysis was done to determine whether one country had been improving or receding in terms of the ND-GAIN score. The trend is calculated by analyzing the behavior of the nation's indicator during the last six years – an average over the most recent three years was compared with the average over the preceding three years. Instead of looking at a year-to-year improvement, the 3-year trend internalized some short-term shocks and focused on the overall trend in a reasonable time scale. For example,

$$\text{ND-GAIN trend} = \left(\frac{Average\ ND-GAIN\ score\ (2012,2011,2010)}{Average\ ND-GAIN\ score\ (2009,2008,2007)} \right) - 1.$$

The same analysis also applies to trends within vulnerability and readiness.

15

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16

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19

Appendix 1: Detailed Indicator Information for Vulnerability

Sector	Exposure	Sensitivity	Capacity
Water	**Projected % change in precipitation.[PPT%↑][8]** Gross measure of threat to water. This is the commonly used indicator in both the scientific and response communities. **Source of data:** CRU data sets,Mitchell,Hulme,New, 2001: Climate data for political areas. Area 34:109-112 http://www.cru.uea.ac.uk/cru/data/hrg/ Data set TYN CY 2.0 **Range :** -1 – 0.5 **Reporting & Time Series :** All countries and a single measure.	**% internal water extracted for all uses. [IWE%↑]** An indication of how much of the nationally available water resource (originating internally or externally such as from inflowing rivers) is already being used. **Source of data:** http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en **Range :** 0 – 100 **Reporting & Time Series:** Data is reported to FAO at 5-year intervals. About 40% compliance since 1990 with enough to detect trends in about half the countries.	**% population with access to improved water supply.[PIW%↓]** Commonly used measure of the capacity to deliver reliable domestic water supplies.High % indicates capacity to deliver water to the population. **Source of data:** http://data.worldbank.org/indicator/SH.H2O.SAFE.ZS **Range:** 0 - 100 **Reporting & Time Series:** Country-level annual data.

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[8]↑ means that high values indicate greater vulnerability; ↓means that low values indicate greater vulnerability. Each measure is rescaled to a range from 0 to 1, with 1 indicating high vulnerability before being incorporated in the ND-GAIN vulnerability index.

	Projected % change in temperature[TMP%↑] Water quality issues rise in warmer conditions causing disease growth & spread; less water for sanitation etc. **Source of Data:** Mitchell,Hulme,New,2001: Climate data for political areas. Area 34:109-112 http://www.cru.uea.ac.uk/cru/data/hrg/ Data set TYN CY 2.0 **Range:** 1.5-5.5 **Reporting & Time Series :** All countries and a single measure	**Existing incidence of water borne diseases [WBD↑].** Measured as "Water, sanitation & hygiene deaths per 100'000 children<5 yr" to capture the effects of water quality on the most sensitive portion of the population **Source of Data:** Accessed October 2013 at http://apps.who.int/gho/data/node.main.168 **Range:** 0-1500 per 100,000 children **Reporting & Time Series :** 190 countries, for 2008 only	**% population with access to improved sanitation [PIS%↓].** High % indicates capacity to deliver sanitation and quality water to the population and hence lower vulnerability. **Source of Data:** http://data.worldbank.org/indicator/SH.STA.ACSNhttp://data.worldbank.org/indicator/SH.STA.ACSN **Range:** 0 - 100 **Reporting & Time Series:** Country-level data reported every 5 years
Food	**Projected % Change in Agricultural (cereal) yields [Yld%↓]** Cereal yield is often treated as the most effective indicator of the effects of climate on food	**% Population dependent on rural livelihoods [Rur%↑]** Rural populations tend to be more directly dependent on food produced locally and nationally. Very high proportion of rural population is usually indicative	**Agricultural capacity [AgC↓]** This is a combination of three separate measures of agricultural technology: the amount of fertilizer used per ha, the number of tractors per area of arable land and the proportion of arable land with

21

supply. This measure is a compilation of several estimates of the effect of projected climate change on cereal yield.

Source of data:
Based on the analysis by Cline, William. 2007. Global Warming and Agriculture: Impact Estimates by Country. Washington, DC: Center for Global Development and Peterson Institute for International Economics. Data taken from Wheeler index at http://www.cgdev.org/doc/Data/Quantifying_Vulnerability_DB.xls.
Country groups as used by Cline were given the same values for all member countries.

Range: -20 - 100

Reporting & Time Series: Most countries

of a strong dependency on subsistence, or near subsistence, farming with few buffers against climate shocks. This indicator includes all people living in the rural regions of a country.

Source of data:http://data.worldbank.org/indicator/SP.RUR.TOTL

Reporting & Time Series: Country-level annual data

irrigation facilities. The measure used here takes two of the above that give the best (i.e. least vulnerable) score. This allows for missing data but also for situations such as where irrigation or fertilizer is less necessary because of rainfall or good quality soils.

Source of data:
Fertilizer consumptionhttp://data.worldbank.org/indicator/AG.CON.FERT.ZS
Agricultural machineryhttp://data.worldbank.org/indicator/AG.LND.TRAC.ZS
Agricultural irrigated land http://data.worldbank.org/indicator/AG.LND.IRIG.AG.ZS

Range: Fertilizer 0 - 200 Kg/ha; Tractors 0 - 200 per 100 km^2 arable land; 0 - 50% of irrigated agricultural land.

