Towards a Multidimensional Vulnerability Index

Six supporting notes

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Author: Patrick Guillaumont

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Contents

Foreward

This document is a collection of six notes that were prepared as input to the high-level panel tasked with developing a multidimensional vulnerability indicator index at the request of the UN General Assembly.

While they are unsolicited contributions on issues to be discussed by the panel, they are a direct follow-up to the OHRLLS report «Multidimensional Vulnerability Index: Potential Development and Uses» of which Laurent Wagner and I were the « lead authors ». This report sets out the principles that should guide the construction of the index, principles that are recalled in the first note of this document.

These notes, like the report which they extend, are in line with the work undertaken by FERDI on vulnerability and its measurement.

Three criteria that a multidimensional vulnerability index should meet to be used effectively*

with Laurent Wagner, PhD in Economics, Research Officer at Ferdi.

As commonly agreed, the vulnerability of a country is here considered as the risk it will be hurt by exogenous shocks. The vulnerability of countries has been recognised since the beginning of development economics as one of the main problems they face, due to shocks, either of external or natural origin. For decades, there has been a rich literature on the economic, social and political consequences of unstable export earnings. More recently, there has been a growing concern about other kinds of vulnerability, linked to shocks such as outbreaks of violence and other expressions of political fragility, epidemics, natural disasters and, above all, climate change: the vulnerability that climate change brings to developing countries in varying degrees constitutes a global challenge.

Small Island Developing States (SIDS) have traditionally been considered highly vulnerable, both through the instability of their exports, often linked to their small size, and through climatic hazards, often linked to their insularity. They now appear particularly vulnerable to climate change. The UN General Assembly has repeatedly highlighted the vulnerability of SIDS, and the need for international measures to address their vulnerability. The last Secretary-General's report on the implementation of the "SIDS Accelerated Modalities of Action" (SAMOA) Pathway summarises the challenges faced by these countries and the responses that the international community has attempted to provide (A/76/211, dated 22/7/2021).

In December 2020, following the General Assembly Resolution A/RES/75/215 requesting the Secretary-General to provide recommendations for the development of a multidimensional vulnerability index relevant to SIDS, a report was prepared by OHRLLS (Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States), entitled «Possible Development and Uses of Multi-Dimensional Vulnerability Indices. Analysis and Recommendations». This presentation is based on the findings

* This note relies on the main conclusions of the United Nations report: *Possible Development and Uses of Multi-Dimensional Vulnerability Indices. Analysis and Recommendations*, of which Patrick Guillaumont and Laurent Wagner are the lead authors, edited by Tishka Hope Francis and Sai Navoti, December 2021. It also develops the presentation given by the authors to the members of the High-Level Panel at its opening session on March 28 2022.

of this report. The report, which is to serve as a reference document for the High-Level Panel recently established to make proposals to the President of the General Assembly, is based on an in-depth review of the various existing indices and academic literature on vulnerability indices. The above-mentioned report of the Secretary General on the implementation of the "SIDS Accelerated Modalities of Action" or SAMOA Pathway summarises its content and endorses its recommended principles.

It should be noted that simultaneously the UN Committee for Development Policy (UN CDP) has long used a vulnerability index (alongside per capita income and a human asset index) as a criterion for identifying least developed countries (LDCs) and that this process has itself been regularly endorsed by the UN General Assembly.

The OHRLLS report and the proposals it contains have been drawn up with the intended use of the index in mind. The index should be used to determine what preferential treatment can be given to the most vulnerable countries, starting with SIDS, particularly in accessing concessional resources.

In order to be used effectively, the multi-dimensional vulnerability index(MVI) should meet three specific criteria, in addition to the usual conditions that any composite indicator must satisfy. The usual requirements, which we do not elaborate on here, are the availability and reliability of the data on the one hand, and its easy comprehensibility and transparency on the other. We highlight here the three specific criteria of the multidimensional vulnerability index that the international community needs:

- the index should indeed be multidimensional;
- it should be universal, what is needed for its consistency;
- it should be separable (i.e. able to isolate structural from non-structural vulnerability), which is an essential condition for it to be useful for policy.

The index should be truly multidimensional: some principles

There may of course be a debate about the number and scope of the various dimensions of the vulnerability index. In the course of the discussions, the principle of retaining three main dimensions emerged as ensuring an optimal balance between the need for diversity and the need for simplicity, the three dimensions being economic, environmental and social.

These three dimensions correspond to three clearly identifiable categories of shock. They are identified more by their impact (economic, environmental and social) than by their origin (which itself may be economic, environmental or social). A differentiation by the ways of measuring the impact makes easier to avoid redundancy of components from one dimension to another. For example, meteorological or seismic events may affect components of economic vulnerability, while the intensification of climate change-related events may be measured in physical

units. Classification according to the impact of shocks rather than their origin can be discussed, as can be a mixed solution. The key is to avoid redundancy of components and to assess separately the three dimensions identified, keeping in mind they may be interrelated.

The three dimensions are to be aggregated in such a way that a high vulnerability in only one dimension is adequately reflected, even if vulnerability appears low in another or the other two. This means that the three dimensions are not perfectly substitutable and that the index must aggregate them accordingly. One way to do this is to use a quadratic average of the three dimensions rather than an arithmetic one.

The index should be truly multidimensional: the three dimensions retained

One is economic vulnerability, which is the traditional dimension of macroeconomic vulnerability. Economic vulnerability has been used since 2000 by the UN Committee for Development Policy as a criterion for identifying LDCs and the Economic Vulnerability Index (EVI) developed for this purpose has been revised several times. This index, recently renamed «Environmental and Economic Vulnerability Index» (EEVI), is likely to capture the possible economic impact of various kinds of exogenous shocks (economic, environmental, health, etc.).