Reporting & Time series:
Missing data is an issue for the machinery indicator and irrigation indicator, but the agricultural capacity considers two indicators

22

		of the three and allows the missing data.
Coefficient of variation in annual cereal crop yields [CCV↑] Based on reported year-to-year variation in cereal yields. High variability is taken as indicating inherent exposure of yields to climate and non-climate variables (e.g. prices affecting inputs to crops). Cereals are the best available indicator of agricultural production for most countries (although clearly not valid or measurable for some other countries). For each country the 1961 to 2008 data was detrended via an exponential function to allow for technological increases in yield and then the standard deviation of the yield calculated to give an estimate of the CV (Stdev/mean).	**Food import dependency [FID% ↑]** It is measured by proportion of cereal consumption obtained from imports. This is taken as a measure of the countries sensitivities to food shocks in the future. Taken with the CCV in national cereal yields, both internal and import dependent countries are covered to some degree. **Sources of data:** http://data.worldbank.org/indicator/TM.VAL.FOOD.ZS.UN **Range:** 0 - 1 **Reporting & Time Series:** Country-level annual data	**% Children under 5 showing "wasting" [Mal%↑]** A measure of malnutrition based on the percent of under 5 year-olds with a low weight for height ratio; usually taken as the best indicator of chronic malnutrition. This is taken as an indication of the lack of capacity to deliver basic nutritional needs to the most sensitive group in society. **Sources of data:** http://data.worldbank.org/indicator/SH.STA.WAST.ZS **Range:** 0 - 10 **Reporting & Time Series:** Data reported ranging from annually to every 5+ years, but usually sufficient to establish trends.

		Sources of data: http://data.worldbank.org/indicator/AG.YLD.CREL.KG **Range:** 0 - 0.5 **Reporting & Time Series:** Most countries and a single measure.		
Health	**Climate Change Induced DALYs [DALY ↑]** A model-based estimate of the quality adjusted loss of life years under several different climate scenarios. **Source of data**: Ebi K. - Globalization and Health 2008, 4:9 - doi:10.1186/1744-8603-4-9 http://www.globalizationandhealth.com/content/4/1/9 **Range:** 0 - 0.4	**Medical staff [MEDS↓]** Lack of medical staff is a major impediment to achieving good health outcomes in many poor countries. This indicator is a sum of the number of doctors, nurses and midwives per 1000 population in the country. **Source of data:** Physicians http://data.worldbank.org/indicator/SH.MED.PHYS.ZS Nurses and midwives http://data.worldbank.org/indicator/SH.MED.NUMW.P3 **Range :** 0 - 25	**Longevity [LONG↓]** Average life span of males and females. Used as a measure of the overall capacity of a country's health services. **Source of data:** http://data.worldbank.org/indicator/SP.DYN.LE00.IN **Range:** 35 - 85 **Reporting & Time series:** Country-level data. The time series varies, but roughly updated annually.	

	Report & Time Series: Data available at the regional (sub-continent) level. Projection in 2030 for DALYs by three types of diseases/nutrition status	Reporting & Time Series: Most countries have available data, but few updates after 2010.	
	% mortality from communicable diseases [MCD%↑] This represents the ability of the health system to cope with communicable diseases which are likely too increase under climate extremes and other stressors associated with climate change. **Sources of data:** http://data.worldbank.org/indicator/SH.DTH.COMM.ZS **Range:** 0 - 50	**% external resources for health care [Hext%↓]** A high dependency, usually on foreign aid, is an indicator of weakness in internal capacity and of vulnerability to climate shocks. This indicator measures the percentage of external resources (e.g. bilateral payments, NGO operations etc) in total health expenditure. **Sources of data:** http://data.worldbank.org/indicator/SH.XPD.EXTR.ZS **Range:** 0 -100 **Reporting & Time Series:** Country-level annual data	**% Life time risk of maternal death" [MatR%↑]** Measure of the capacity to deliver health services to a vulnerable and important group. This indicator measures the life time risk of maternal death, which is the probability that a 15-year-old female will die eventually from a maternal cause. **Sources of data:** http://data.worldbank.org/indicator/SH.MMR.RISK.ZS **Range:** 0 - 4 **Reporting & Time Series:** country-level data reported every 5 years.

25

	Reporting & Time Series: All countries, single estimate in 2008		
Human Habitat	**Urban concentration in largest cities [UUC%↑]** A high concentration of people in one city creates challenges in adapting to climate change. The concentration suggests stressed services, few choices for displaced rural poor and vulnerability to major losses in a single extreme climate event. This indicator measures the percentage of the population living in the largest cities **Source of data:** http://data.worldbank.org/indicator/EN.URB.LCTY.UR.ZS **Range:** 10 - 80 **Report & Time Series:**Country-level	**Urban population living in slums [UUS%↑]** Slums impose a great challenge to successful adaptation especially in cities.A slum household is defined as a group of individuals living under the same roof lacking one or more of the following conditions: Access to improved water; Access to improved sanitation; Sufficient-living area; Durability of housing (Tenure is included as a 5th element, but insufficient data is available). **Source of data:** http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=710 **Range:** 0 - 70 **Reporting & Time Series:**87 countries in the original set in 1990, 1995, 2000, 2005, 2007,	**Value lost due to electrical outages [VLE%↑]** This is a measure ofPercentage of sale lost due to electrical outages, as an indicator of the capacity to provide a stable supply of electricity, which is fundamental to production, life support and comfort. It is likely to be indicative of the capacity to provide other essential services. Analysis of other possible measures relating to the provision of services (e.g. road provision, travel times, the efficiency various business transactions etc) show them to be correlated with electrical outages but not as comprehensively reported in many cases, or used elsewhere in the Readiness Axis. **Source of data:** http://data.worldbank.org/indicator/IC.FRM.OUTG.ZS **Range:** 0 - 10

	annual data since 1995	2009. The data set is expanded to 159 countries with assumption that wealthier countries have a default score of 0	**Reporting & Time series:** Scattered 2002 to 2010 with most reporting countries having 2 or 3 values
	Urban Risk [URP↑] The large cities of a country are the centers of attraction for rural to urban migration and the economic drivers in most countries. Severe human suffering and social and economic disruption can occur if these cities are struck by natural disasters. This measure seeks to capture that risk based on a data set from the UNESA statistical data. See the Annex for a detailed description of its derivation. This measure is a natural disaster risk index for populations living in large cities (i.e. >0.75M people).	**Excess urban growth [UEX↑].** If the urban population is growing considerably faster than the country as a whole, it is likely to be putting additional strain on urban services and making it difficult for city managers to consider and plan for the effects of climate change. It is also likely to be an indicator of rapid rural-urban migration which can have complex effects. This indicator measures the excess rate of population growth in urban centers compared with the population growth rate in the whole country **Sources of data:** Population growth http://data.worldbank.org/indicator/SP.POP.GROW Urban population growth	**Quality of trade and transport infrastructure [UQI↓].** The quality of this infrastructure is indicative of capacity to effectively supply and manage essential infrastructure by the public and private sectors. It is assumed here that same capacity is indicative of a capacity to sustain that infrastructure in the face of climate change. Logistics professionals' perception of country's quality of trade and transport related infrastructure (e.g. ports, railroads, roads, information technology), on a rating ranging from 1 (very low) to 5 (very high). Scores are averaged across all respondents. **Sources of data:** http://data.worldbank.org/indicator/LP.LPI.INFR.XQ

	Sources of data: http://esa.un.org/unup/CD-ROM/Urban-Agglomerations.htm **Range**: 0 - 0.8 **Reporting & Time Series:** 192 countries; 121 countries have cities meeting the size criterion and the remaining countries are given a default risk of zero. It's a single estimate of the risk profile itself, although the population weightings could be updated as populations change, but the effect would be very small over the next 5 to 10 years.	http://data.worldbank.org/indicator/SP.URB.GROW Urban population total http://data.worldbank.org/indicator/SP.URB.TOTL **Range :** -1 - 1 **Reporting & Time Series:** Country-level annual data	**Range:** 0 - 5 **Reporting & Time Series:**2006 & 2009 for most countries
Ecosystem Service	**Projected biome threat [EBS%↑]** This will match the other core sectors (Food, Water,	**Ecological footprint [EEF↑]** A country with a surplus has the capacity to produce more from within its boundaries and thus is	**Proportion of Protected Biomes [EPB%↓]** Countries with good protection of their core ecosystem types are

28

| Health) each of which has a measure that deals with the exposure to future climates (e.g. projected temperature increase, projected agricultural yields). The measure captures the miss-match between biomes and their climate and thus the threat of changes (usually a degrading) in biome function. This indicator measures the proportion of the land area of a country on which the existing biome is no longer matched to the projected climate of the late 21st century and thus might be expected to undergo significant changes.

Source of data:
http://pubs.giss.nasa.gov/docs/2000/2000_Hansen_et al_2.pdf | likely to have more options to adapt to a changing climate. This indicator seeks to measure the number of hectares of land and water, both within and outside the country, to supply the average demand on the ecosystems services by the lifestyles of the population of each country. This is compared with the estimated capacity of a country's ecosystems to regenerate and maintain ecosystem services for either internal use or export. This measure uses the surplus or deficit of capacity to supply over the demand within each country.

Source of data:http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_data_and_results/

Range:
-5 - 5

Reporting & Time | likely to have the capacity to implement a wider range of actions to continue to protect and manage ecosystem services under a changing climate. This indicator is taken directly from the Yale Environmental Performance Index (EPI) ("The weighted percentage of biomes under protected status, where the weight is determined by the size of biomes within a country. Countries are not rewarded for protecting beyond 17% of any given biome (i.e., scores are capped at 17% per biome) so that higher levels of protection of some biomes cannot be used to offset lower levels of protection of other biomes."]

Source of data:
http://www.stat.yale.edu/~jay/EPI_data_download/EPI2012_all_ts.csv [original data has two sources: 1. World Database of Protected Areas from UNEP World Conservation Monitoring Center, 2011, http://www.protectedplanet.net/ |

29

Range: 0 - 12 **Report & Time Series:** Most of countries, single estimate	**Series:**Technically available for most of the countries since 1961, but requires some effort to extract them.	2. WWF Ecoregions of the World from World Wildlife Fund USA, http://www.worldwildlife.org/science/ecoregions/delineation.html] **Range:** 0 - 100 **Reporting & Time series:** Country-level annual data since 1990
Dependency on natural capital [ENC%↑] This measure captures a country's reliance on ecosystem services, which are themselves exposed to disruption by climate change. Based on Natural Capital accounting project of the World Bank. This measure seeks to account for the use of natural capital in national accounting by including information on the change in natural capital such as mineral resources, forest stocks etc. In this	**Threatened Species [ETS↑].** Threats of extinction arise from many pressures currently unrelated to climate change. Further climate change is likely to exacerbate these pressures in many cases and thus this measure is an indication of the sensitivity of a country's ecosystems services to change in the future. This indicator is a composite measure made up of (1) the % of mammal species recorded as threatened; (2) the % of plant species threatened; and (3) the number of bird species threatened. These three groups represent a good, but incomplete, coverage of the	**Engagement in International Environmental Conventions [EIC↓].** Although not a direct measure of capacity, the failure to take part in such forums is usually associated with either lack of technical capacity to deal with the issues and/or lack of political ability to reach decisions over appropriate engagement. This measure is based on the country's participation in international forums, which is taken as an indicator its capacity to engage in multilateral negotiations and to reach agreement on appropriate actions internally.