A second dimension is environmental vulnerability, which can be focused on vulnerability to climate change. Indeed, because of the major and growing importance of this vulnerability, especially for SIDS, it is logical and convenient to consider it separately, through purely physical indicators. The impact of other forms of vulnerability due to environment can be captured through the economic dimension, or possibly the social one.

Finally, the third dimension is social or socio-political vulnerability. This involves targeting recurring social shocks that reflect the fragility of states and their exposure to these shocks. This vulnerability can be specifically captured by violent events, which occur either within the country or at its borders.

The index should be universal

The initial request from the UN General Assembly refers mainly to the vulnerability of small island developing states. It expresses an intention to show the high vulnerability of these countries and to be able to use the index as an argument for special support for them, especially with regard to development financing.

For the argument to be credible and for the index to provide robust support for SIDS, it is necessary that their vulnerability can be fairly compared with that of other developing countries, some of which may also be highly vulnerable, albeit in different ways. For this reason, the Commonwealth Secretariat (Kattumuri et Mitchell, 2021) has proposed the concept and measurement of a Universal

Vulnerability Index (UVI).

It is precisely because the index is multidimensional that it should be universal. This leads to re- emphasising the need to highlight the vulnerability of countries in their specific dimension. When in the MVI the different dimensions are aggregated, more impact will be given to those components that reflect higher vulnerability, what can be done, as indicated above, by using a quadratic average.

The index should be « separable »

A country's vulnerability depends on the one hand on structural factors, as well as other exogenous factors, i.e. factors that are beyond the present control of governments, and on the other hand on factors that are related to their present policies.

The vulnerability to be taken into account in order to justify a higher aid allocation or a preferential treatment (such as that given to LDCs) is indeed that vulnerability which do not result on the weakness of the present policy, and only depends on structural factors, which makes the separability criterion essential.

Disentangling the structural or exogenous factors of vulnerability from those due to current policy is not always easy, but is absolutely necessary. Extensive attention has been paid to this issue in the report on multidimensional vulnerability. The exogenous or structural vulnerability results both from the recurrence of shocks, which reflects their probability, and from the exposure to the shocks, which determines their potential impact and corresponds to structural features inherited from the past.

As for resilience, i.e. the ability to cope with shocks, this itself depends on both structural (or inherited) factors, such as the level of per capita income or human capital, and of course on the current policy: thus, to guide aid allocation or grant preferential treatment, a low structural resilience must be considered either within structural vulnerability or separately alongside it, as is done for the identification of LDCs. The MVI, as presented in the OHRLLS report is thus composed by five parts: (i) the structural vulnerability of economic nature; (ii) the structural (or physical) vulnerability related to environment (or more precisely to climate change); (iii) the structural vulnerability (or fragility) of social nature; (iv) the weakness of structural resilience; (v) the weakness of resilience linked to present policy. In the intended use of the MVI, the separation between "Structural MVI" and "General MVI" can then be set up by two ways, depending on whether the weakness of structural resilience (iv) is included in the Structural MVI, which then encompasses (i) to (iv), or is treated separately, as we can see below.

The expected uses of an MVI that would meet these criteria

A general vulnerability index, including structural and political factors, can be used for domestic policies. But to guide international policies, what is first expected is a structural vulnerability index: this, as a major index of structural handicap to sustainable development, provides an ethical basis for the special treatment in favour of the most vulnerable countries (see Guillaumont, Guillaumont Jeanneney and Wagner, 2017, 2020; Guillaumont 2021).

This index can be used in two ways.

It can be used in a discontinuous way, referring to a threshold value, as is already the case with the CDP vulnerability index for the identification of LDCs, or, as could be the case, to determine eligibility for special funds, as the concessional windows of the multilateral banks, or other special measures. The choice of eligibility thresholds, which is always difficult, may of course differ between the institutions that would like to use the index in this way.

It can also, and most importantly, be used on a continuous way, as a criterion for allocating ODA, as recommended by the UN General Assembly in 2012 to smooth the transition of graduating LDCs (and as also applied in 2014 by the European Commission for the former European Development Fund (EDF) and Development Cooperation Instrument (DCI)). There are now two new challenges.

The first is that the structural MVI be introduced into the Performance Based Allocation (PBA) of the multilateral development banks, so that this formula becomes a Performance and Vulnerability Based Allocation (PVBA) . As noted above, the factors of structural resilience weakness of resulting from the levels of per capita income and human capital, if they are not included in the MVI, can be included separately in the allocation formula, as is generally the case for per capita income. At the same time, it would be consistent that present policy resilience be included in the performance indicator.

The second challenge would be to use the structural vulnerability index in other financial mechanisms, such as bilateral aid, or possibly debt treatment. A new and timely application would be to take into account the structural MVI in the reallocation of SDRs, which is at the heart of the current international agenda (see on this subject the contribution of B. Cabrillac and S. Guillaumont Jeanneney, 2022, and the simulations made by A. Cornier and L. Wagner, 2022).

For the (Structural) MVI to be progressively used by the international community and benefit the SIDS and other developing vulnerable countries, it is important it relies on a broad consensus on its principles, in other words on the criteria it should meet and on the ensuing index structure. It then can be used either as the completed and precise index designed by the High Level Panel or as a common framework reflecting these principles, with a precise content likely to be adapted according to the user needs or preferences.