measure only those elements related to ecosystem services are counted. These are crop, pasture, forest (timber), forest (non-timber) and protected areas. Sub-surface capital such as oil, gas and mineral reserves are not included in this measure. The indicator is expressed as % of GDP **Sources of data:** http://data.worldbank.org/sites/default/files/total_and_per_capita_wealth_of_nations.xls **Range:** 0 - 0.5 **Reporting & Time Series:** Country-level data. Available in 1995, 2000, 2005	state of ecosystems. Birds have to be treated differently from mammals and plants because the number of bird species within a country is difficult to determine as many are migratory over long distances and the source of the threat of extinction may arise from causes far distant from the country. **Sources of data:** http://www.iucnredlist.org/http://www.iucnredlist.org/ **Range:** 0 - 1 **Reporting & Time Series:** Most of countries, single estimate only.	**Sources of data:** http://sedac.ciesin.columbia.edu/entri/index.jsp **Range:** 0 - 0.6 **Reporting & Time Series:** Annual since 1995 based on the continually increasing number of conventions etc and the time lags in countries signing and ratifying the agreements.
Infrastructure (Coast)	**% of area of country less than 5m above sea-level [SLA↑]**	**% of population living less than 5m above sea-level [SLP↑]**	

31

	Commonly used measure of exposure to a range of coastal threats, including seal-level rise, storms and storm surge and salt water intrusion. It is not directly related to flooding due to rises in mean sea-level. **Source of data:** http://sedac.ciesin.columbia.edu/data/collection/gpw-v3 **Range:** 0 -100 **Report & Time Series:** Most of countries, single measures	Simple measure of the proportion of the population living in that region. The rationale is that an estimate of the population exposed to the risks arising from seal-level rise, storm surge and similar effects. **Source of data:** http://sedac.ciesin.columbia.edu/data/collection/gpw-v3 **Range:** 0 - 100 **Reporting & Time Series:** Most of countries, Single measure from 1995	
Infrastructure (Energy)	**% population with access to reliable electricity [Elect%↓]** "Without access to energy service, the poor will be deprived of the most basic of human rights and of economic opportunities to improve their standard of living. People cannot	**% energy (electricity) production at risk [ERisk%↑].** This is an estimate of how vulnerable electricity production might be to climate impacts. Currently it is a measure of the percentage of total electricity (analogue for energy) that is either imported or derived from hydro-electricity. The rational	

	access modern hospital services without electricity, or feel relief from sweltering heat. Food cannot be refrigerated and businesses cannot function. Children cannot go to school in rainforests where lighting is required during the day. The list of deprivation goes on." **Sources of data:** http://content.undp.org/go/cms-service/stream/asset/?asset_id=2205620 **Range:** 0 -100 **Reporting & Time Series:** 2009 & 2010	is that imported energy could increase in price or be cut off in crises, while hydroelectricity is going to be subject to the impacts of change rainfall patterns and competing uses. The indicator is currently a measure of the % of total electricity (analogue for energy) that is either imported and thus not fully within a country's control or derived from hydro-electricity, which will be subject to climatic uncertainty. **Sources of data:** Energy import http://data.worldbank.org/indicator/EG.IMP.CONS.ZS Electricity production from hydro http://data.worldbank.org/indicator/EG.ELC.HYRO.ZS **Range:** 0 - 100 **Reporting & Time Series:** Most years since 1995	
Infrastructure (Transport)	**Floods per decade per 100,000 km² [Flood ↑]**	**% Paved roads [Paved↓]** Paved roads are those finished	

This is used as a measure of exposure as floods are usually the greatest threat to road infrastructure. The indicator is acount of the number of disastrous floods recorded in the CRED database over the period 1992 to 2007 scaled to the area of the country

Sources of data:
Land area
http://data.worldbank.org/indicator/AG.LND.TOTL.K2
Flood disasters
http://www.emdat.be/

Range: 0 - 100

Reporting & Time Series: Single value available for most countries.

with macadamized crushed stone, bitumen or equivalent, concrete or cobblestones and expressed as a % of the stated length of the public road system, a measure of the sturdiness of the system.

Sources of data:http://data.worldbank.org/indicator/IS.ROD.PAVE.ZS

Range: 0 – 100

Reporting & Time Series: Country-level data with About 8 reporting dates since 1995

Appendix 2: Detailed Indicator Information for Readiness

Appendix 2.1 Index of Economic Freedom: Indices calculation, Factors and Source of data
(Source: http://www.heritage.org/index/)

Indicator	Factor score calculation and Source of Data
Business Freedom	Factor Score$_i$ = 50*factor$_{average}$/factor$_i$ *(i: individual country)*
Starting a business- Procedures	Source of Data: WB Doing Business, Economist Intelligence Unit, Country Commerce, 2009–2012; U.S. Department of Commerce, Country Commercial Guide, 2009–2012; and official government publications of each country.
Starting a business-time	
Starting a business-cost	
Obtaining a license-Procedures	
Obtaining a license-time	
Obtaining a license-cost	
Closing a business-Procedures	
Closing a business-time	
Closing a business-recovery rate	
Trade Freedom	Trade Freedom$_i$ = (((Tariff$_{max}$–Tariff$_i$)/(Tariff$_{max}$-Tariff$_{min}$)) * 100) – NTB$_i$ *(i: individual country)*