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Averaging is Key to Build and Use a Multidimensional Vulnerability Index*

In the general presentation of the criteria that the MVI should meet, we emphasized the importance of the way by which the three dimensions of the MVI are averaged in a single index, with the aim to limit the substitutability between them, so that the specific vulnerability of each country can be fairly reflected. The use of a quadratic average (MVIq) instead of the usual arithmetic average (MVIa) was thus proposed, in the UN report "Possible Developments and Uses of Multidimensional Vulnerability Indices" (UN OHRLLS, 2020) that led to the High Level Panel on this topic[1].

It means, calling n the number of dimensions of the MVI, and V_i the subindex of vulnerability in the dimension[2] i that the quadratic average

$$MVI_q = \sqrt{\frac{1}{n}\sum_{i=1}^{n} V_i^2}$$

should be preferred to the arithmetic average

$$MVI_a = \frac{1}{n}\sum_{i=1}^{n} V_i$$

* This policy brief supplements the note by Patrick Guillaumont and Laurent Wagner "Three criteria the MVI should meet to be used effectively". It benefitted from discussions with Sosso Feindouno and Laurent Wagner, as well as calculations by Alban Cornier at FERDI.
Guillaumont P., Wagner L. (2022) Three criteria that a multidimensional vulnerability index should meet to be used effectively, FERDI Policy brief B234, May.

1. A quadratic average was itself used in the *Commonwealth Universal Index of Vulnerability*, April 2021. It was even earlier applied to aggregate the components of the "Physical Vulnerability to Climate Change Index" (PVCCI) by Feindouno, Guillaumont and Simonet « The Physical Vulnerability to Climate Change Index : An Index to be Used for International Policy » *Ecological Economics* , Vol 176, October, with a similar goal of limiting the substitutability between components.
2. As an example, let us compare the index value for two countries, supposing **three** dimensions, respectively with component indices of 90, 30, 30 for country A and 50, 50, 50 for country B: they have the same index of 50 with an arithmetic average, but they differ with the quadratic average, still 50 for country A, but 58 for country B, highly vulnerable in one dimension.

A step further, suggested in the footnote 2 of the note "Three criteria that a multidimensional vulnerability index should meet to be used effectively" would be to use what we called a *semi -geometric average or a reversed geometric average*, namely the complement to 100 (or one) of the geometric average of the complement to 100 (or one) of each dimension subindex[3] :

$$MVI_g = 100 - \sqrt[n]{\prod_{i=1}^{n}(100 - V_i)}$$

This averaging formula even more than the quadratic average enhances the impact of the most vulnerable dimension on the value of the composite index[4].

It would still be possible to move further in the same direction by designing "*critical thresholds*" for the three or n sub-indices i.e for the three or n dimensions, what means that a country where vulnerability in one dimension is above the critical threshold (V_i^*) be considered as "highly vulnerable", with an index equal to 100, whatever its position in the other two dimensions[5] :

$$MVI_k = 100 - \sqrt[n]{\prod_{i=1}^{n}(V_i^* - V_i)}$$

The issue would then to choose the threshold levels. It could be for instance at the upper quintile or decile of the sub index value in each dimension for a set of developing countries[6]. It would mean that each country with a very high level of vulnerability in only one dimension would be considered as "highly vulnerable". In particular most of the SIDS, which are in the upper decile or quintile of the environmental vulnerability or the PVCCI (Physical Vulnerability Index to Climate Change), would be considered as "highly vulnerable" (probably as well as the most arid countries).

This last (truncated) averaging formula would be useful only for designing a *category* of "highly vulnerable countries". By the way this would be also possible with the other three formulas, first designed to be used "continuously" without threshold values. Let us focus on these 3 formulas and to compare the relative value of results to which they lead. It is well known that the quadratic average is higher than the arithmetic one. It also appears that generally the reversed geometric

3. We suggested and used this kind of averaging for the Economic Vulnerability Index (EVI) of the Committee for Development Policy (CDP) in Guillaumont P., *Caught in a Trap, Identifying the Least Developed Countries,* Economica, 2009, where it is called "semi-geometric", but better named "reversed geometric".
4. With the previous two profiles of vulnerability the semi-geometric average would be about 62 for country B (and still 50 for country A), instead of 50 with the arithmetic average and 58 with the quadratic one.
5. Again, with the same two country profiles, and supposing a "critical threshold" of 85 or 90, the index would be at the maximum level of 100 for country B (and still 50 for country A).
6. It has been the practice of the UN CDP from 1991 to 2015 to retain a threshold at the quartile level for using its EVI (and HAI as well) as a criterion for the identification of LDCs.

average is higher than the quadratic one, so that

$$MVI_a < MVI_q < MVI_g$$

What here matters is that the difference between the 3 values is all the more important that a country has a high value in one dimension (see in annex a table showing the values for 4 virtual countries with the same arithmetic average). As a result, the share of SIDS, most of them with a high value of physical vulnerability to climate change, which are among the 40% or 33% highest vulnerable countries is higher with the quadratic average than with arithmetic average and higher with the reversed geometric average than with the quadratic average[7]. In the choice of the averaging method, the expected use of the MVI should thus be kept in mind.

The last formula (MVI_k) offers an answer to the question of classifying countries between those which are "highly vulnerable" and those which are not considered so. As such it may be politically attractive, although relying on arbitrary thresholds. But the identification of a specific group of highly vulnerable countries can be used only for binary measures, such as the eligibility to special funds (or special preferences). Its use as a criterion for aid allocation would be debatable, because it would not allow to differentiate within the "highly vulnerable countries" according to their level of vulnerability, so that it would be unfair for the most vulnerable among the highly vulnerable countries.

In conclusion, averaging is key. Using an averaging method that enhances the specific vulnerability of each country in one or another dimension is a condition to make an MVI acceptable for the most vulnerable countries, in particular the SIDS. Once that agreed, it could be reasonable to propose a framework of calculation of the MVI with the 2 or 3 formulas for averaging the three dimensions, and to invite the users (or "donors") to choose the method (and possible thresholds) the most appropriate with regard to the use they wish : MVI_g or MVI_q for a continuous criterion of aid allocation, MVI_k for binary measures involving a classification between the highly vulnerable countries and the other ones, a classification that would unavoidably rely on arbitrary thresholds.

Well explained, the quadratic average seems the easiest way to find a consensus on how to aggregate the three dimensions of vulnerability in a single index that fairly reflects the specific vulnerability of each country in one or another dimension.

7. This could be illustrated for instance by using the data of the Commonwealth Secretariat UVI. Moreover, it would appear that the MVI_k evidences a group of countries reaching the maximum value (100) of the MVI, due to any dimension. This group would look like a category of "highly vulnerable countries" while only other countries would be differentiated by their level of vulnerability (below 100).

Annex. Value of the "MVI" and its 3 components for 4 countries (A, B, C, D) according the way by which the components are averaged, and with the same arithmetic average.

	Component values			MVI Values		
Countries	**1**	**2**	**3**	**AR**	**QUA**	**RGEO**
A	50	50	50	50	50	50
B	30	100	20	50	61,4	100
C	50	80	20	50	55,7	56,9
D	70	50	30	50	52,6	52,8

AR, QUA and RGEO mean respectively: Arithmetic, Quadratic and Reverse Geometric averages.

Back to the rationale of a Multidimensional Vulnerability Index (MVI) and its components to enhance its consistency

The MVI project was born from a UN General Assembly Resolution that gives it legitimacy, conditioned by its economic rationale (see the previous notes prepared for UNDESA-OHRLLS for their support to the work of the High-Level Panel on MVI: Guillaumont P. and L.Wagner, 2022; and Guillaumont, 2022). It seems useful to come back to the rationale of the index and of its components to enhance the consistency of the exercise.

Lessons from the past: The rationale when a vulnerability index was first introduced as a criterion for the identification of the LDCs.

When the Economic Vulnerability Index (EVI) recently renamed Economic and Environmental Index was set up in 2000-2005 by the UN CDP (Committee for Development Policy), its rationale was clear, and its components were discussed and selected with regard to this rationale. The rationale was that of the LDC category itself, identified since its beginning as poor countries facing structural handicaps to economic growth.

Structural economic vulnerability was then considered as one of the two main structural handicaps to growth, the weakness of human capital being the other one. The literature was giving a strong support to the relevance of these two main structural handicaps (see Guillaumont, 2009)[1]. And in the discussion which at the CDP followed the adoption of the principle of the EVI criterion, each component was considered with respect to its link with the rate of economic growth or one of the main growth determinants[2].

While the (negative) link tested econometrically between each component and the rate of economic growth was unevenly significant, overall there were fairly good reasons to assert the presence of such a link. Of all the components,

1. More questionable was the view adopted since the beginning by the CDP, previously named Committee of Development Planning that the two structural handicaps were strictly complementary (facing the two was needed to be included into the LDC category). While this view found some econometric support over the period 1975-2000 (see Guillaumont, 2009), it was not clearly supported when tested over a longer and more recent period (1975-2011) (see Guillaumont (ed), 2019).
2. For instance, "remoteness from the world markets" was designed with respect to its impact on trade as estimated in a gravity model.

the instability of exports of goods and services generally had the most significant negative impact on growth. And it was even possible to investigate which measure of instability had the most significant coefficient, thus suggesting how to define the component. It was also true that the higher the export to GDP ratio (i.e. the more open the country is to foreign trade), the more exposed it is to external shocks. But on the other hand, openness to the outside world has long been considered in the literature as the result of a good policy and not as a structural handicap. The correct procedure then was to consider in the export to GDP ratio only what results from structural factors, the first of which is naturally a small population size. It is well established that the long-term economic growth rate, once the influence of other factors known in the literature is controlled for, is a positive function of population size. This is why in the initial formulation of the EVI by the CDP the smallness of population size was recognised as the first component of the vulnerability index[3]. The reform of the index in 2011-2012, which consisted of reducing the weight given to population size to include a new environmental criterion, namely the proportion of the population living in low elevated coastal zones/areas (LECZ), thus paradoxically resulted in a decrease in the relative vulnerability of several small island LDCs, particularly those that were mountainous, such as Vanuatu or Sao Tome and Principe (see Guillaumont, 2014).

The introduction of this LECZ component of vulnerability illustrates the need to have a logical framework to identify the basis of each indicator. Indeed, if we look for a correlation between the share of the population living in low elevated coastal areas (LECZ) and economic growth, it is not negative, but on the contrary positive, since it is in these areas that port activities, and related urban activities are established. It was indeed logical to redefine the category of least developed countries in relation to the objective of sustainable development and not only to economic growth, as well as the vulnerability indicator that serves as a criterion for the category. But this meant that the logical basis for the components was no longer to be found only in their past relationship with economic growth.

What rationale with respect to climate change?

How then can we identify the logical underpinnings of new environmental components? It is of course necessary to look at the overall framework, where the different dimensions of vulnerability are considered specifically. As we have seen, it is possible to assess the risk that economic growth may be affected by this or that factor that has negatively influenced growth in the past. But the same cannot be said of the risk for sustainable development, in particular vulnerability to climate change, which is still a relatively new phenomenon, the economic effects of which are only gradually being felt. This vulnerability can only be assessed ex ante. And

3. To better capture the structural factors of openness, an index of remoteness from world markets was also introduced as a component of the EVI, see explanations given in Guillaumont 2009, pp.181-183.

estimates of the future consequences of climate change on economic growth or even just on agricultural productivity are highly uncertain and questionable, if only because they depend on the policies that will be implemented and the technologies that will be available.