The trade-weighted average tariff rate	Source of Data: World Bank, World Development Indicators 2012; World Trade Organization, Trade Policy Review, 1995–2012; Office of the U.S. Trade Representative, 2012 National Trade Estimate Report on Foreign Trade Barriers; World Bank, Doing Business 2011 and 2012; U.S. Department of Commerce, Country Commercial Guide, 2008–2012; Economist Intelligence Unit, Country Commerce, 2009–2012; World Bank, Data on Trade and Import Barriers: Trends in Average Applied Tariff Rates in Developing and Industrial Countries, 1981–2010; and official government publications of each country.
Non-tariff barriers (NTBs)	
Fiscal Freedom	Fiscal Freedom$_{ij}$= 100 – α (Factor$_{ij}$)^2 *(α is a coefficient set equal to 0.03;* *i: individual country; j: individual factor)*
The top marginal tax rate on individual income	Source of Data: Deloitte, International Tax and Business Guide Highlights; International Monetary Fund, Staff Country Report, "Selected Issues and Statistical Appendix," and Staff Country Report, "Article IV Consultation," 2009–2012; PricewaterhouseCoopers, Worldwide Tax Summaries, 2009–2012; countries' investment agencies; other government authorities (embassy confirmations and/or the country's treasury or tax authority); and Economist Intelligence Unit, Country Commerce and Country Finance, 2009–2012. For information on tax burden as a percentage of GDP, the
The top marginal tax rate on corporate income	

36

The total tax burden as a percentage of GDP.	primary sources (in order of priority) were OECD data; Eurostat, Government Finance Statistics data; AfDB and OECD, African Economic Outlook 2012; IMF Staff Country Report, "Selected Issues," and Staff Country Report, "Article IV Consultation," 2009–2012; ADB, Key Indicators for Asia and the Pacific, 2009–2012; and individual contacts from government agencies and multinational organizations such as the IMF and World Bank.
Government Spending	$GE_i = 100 - \alpha\,(Expenditures_i)^2$ *(α is a coefficient to control for variation among scores (set at 0.03; i: individual coutntry)*
Government spending as percentage of GDP	Source of Data: OECD data; Eurostat data; AfDB and OECD, African Economic Outlook 2012; IMF, Staff Country Report, "Selected Issues and Statistical Appendix," Staff Country Report, "Article IV Consultation," 2009–2012, and WEO Database 2012; ADB, Key Indicators for Asia and the Pacific, 2009–2012; AfDB, The ADB Statistics Pocketbook 2012; official government publications of each country; and Economic Commission for Latin America, Economic Survey of Latin America and the Caribbean 2010–2011 and Macroeconomic Report on Latin America and the Caribbean—June 2012.
Monetary Freedom	$Monetary\ Freedom_i = 100 - \alpha\,\sqrt{Weighted\ Avg.\ Inflation_i}\ -\ PC\ penalty_i$ $Weighted\ Avg.\ Inflation_i = \theta_1\,Inflation_{it} + \theta_2 Inflation_{it-1} + \theta_3\,Inflation_{it-2}$ *(θ₁ through θ₃ represent three numbers that sum to 1 and*

	are exponentially smaller in sequence; *i: individual country; t: year)*
The weighted average inflation rate for the most recent three years Price controls	Source: IMF, International Financial Statistics Online; International Monetary Fund, WEO, 2012; Economist Intelligence Unit, ViewsWire; and official government publications of each country.
Investment Freedom	(Qualitative Measure, see Appendix 2.2)
The index evaluates a variety of restrictions that are typically imposed on investment. Points, as indicated in Appendix Table, are deducted from the ideal score of 100 for the restrictions found in a country's investment regime.	
Source of Data: Official government publications of each country; Economist Intelligence Unit, Country Commerce, 2009–2012; Office of the U.S. Trade Representative, 2012 National Trade Estimate Report on Foreign Trade Barriers; and U.S. Department of Commerce, Country Commercial Guide, 2009–2012.	
Financial Freedom	(Quantitative Measure, see Appendix 2.3) The index considers 5 areas to assess an economy's overall level of financial freedom. An overall score on a scale of 0 to 100 is given to an economy's financial freedom through deductions, as indicated in Appendix Table2, from the ideal score of 100.
The extent of government regulation of financial services The degree of state intervention in banks and other financial firms through direct and indirect ownership The extent of financial and capital market development Government influence on the allocation	Source of Data: Economist Intelligence Unit, Country Commerce and Country Finance, 2009–2012; IMF, Staff Country Report, "Selected Issues," and Staff Country Report, "Article IV Consultation," 2009–2012; OECD, Economic Survey; official government publications of each country; U.S. Department of Commerce, Country Commercial Guide, 2009–2012; Office of the U.S. Trade Representative, 2011 National Trade Estimate Report on

of credit	Foreign Trade Barriers; U.S. Department of State, Investment Climate Statements, 2009–2012; World Bank, WDI 2012; and various news and magazine articles on banking and finance.
Openness to foreign competition.	
Labor Freedom	Factor Score$_i$= 50 × factor$_{average}$/factor$_i$ *(i: individual country)*
Ratio of minimum wage to the average value added per worker	Source of Data: World Bank, Doing Business 2013; Economist Intelligence Unit, Country Commerce, 2009–2012; U.S. Department of Commerce, Country Commercial Guide, 2009–2012; and official government publications of each country.
Hindrance to hiring additional workers	
Rigidity of hours	
Difficulty of firing redundant employees	
Legally mandated notice period	
Mandatory severance pay	

Appendix 2.2 Types of Investment Restrictions & Points deducted (full score: 100 points)
(Source: http://www.heritage.org/index/)