Therefore, the only reasonable estimate of a country's vulnerability to climate change should be based on the physical manifestations of climate change, which can already be observed or anticipated at the country level (and are likely to have deleterious effects of any kind). This is the approach followed in the construction of Ferdi "Physical Vulnerability to Climate Change Index", the components of which are all main shocks related to climate change or indicators of exposure to these shocks (LECZ, tendency for increased aridity, intensification of temperature or rainfall shocks, or of cyclones, etc.)[4].

The rationale for the components of the third or social dimension

As for the indicators that it is desirable to retain as components of the third dimension (known as the social or socio-political dimension), their legitimacy must be sought in the potential impact of exogenous events likely to recur on the well-being of populations. As the phenomena of economic instability or manifestations of climate change, both exogenous and recurrent, have already been taken into account in the two previous dimensions of vulnerability, components are to be identified that are both social in nature, and exogenous. This is the case for recurrent violence within a country, as well as violence at its borders, or global and regional epidemics. Ensuring the rational basis of the components selected for the third dimension of the MVI is important and needed, while this is the dimension where it is most difficult to distinguish between what is the result of the present policy of the state and what is imposed on it because it is inherited from the past or comes from outside, in other words between the *structural fragility* of the state and that which depends solely on its present choices or decisions. Anyway, the structural roots of the socio-political or fragility are well reflected by the growing literature about the "fragility trap" for instance evidenced by the Commission on State Fragility, Growth and Development (2018).

The components that best correspond to this criterion of social exogeneity are recurrent internal violence, which has been established in the literature as a risk for the future, as well as violence in neighbouring countries, because of the well observed risk of contagion. The same applies to the risk of epidemics: recurrent internal epidemics, as well as the presence of epidemics in neighbouring countries and in those with which the country trades, are exogenous threats to the health of a country's populations.

4. See the presentation of the index and the justification of its components in Feindounou S., Guillaumont P., Simonet C. (*Ecological Economics*, 2020).

The structural grounds of a low resilience

As was clearly established in the Commonwealth report (2021) and in the UN-OHRLLS report (2021), vulnerability cannot be estimated without taking into account the weakness of resilience to exogenous shocks. This resilience is based on a series of factors which are largely the same whatever the dimension of vulnerability considered, what should lead to have only one measurement of resilience. The components of resilience must then be considered separately from the measurement of each dimension indicator. And they themselves must be separated into components that are structural in nature and components that depend on the current policies of countries.

As for the structural components of resilience, their potential list would be long, but can be reduced to two synthetic variables whose logical basis is clear and could be supported by multiple references: these might be the level of human capital and the level of per capita income (to which the state of infrastructure is highly correlated and can possibly be added). Not surprisingly, human capital and per capita income are, alongside (structural) vulnerability, the other two criteria for identifying the least developed countries[5]. And both are the components of the Human Development Index (HDI). But it can be reasonably agreed not to include per capita income within the MVI, because MVI has been precisely requested and conceived to capture a development feature differing from income per capita. Another reason is that in many uses of the MVI income per capita will probably stay considered alongside. The basic factors of structural resilience then remain the level of education and health, i.e. the human capital, and possibly, if adequately measured as an exogenous factor, the physical infrastructure.

The MVI, with or without structural resilience, in a broader logical framework

Two conceptual implications can be drawn from above conclusions, allowing the MVI to fit in the framework of the other development metrics progressively set up within the UN, and themselves likely to evolve.

Consider first the Human Development Index HDI (which includes both per capita income and human capital). Adding (negatively) the structural Multidimensional Vulnerability Index (MVI) (without its structural resilience components already included in the HDI) may lead to designing an "index of sustainable human development". It would bring in the essential elements of vulnerability/sustainability, with their three dimensions.

Second, in the process of identification of the LDCs by the CDP, the MVI

5. As for the logical measure of non-structural or policy weakness in resilience, this raises the general problem of measuring good governance and good policy in the face of shocks, what we do not address here.

could be a good candidate to replace the present EVI, again if measured without its structural resilience components, already taken into account in the other Identification criterion that is the Human Assets Index (alongside the GNI per capita). Or, if including the structural resilience components, it might replace both the EVI and the HAI, leading to consider the LDCs as countries both poor (income per capita criterion) and facing a high multidimensional structural vulnerability (MVI criterion).

Finally, if the levels of education, health (and possibly physical infrastructure) are included as components of structural resilience in the measurement of (structural) vulnerability, the resulting MVI indicator itself, considered alongside income per capita, becomes an indicator of (less) sustainable development, or to put it another way, an indicator of the risk of unsustainability of development. or, conversely, an index of less likely sustained development (for reasons beyond the control of present policy)[6].

In brief, in choosing the components of MVI, it should be kept in mind that the new index could contribute to enhance the visibility and coherence of the concepts put forward within the UN system by UNDESA through the CDP, by the UNDP through the Human Development Office and now by the High-Level Panel on the MVI.

From a more practical and operational point of view, the MVI is expected to be used for the allocation of concessional funds by institutions which take into account income per capita as a criterion. If they instead use the HDI components (not only income per capita, but also human capital) as allocation criteria, there would be no need to include low structural resilience in the vulnerability measure. When, as most often, they use income per capita, but not human capital, a measurement of the MVI including low structural resilience is needed. In any case, it would be necessary to have the multidimensional structural vulnerability index in two versions, with and without structural resilience.

6. What we had previously called "least likely to develop index" with reference to the economic vulnerability index alone (Guillaumont, 2009) and could be consistently extended to a multidimensional vulnerability indicator (Guillaumont, 2018; 2021).

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About Resilience in the Multidimensional Vulnerability Index (MVI)

Origin of the concept related to vulnerability

Before recently invading the vocabulary of the social sciences, the concept of resilience was a physical notion that referred to shock resistance. The use that is now made of it in the social sciences, particularly in economics, psychology, and ecology, remains in accordance with the initial definition: it is a capacity to resist shock or trauma. In the vocabulary of economics the concept of resilience has spread in the wake of that of vulnerability: vulnerability to a shock.

In the work of the Committee for Development Policy (CDP) in the introduction of economic vulnerability as a criterion for identifying the Least Developed Countries (LDCs), the ability to adapt or react to exogenous shocks was excluded from the measurement of the economic vulnerability index for two reasons: the first was that two other criteria were taken into account in parallel - the level of per capita income and the level of human capital (Human Assets Index, HAI); the second was that the ability to react or adapt to shocks wich did not depend on per capita income and human capital, so was primarily linked to national policy and therefore could not be taken into account in a structural vulnerability index.

Two types of resilience factors

Resilience to shocks (whether external or environmental) depends on two categories of factors: structural factors and factors related to current policy. Structural factors, besides per capita income and human capital (the two main ones), can also include more specific factors, notably the quality of infrastructure, particularly in the field of transport and communications. For present governments, these are indeed structural factors, because this state of the infrastructures is what they have inherited. It is therefore a stock indicator (measured in year t-1) that will have to be used, and not a flow indicator.

In total, the indicator or indicators of structural resilience that will be used in the measurement of structural vulnerability will of course depend on what has been included in the measurement of exposure to shocks (see below), but mainly on the use that is expected for the Multidimensional Vulnerability Index (MVI).

At the origin of the project it was clear that the development of such an index

was sought to escape the sometimes almost exclusive predominance of the reference to per capita income in international debates and that therefore the level of per capita income should not appear as such in the construction of the MVI. So, even if per capita income is an essential factor of resilience and since it will probably remain in the debates on the allocation of concessional resources, like for the identification of LDCs, it should not be included in the resilience component of the MVI. With regard to human capital, which is also essential to resilience, although it is to some extent correlated with the level of per capita income, and because it does not generally appear in aid allocation formulas, it should appear as an indicator of structural resilience. As for the identification of LDCs, it will then be up to the CDP, if it chooses to refer to the MVI, either to ensure that the two indicators EVI and HAI are brought together in the new indicator proposed by the High Level Panel, or to maintain HAI as a specific indicator and adapt its vulnerability indicator, keeping aside the resilience, that strongly depends on human capital[1].

One or more indicators of structural resilience

Structural resilience as it has been defined above is essentially common to the three dimensions of structural vulnerability that are used (economic, environmental, and social) and it would therefore be artificial and laborious to want to differentiate structural vulnerability according to each dimension of vulnerability.

This is not to say that structural resilience cannot itself have several dimensions (possibly economic, environmental, and social), but these dimensions do not correspond specifically to the three dimensions of structural vulnerability and must be defined according to their common relevance for the three dimensions of vulnerability (or the three types of shocks). In this respect, it could be clearer, in order to avoid confusion on this topic, to use two components rather than three in structural resilience, these could be respectively related to the level of human capital and the quality of infrastructure.

It might be added that if unidimensional measures of resilience were designed, they would unavoidably include some common components, which would result in redundancy when the three dimensions are aggregated in a MVI. Instead, one common measure of weak structural resilience would appear as a kind of fourth dimension in the MVI[2].

1. See the previous "brief", Guillaumont P. "Back to the rationale of the MVI and its components to enhance its consistency" FERDI Policy Brief 239, September 2022.
2. It can also be debated whether this structural resilience dimension should be included as a 4th one, as an indicator of weak structural resilience added to the three unidimensional structural vulnerability indicators, to be aggregated accordingly, or as an indicator of structural resilience dividing the structural MVI. The two methods have been proposed in the Commonwealth Universal Vulnerability Index (2021). The first or additional method with the index of weak resilience as a 4th dimension seems preferable to dividing the structural MVI by an index of resilience, that is too sensitive to extreme values of resilience, and may lead to underestimation of the vulnerability of some countries which have a high human capital.

The border issue between structural vulnerability and low structural resilience: Case of remoteness

Finally, some indicators may be included in structural vulnerability or in weak structural resilience. An example of this is remoteness, conveniently measured by the distance from/to the world market (from/to the various potential markets), possibly adjusted according to landlockedness. This measure reflects difficulty of access or structural transport costs[3]. Such an indicator was introduced by the CDP in 2005 as a component of its Economic Vulnerability Indicator (EVI) and since maintained because CDP considered that it indeed measures the structural handicap corresponding to higher trade costs, but is also a specific factor of vulnerability in case of natural disasters and food shortage. However, the difficulty of access can just as easily appear as a factor of weak structural resilience, then as a factor of structural resilience. The same may be said of the weakness of infrastructure, which is another structural factor of transportation costs and itself reflects low capacity for access or supply in the event of a crisis, for any origin of the shocks. It should be noted that it is in "structural resilience" that (a low) remoteness, as well, as infrastructure quality, has been taken into account by the Universal Vulnerability Index (UVI) of the Commonwealth Secretariat[4], which underlines that it concerns the three dimensions of vulnerability and not only economic vulnerability. Finally, another argument may justify placing remoteness in low structural resilience rather than in shock exposure: it may be paradoxical to consider remoteness as an element of exposure to shocks while it is a structural factor of low trade openness.