Investment Restrictions	
National treatment of foreign investment	
• No national treatment, prescreening	25 points deducted
• Some national treatment, some prescreening	15 points deducted
• Some national treatment or prescreening	5 points deducted

Foreign investment code	
• No transparency and burdensome bureaucracy	20 points deducted
• Inefficient policy implementation and bureaucracy	10 points deducted
• Some investment laws and practices non-transparent or inefficiently implemented	5 points deducted
Restrictions on land ownership	
• All real estate purchases restricted	15 points deducted
• No foreign purchases of real estate	10 points deducted
• Some restrictions on purchases of real estate	5 points deducted
Sectoral investment restrictions	
• Multiple sectors restricted	20 points deducted
• Few sectors restricted	10 points deducted
• One or two sectors restricted	5 points deducted
Expropriation of investments without fair compensation	
• Common with no legal recourse	25 points deducted
• Common with some legal recourse	15 points deducted
• Uncommon but occurs	5 points deducted
Foreign exchange controls	
• No access by foreigners or residents	25 points deducted
• Access available but heavily restricted	15 points deducted
• Access available with few restrictions	5 points deducted
Capital controls	

• No repatriation of profits; all transactions require government approval	25 points deducted
• Inward and outward capital movements require approval and face some restrictions	15 points deducted
• Most transfers approved with some restrictions	5 points deducted

Appendix 2.3 Types of Government Interference & points deducted for Fiscal Freedom full score: 100 points)
(Source: http://www.heritage.org/index/)

Negligible government interference.	0 point deducted
Minimal government interference. Regulation of financial institutions is minimal but may extend beyond enforcing contractual obligations and preventing fraud.	10 points deducted
Nominal government interference. Government ownership of financial institutions is a small share of overall sector assets. Financial institutions face almost no restrictions on their ability to offer financial services.	20 points deducted
Limited government interference. Credit allocation is influenced by the government, and private allocation of credit faces almost no restrictions. Government ownership of financial institutions is sizeable. Foreign financial institutions are subject to few restrictions.	30 points deducted
Significant government interference. The central bank is not fully independent, its supervision and regulation of financial institutions are somewhat burdensome, and its ability to enforce contracts and prevent fraud is insufficient. The government exercises active ownership and	40 points deducted

control	
Considerable government interference. Credit allocation is significantly influenced by the government, and private allocation of credit faces significant barriers. The ability of financial institutions to offer financial services is subject to significant restrictions. Foreign financial	50 points deducted
Strong government interference. The central bank is subject to government influence, its supervision of financial institutions is heavy-handed, and its ability to enforce contracts and prevent fraud is weak. The government exercises active ownership and control of financial institutions	60 points deducted
Extensive government interference. Credit allocation is extensively influenced by the government. The government owns or controls a majority of financial institutions or is in a dominant position. Financial institutions are heavily restricted, and bank formation faces significant barrie	70 points deducted
Heavy government interference. The central bank is not independent, and its supervision of financial institutions is repressive. Foreign financial institutions are discouraged or highly constrained.	80 points deducted
Near repressive. Credit allocation is controlled by the government. Bank formation is restricted. Foreign financial institutions are prohibited.	90 points deducted
Repressive. Supervision and regulation are designed to prevent private financial institutions. Private financial institutions are prohibited.	100 points deducted

Appendix 2.4 Worldwide Governance Indicators: definition and data source
(Source: http://info.worldbank.org/governance/wgi/index.aspx#doc)

Indicator	Source of Data
Voice and Accountability Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	**Source of Data:** **Representative Sources[9]:** **EIU (Economist Intelligence Unit)** Democracy Index Vested interests Accountability of Public Officials Human Rights Freedom of association **FRH (Freedom House)** Political Rights Civil Liberties Press Freedom Index Media Civil Society Electoral Process **GCS (World Economic Forum Global Competitiveness Report)** Transparency of government policymaking Freedom of the Press Favoritism in Decisions of Government Officials Effectiveness of Law-Making Body **GWP (Gallup World Poll)** Confidence in honesty of elections

[9] Representative indicators are indicators that cover a set of countries in which the distribution of governance is likely to be similar to that in the world as a whole. Practically these include all of the indicators with large cross-country coverage of developed and developing indicators. In contrast non-representative indicators cover either specific regions (for example the BEEPS survey of transition economies or the Latinobarometer survey of Latin American countries), or particular income levels (for example the World Bank CPIA ratings that cover only developing countries). (Kaufmann et al., 2009)

43

	HUM (Cingranelli Richards Human Rights Database and Political Terror Scale)
	Restrictions on domestic and foreign travel
	Freedom of political participation
	Imprisonments because of ethnicity, race, or political, religious beliefs
	Freedom of Speech
	IPD (Institutional Profiles Database)
	Freedom of elections at national level
	Are electoral processes flawed?
	Do the representative Institutions (e.g. parliament) operate in accordance with the formal rules in force (e.g. Constitution)?
	Freedom of the Press (freedom of access to information, protection of journalists, etc.)
	Freedom of Association
	Freedom of assembly, demonstration
	Respect for the rights and freedoms of minorities (ethnic, religious, linguistic, immigrants...)
	Is the report produced by the IMF under Article IV published?
	Reliability of State budget (completeness, credibility, performance...)
	Reliability of State accounts (completeness, audit, review law...)
	Reliability of State-owned firms' accounts
	Reliability of basic economic and financial statistics (e.g. national accounts, price indices, foreign trade, currency and credit, etc.).
	Reliability of State-owned banks' accounts
	Is the State economic policy (e.g. budgetary, fiscal, etc.)... communicated?
	Is the State economic policy (e.g. budgetary, fiscal, etc.)... publicly debated?
	Degree of transparency in public procurement
	Freedom to leave the country (i.e. passports, exit visas, etc.)
	Freedom of entry for foreigners (excluding citizens of countries under agreements on free movement, e.g. Schengen Area, etc.)
	Freedom of movement for nationals around the world
	Genuine Media Pluralism
	Freedom of access, navigation and publishing on Internet

44

PRS (Political Risk Services International Country Risk Guide)
Military in politics Democratic accountability
RSF (Reporters Without Borders Press Freedom Index)
Press Freedom Index
WMO (Global Insight Business Conditions and Risk Indicators)
Institutional permanence: An assessment of how mature and well-established the political system is. It is also an assessment of how far political opposition operates within the system or attempts to undermine it from outside.
Representativeness: How well the population and organized interests can make their voices heard in the political system. Provided representation is handled fairly and effectively, it will ensure greater stability and better-designed policies.

Non-representative Sources:
AFR (Afrobarometer)
How much do you trust the parliament?
Overall, how satisfied are you with the way democracy works in your country?
Free and fair elections
Political Participation
BTI (Bertelsmann Transformation Index)
Stability of Democratic Institutions
Political and Social Integration
CCR (Freedom House Countries at the Crossroads)
Civil Liberties
Accountability and public voice
GII (Global Integrity Index)
Civil Society Organizations Media
Public Access to Information Voting & Citizen Participation

	Election Integrity
	Political Financing
	IFD (IFAD Rural Sector Performance Assessments)
	Policy and legal framework for rural organizations
	Dialogue between government and rural organizations
	IRP (IREEP African Electoral Index)
	Africa Electoral index
	LBO (Latinobarometro)
	Satisfaction with democracy
	Trust in Parliament
	MSI (International Research and Exchanges Board Media Sustainability Index)
	Media Sustainability Index
	OBI (International Budget Project Open Budget Index)
	Open Budget Index
	VAB (Vanderbilt University Americas Barometer)
	Trust in parliament Satisfaction with democracy
	WCY (Institute for Management and Development World Competitiveness Yearbook)
	Transparency of government policy
	WJP (World Justice Project Rule of Law Index)
	Factor 1: Limited Government Powers
	Factor 4: Fundamental Rights

Political Stability and Absence of Violence	Source of Data
Political Stability and Absence of Violence measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.	**Representative Sources:** **EIU (Economist Intelligence Unit)** Orderly transfers Armed conflict Violent demonstrations Social Unrest International tensions / terrorist threat **GCS (World Economic Forum Global Competitiveness Report)** Cost of Terrorism **HUM (Cingranelli Richards Human Rights Database and Political Terror Scale)** Frequency of political killings (CIRI) Frequency of disappearances (CIRI) Frequency of tortures (CIRI) Political terror scale (PTS) **IJT (iJET Country Security Risk Ratings)** Security Risk Rating **IPD (Institutional Profiles Database)** Intensity of internal conflicts: ethnic, religious or regional Intensity of violent activities...of underground political organizations Intensity of social conflicts (excluding conflicts relating to land) **PRS (Political Risk Services International Country Risk Guide)** Government stability Internal conflict External conflict Ethnic tensions **WMO (Global Insight Business Conditions and Risk Indicators)** *Civil unrest* How widespread political unrest is, and how great a threat it poses to investors. Demonstrations in themselves may not be cause for concern, but they will cause major disruption if they escalate into severe violence. At the extreme, this factor

	would amount to civil war. *Terrorism* Whether the country suffers from a sustained terrorist threat, and from how many sources. The degree of localisation of the threat is assessed, and whether the active groups are likely to target or affect businesses. **Non-representative Sources:** **WCY (Institute for Management and Development World Competitiveness Yearbook)** The risk of political instability is very high **WJP (World Justice Project Rule of Law Index)** Factor 3.2: Civil conflict is effectively limited (Order and Security)

Control of Corruption	Source of Data
Control of Corruption 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 "capture" of the state by elites and private interests.	**Representative Sources:** **EIU (Economist Intelligence Unit)** Corruption among public officials **GCS (World Economic Forum Global Competitiveness Report)** Public Trust in Politicians Diversion of Public Funds Irregular Payments in Export and Import Irregular Payments in Public Utilities Irregular payments in tax collection Irregular Payments in Public Contracts Irregular Payments in Judicial Decisions State Capture **GWP (Gallup World Poll)** Is corruption in government widespread? **IPD (Institutional Profiles Database)** Level of "petty" corruption between administration and citizens Level of corruption between administrations and local businesses Level of corruption between administrations and foreign companies **PRS (Political Risk Services International Country Risk Guide)** Corruption **WMO (Global Insight Business Conditions and Risk Indicators)** *Corruption :* An assessment of the intrusiveness of the country's bureaucracy. The amount of red tape likely to countered is assessed, as is the likelihood of encountering corrupt officials and other groups. **Non-representative Sources:** **ADB (African Development Bank Country Policy and Institutional Assessments)** Transparency, accountability and corruption in public sector **AFR (Afrobarometer)** How many elected leaders (parliamentarians) do you think are involved in corruption?