3. See Guillaumont P. *Out of the trap. Identifying the Least Developed Countries*, Economica, 2009.
4. The Commonwealth, *The Commonwealth Universal Index. For a Global Consensuson the Definitionand Measurement of Vulnerability*, April 2021.

Should inequality be a component of the multidimensional vulnerability index?

The question has been raised as to whether inequality within countries should be considered as an element and therefore an indicator of vulnerability in the framework of the multidimensional vulnerability index (MVI). Yes, of course, we hear, since "reduced inequalities" is the 10th Sustainable Development Goal"! But why and how?

Why?

If inequality may be a factor of vulnerability, it seems because it is supposed to reduce the resilience of societies to the different categories of shocks they experience.[1] It is probably possible to find in the literature some confirmation of this relationship, but still necessary to specify its nature. In the face of shocks, inequality can reduce the resilience of populations, and it may also reduce the ability of political authorities to react. If it is about the resilience of populations, it is indeed because of poverty that populations lack resilience to shocks: so inequality can decrease their resilience mainly because of its impact on poverty. If it is about the ability of political authorities to react, it may be diminished by inequality, but the relationship is complex, far to be linear. Nevertheless, let us admit that inequality can directly or indirectly contribute to increasing the vulnerability of countries by reducing the resilience of populations and/or the responsiveness of political authorities.

How?

In order to take into account the internal inequality of countries in the Multidimensional Vulnerability Index (MVI), it is necessary to respect the principles on which it is agreed to base this index[2], in particular the principle of separability

1. See Guillaumont P. (2022) About Resilience in the Vulnerability Multidimensional Index (MVI). FERDI Policy brief B241, October.
2. See Guillaumont P., Wagner L. (2022) Three criteria that a multidimensional vulnerability index should meet to be used effectively, FERDI Policy brief B234, May.

between what is exogenous and what is due to the present policy. This principle implies distinguishing between structural vulnerability and low structural resilience on the one hand, and overall vulnerability and low resilience on the other. Only the former can be used to determine the granting of certain benefits to countries identified as highly vulnerable, whether for access to a particular preferential trade schemes or as a criterion for the allocation of concessional development finance: structural vulnerability, that which is exogenous and cannot be attributed to the present policy of the countries, must facilitate access to preferential mechanisms and lead to an allocation of more resources. On the opposite, the vulnerability or low resilience that is due to the present policy should not lead to such benefits, which would create a moral hazard; the low resilience related to the present policy could instead be seen as a sign of poor performance and have an opposite impact to what is expected of low structural resilience. The MVI, like any index, must be designed according to a clear logic and the use that one wants to make of it.

With regard to inequality, it obviously cannot be considered as a factor justifying more aid or other benefits, which would favor the most unequal countries. It cannot therefore be included in the MVI as an element of structural vulnerability or low structural resilience, without distorting its meaning. On the other hand, it could be included as an element of weak policy resilience, as well as poor governance, in a more general vulnerability index and then have an impact of opposite sign to that which it would have been if it had been included in the structural MVI.

Moreover (or however) multidimensional inequality is already taken into account through its structural impact on health and education (a low level of which is intended to lead to more advantages). What makes the difference between low human capital and inequality is that inequality is perceived as quite more dependent on present policy. Public opinion and Parliamentary members are inclined to more support countries with a low level of health and education, not those with high inequality.

Implications for the use of the index

It should be noted that in the CPIA (Country Policy and Institutional Assessment), which in a recomposed form represents the "performance" in the PBA (Performance Based Allocation), one of the four clusters composing it is "Policy for Social Inclusion, Equity", which affects negatively (but with little weight) the level of allocation. It is therefore a way of taking into account inequality, which is then considered an indicator of poor performance, not of high vulnerability. It is, of course, conceivable to grasp inequality in a less complex way. But it is to recognize that inequality, measured in some way, has its place in an allocation formula on the performance side, not on the needs side. If the objective is in particular to have the MVI (in its structural form) recognized as an allocation criterion, in particular by Multilateral Development Banks, including inequality on the needs side would inevitably lead to a reject. On the other hand, considering low inequality as part of

a policy-related "performance" or as a low policy resilience indicator would remain consistent with the core principles of both the MVI and the allocation.[3]

It would still be necessary to choose the indicator of inequality most suited to this use, what is not the purpose of this note, and is not an easy task. There is no quantitative "Target" corresponding to the "Reduced inequalities" 10th Sustainable Developement Goal and the CPIA cluster "Policy for Social Inclusion, Equity", is itself the result of subjective assessments. The issue is then the possibility to choose an indicator of inequality that reflects a weak present policy resilience and is comparable across countries, i.e. with a similar meaning for all of them.

3. See Guillaumont P., Guillaumont Jeanneney S., Wagner L. (2020) *Measuring vulnerabilities to improve aid allocation, especially in Africa*, FERDI, 148 p.

The genesis of and need for country vulnerability profiles, besides a Multidimensional Vulnerability Index

The need for country vulnerability profiles is linked to the difficulty of capturing in a single index, no matter how complex, the various kinds of vulnerability which developing countries may face. The Multidimensional Vulnerability Index (MVI) being developed by the United Nations has not removed the need for vulnerability profiles, but rather has brought them back into focus.

The origin of the country vulnerability profiles: what lessons can be learned?

The idea of developing vulnerability profiles came to me in 1999 while chairing a working group of the United Nations Committee for Development Policy (CDP). The purpose of the group was to find a consensus on how to introduce an economic vulnerability index which would replace the then existing economic diversification index as one of the three criteria for identifying least developed countries. This was at the Commonwealth Secretariat in Marlborough House, London, and the discussion was bogged down between a sophisticated, but unworkable, proposal from a consultant, and the one we were trying to push with the CDP. The issue was not just conceptual. For various island LDCs the issue was whether replacing the economic diversification index by a vulnerability index could reduce the risk of graduation from LDC status. Wishing to conclude the meeting, while recognizing that the economic vulnerability index we were proposing was imperfect, it seemed to me useful to refer to what had been done in international comparisons of poverty levels, where synthetic indices had been complemented by «poverty profiles": so we agreed that it would be necessary to supplement the vulnerability index, which was to become the Economic Vulnerability Index (EVI), with «vulnerability profiles» to be established for LDCs eligible for graduation.

When the principle of adopting this vulnerability index was endorsed by the CDP in 2000 and 2002, the CDP requested that for countries eligible for graduation a vulnerability profile be prepared by the UNCTAD Secretariat. UNCTAD did so, and at the request of the countries concerned, collected arguments as to

why their graduation was dangerous and therefore premature. This is why, without abandoning the vulnerability profiles entrusted to UNCTAD, the CDP, in order to refine its judgement before issuing a proposal on the graduation of eligible countries, entrusted its Secretariat with the responsibility of assessing the impact that a graduation could have on the countries concerned (referred to as an «Impact Assessment»)[1].

This brief historical review provides several lessons.

Firstly it highlights the consensus for having a «vulnerability profile» for each country as a complement to a universal index applicable to all countries: this remains the case, regardless of the progress made in the construction of a universal index so that the specific vulnerability of each country can be properly reflected.

Secondly it shows that it is necessary to clearly define the purpose of these profiles and their scope of application. Previously the aim had been to help the CDP in its work of identifying the least developed countries, principally for their graduation, but possibly also for the inclusion of new countries. In the case of the MVI, since its construction was originally launched at the request of small island states, it would be conceivable that these profiles could be established as a priority for these countries. But these profiles are not equally useful for all countries; and given the stated principle of universality of the MVI, highly vulnerable countries, other than SIDS, would be justified in requesting such a profile for themselves. In short, all developing countries are likely to be the subject of a «vulnerability profile», but to be meaningful, their implementation will have to be gradual and therefore initially selective.

Thirdly, depending on which agency is responsible for preparing the vulnerability profiles, its judgment may be influenced by its position within the international system.

This is why there are two possibilities, the first of which is to establish a general method for constructing vulnerability profiles, the application of which would be entrusted to an independent body within the United Nations system (OHRLLS, UNCTAD or CDP). The second is to leave it up to each organization to draw up vulnerability profiles for the countries under its jurisdiction according to the use it wishes to make of them (for example, a regional development bank may wish to use them to adapt the lessons drawn from the MVI for the allocation of the concessional funds it grants, or the CDP may wish to make recommendations about LDC graduation or inclusion).

1. See more details in Guillaumont, P. (2019) *Out of the trap: Supporting the least developed countries*, Economica-Ferdi, 324 p. Chapter 7, written with Alassane Drabo.

A double question of method

Vulnerability profiles should be based on a reasoned discussion of the relevance of the indicators used by the MVI for the country in question, and should also highlight elements of vulnerability or resilience which are not sufficiently captured by the MVI. Even if the vulnerability profile is prepared using a rigorous methodology, it should remain a primarily qualitative exercise. It should not be designed as a means of adjusting the final value of the MVI components, since its value would then lose its comparative meaning because the values for other countries would not be modified accordingly.

Naturally, if an international or bilateral organization for its own analyses or operations wishes to amend, correct, or modify the MVI adopted by the Panel, it can do so, but it should use the MVI only if their corrected index conforms to the principles of multidimensionality, universality, and separability that make comparisons between countries relevant, and allows it to use the index for operational purposes.

Broadening the scope of components or deepening their relevance

Let us mention a few areas in which a vulnerability profile would be useful and whose purpose must be clarified.

One area is that of shocks whose specific nature cannot be captured by existing indicators. For example, while the risk of sea level rise can be assessed fairly well in physical terms, given the size of the floodplain, it is more difficult to measure the risk of glacial lake outbursts due to global warming in countries such as Nepal or Bhutan. While this risk cannot be captured in the MVI along with sea level rise, it is important that it be examined in a vulnerability profile.

Another more general area is the division between what is structural and what is the result of current policy, particularly for the measurement of resilience: the MVI should seek to give a general answer to this question, but it is clear that the dividing line can be discussed in a country-specific way, which then has a place in a vulnerability profile, as long as it is prepared by an independent body.

In fact, there are potentially two parts to a vulnerability profile.

First is to look at the relevance of the MVI indicators to ensure that the level of this composite index properly reflects the relative level of multidimensional vulnerability of the country. Only significant differences with what the MVI indicates should be taken into account in the vulnerability profile: Indeed, minimal differences could be noted in the other countries for which the composite index is calculated, without having a significant impact on their relative position with respect to the MVI.

Secondly some country-specific forms of vulnerability could be examined which are not captured in the calculation of the MVI, because for these kinds of

vulnerability it is often extremely difficult to distinguish between what is structural and what is due to current policy. This is particularly the case for so-called «debt vulnerability», which rightly has been left out of the MVI. Of course, these other forms of vulnerability, by their very nature, cannot be used in the same way for international policy as those that shape the MVI.

Towards a Multidimensional Vulnerability Index
Six supporting notes

Patrick Guillaumont

This document is a collection of six notes that were prepared as input to the high-level panel tasked with developing a multidimensional vulnerability indicator index at the request of the UN General Assembly.

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63, boulevard François-Mitterrand
CS 50320
63009 Clermont-Ferrand Cedex
www.ferdi.fr
+33 (0)4 73 17 75 30