	How many judges and magistrates do you think are involved in corruption? How many government officials do you think are involved in corruption? How many border/tax officials do you think are involved in corruption? **ASD (Asian Development Bank Country Policy and Institutional Assessments)** Transparency, accountability and corruption in public sector **BPS (Business Enterprise Environment Survey)** How common is it for firms to have to pay irregular additional payments to get things done? Percentage of total annual sales do firms pay in unofficial payments to public officials? How often do firms make extra payments in connection with taxes, customs, and judiciary? How problematic is corruption for the growth of your business? **BTI (Bertelsmann Transformation Index)** Anti-Corruption policy Prosecution of office abuse Prosecution of office abuse **CCR (Freedom House Countries at the Crossroads)** Anti-Corruption and Transparency **FRH (Freedom House)** Corruption **GCB (Transparency International Global Corruption Barometer Survey)** Frequency of household bribery - paid a bribe to one of the 8/9 services Frequency of corruption among public institutions: Political parties Frequency of corruption among public institutions: Parliament/Legislature Frequency of corruption among public institutions: Media Frequency of corruption among public institutions: Legal system/Judiciary Frequency of corruption among public institutions: Public officials **GII (Global Integrity Index)** Anti-Corruption Agency

Rule of Law	**Source of Data** **Representative Sources**:

Rule of law 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. This table lists the individual variables from each data sources used to construct this measure in the Worldwide Governance Indicators	**EIU (Economist Intelligence Unit)** Violent crime Organized crime Fairness of judicial process Enforceability of contracts Speediness of judicial process Confiscation/expropriation Intellectual property rights protection Private property protection **GCS (World Economic Forum Global Competitiveness Report)** Business Cost of Crime and Violence Cost of Organized Crime Reliability of Police Services Judicial Indepdendence Efficiency of Legal Framework for Challenging Regulations IPR protection Property Rights Informal Sector **GWP (Gallup World Poll)** Confidence in the police force Confidence in judicial system Have you had money property stolen from you or another household member? Have you been assaulted or mugged? **HER (Heritage Foundation Index of Economic Freedom)** Property Rights **HUM (Cingranelli Richards Human Rights Database and Political Terror Scale)** Independence of judiciary (CIRI) **IPD (Institutional Profiles Database)** Degree of security of goods and persons Organised criminal activities (drug trafficking, weapons, prostitution...) Degree of judicial independence vis-à-vis the State Degree of enforcement of court orders

	Timeliness of judicial decisions
	Equal treatment of foreigners before the law (compared to nationals)
	Practical ability of the administration to limit tax evasion
	Efficiency of the legal means to protect property rights in the event of conflict between private stakeholders?
	Generally speaking, does the State exercise arbitrary pressure on private property (e.g. red tape...)?
	Does the State pay compensation equal to the loss in cases of expropration (by law or fact) when the expropriation concerns land ownership?
	Does the State pay compensation equal to the loss in cases of expropration (by law or fact) when the expropriation concerns production means?
	Degree of observance of contractual terms between national private stakeholders
	Degree of observance of contractual terms between national and foreign private stakeholders
	In the past 3 years, has the State withdrawn from contracts without paying the corresponding compensation... vis-à-vis national stakeholders?
	In the past 3 years, has the State withdrawn from contracts without paying the corresponding compensation... vis-à-vis foreign stakeholders?
	Respect for intellectual property rights relating to... trade secrets and industrial patents
	Respect for intellectual property rights relating to... industrial counterfeiting
	Does the State recognize formally the diversity of land tenure system?
	PRS (Political Risk Services International Country Risk Guide)
	Law and Order
	TPR (US State Department Trafficking in People report)
	Trafficking in People
	WMO (Global Insight Business Conditions and Risk Indicators)
	Judicial Independence: An assessment of how far the state and other outside actors can influence and distort the legal system. This will determine the level of legal impartiality investors can expect.
	Crime: How much of a threat businesses face from crime such as kidnapping, extortion, street violence, burglary and so on. These problems can cause major

inconvenience for foreign investors and require them to take expensive security precautions.

Non-representative Sources:
ADB (African Development Bank Country Policy and Institutional Assessments)
Property rights and rule based governance
AFR (Afrobarometer)
Over the past year, how often have you or anyone in your family feared crime in your own home?
Over the past year, how often have you or anyone in your family had something stolen from your house?
Over the past year, how often have you or anyone in your family been physically attacked?
How much do you trust the courts of law?
Trust in police
ASD (Asian Development Bank Country Policy and Institutional Assessments)
Property rights and rule based governance
BPS (Business Enterprise Environment Survey)
How often is following characteristic associated with the court system: Fair and honest?
How often is following characteristic associated with the court system: Enforceable?
How often is following characteristic associated with the court system: Quick?
How problematic is crime for the growth of your business?
How problematic is judiciary for the growth of your business?
BTI (Bertelsmann Transformation Index)
Separation of powers
Independent Judiciary
Civil rights CCR Rule of Law
FRH (Freedom House)
Judicial framework and independence (FNT)
GII (Global Integrity Index)

	Executive Accountability
	Judicial Accountability
	Rule of Law
	Law Enforcement
	IFD (IFAD Rural Sector Performance Assessments)
	Access to land
	Access to water for agriculture
	LBO (Latinobarometro)
	Trust in Judiciary
	Trust in Police
	Have you been a victim of crime?
	PIA (World Bank Country Policy and Institutional Assessments)
	Property rights and rule based governance
	VAB (Vanderbilt University Americas Barometer)
	Trust in supreme court Trust in justice system
	Trust in police
	Have you been a victim of crime?
	WCY (Institute for Management and Development World Competitiveness Yearbook)
	Tax evasion is a common practice in your country
	Justice is not fairly administered in society
	Personal security and private property are not adequately protected
	Parallel economy impairs economic development in your country
	Patent and copyright protection is not adequately enforced in your country
	WJP (World Justice Project Rule of Law Index)
	Factor 3.1: Crime is effectively controlled (Order and Security) Factor 7: Civil Justice
	Factor 8: Criminal Justice