# GLOBAL
# MILITARISATION INDEX

Codebook
Version 2.0 (2022)

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# Introduction to the Global Militarisation Index and why it differs from other indices

In most countries in the world, the military is the central state-run institution of organised violence.[1] Its main task is to defend the country and its population against aggression and enemies, thus ensuring security. Accordingly, a strong military can be an indicator of a strained security situation in a country or a region. In such a situation, however, high militarisation tends to exacerbate the existing security dilemma and can drive regional arms dynamics. Yet in some cases, the main task of the military is to secure the power of the ruling elite and to subdue opposition. In these cases, a strong military is clearly problematic. A weak or dysfunctional military, by contrast, is often not in a position to prevent violence or the escalation of conflict as it cannot enforce or maintain its monopoly on the use of force. This, in turn, can have negative implications on the population and the economic and social development of the country. To carry out its mission effectively, a military needs to be provided with adequate resources in terms of personnel, finances and weapons.[2] Such investment in the armed forces may pay off as a development dividend, but they also invariably represent a greater or lesser burden, as these resources are lacking in other sectors, such as the health service. A military that absorbs a large part of a society's resources could hamper necessary structural economic and social change and cause development deficits in industry and agriculture.

The Global Militarisation Index (GMI), developed by BICC in 2003, aims to provide data for a more nuanced debate about the role of militarisation that goes beyond the usual normative debates. Following a resource-based approach, the GMI understands militarisation as the relative weight and importance of the state's military apparatus in relation to its society as a whole. For this, the GMI compares spending on the military and military equipment with spending on other areas of society and thus allows statements about the social weighting of the military. It also complements expenditure on the military and armament of a society with information on the allocation of human and material resources to the military. These are also compared to resource expenditures in other areas of society, such as the health sector. Via its sub-indices, it thus allows a more detailed and more nuanced view of the concept of militarisation.

In doing so, it differs from other existing indices, such as the Military Expenditure Database published by the Stockholm International Peace Research Institute SIPRI. This database covers military expenditures from 1949 to 2020 and is updated annually. The GMI also uses this data for its calculations.

As described above, the GMI's concept is neither limited to military expenditures nor does it measure military power (such as the Global Firepower Index) or geopolitical influence or rather the capacity to intervene (such as the Elcano Global Presence Index).

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1 \ We understand organised violence as all measures that a societal collective uses to counter the problem of internal/ intra-societal violence. Yet, as social orders always need a modicum of violence to uphold the status quo, organised violence always encompasses both, measures to contain it and measures to use it. This is why every social order creates norms that sanction internal/ intra-societal violence ('murder is taboo') and others that legitimise certain forms of violence under certain conditions. At the institutional level, organised violence means the establishment of institutions of violence (such as police, army) that may use violence under certain circumstances to prevent or limit illegitimate private violence (see Schetter & Müller-Koné, 2021

2 \ We assume that other aspects, such as an effective control by a legitimate government and military-societal relations which prevent the use of (miilitary) violence against one's own people, also play an important role in the functionality of the military.

In contrast to the World Military Expenditures and Arms Transfers (WMEAT) dataset of the US State Department, the GMI collects data yearly and does not cover longer periods at irregular intervals. This results in consistent timelines that allow us to look at and analyse the current development of militarisation globally or in certain regions. This is an important advantage, especially for mapping arms and escalation dynamics.

However, it should be emphasised that the GMI, especially in tandem with other indices, offers the chance to explore domestic or regional effects of militarisation, such as on security, prosperity or human development. The GMI thus addresses researchers, advisors or policymakers who are interested in regional and domestic effects of militarisation and who are working on arms exports and global or regional dynamics of armament and conflict.

## Unit of analysis and inclusion/exclusion criteria

The GMI is a global index, which means that it has the ambition to record the annual status of militarisation of every country in the world. Criteria, such as size or number of citizens, are irrelevant for this. This is why the current GMI ranking contains the Fiji Islands or Iceland; both countries with less than one million inhabitants. The only factor that restricts inclusion in the Index is the insufficient availability of (up-to-date) data—and this solely serves to secure the quality of the Index (see Note on missing data on page 7).

## Coverage

The GMI covers the period from 1990 to 2019 and currently comprises 151 countries. It is updated annually. Depending on the availability of data, coverage of the number of countries included in the Index may vary slightly from year to year.

## Publication

As the GMI is based on data made available externally, it is published retrospectively at the end of each year. The GMI 2020, for instance, was published in December 2020 and is based on data from 2019.

# How to measure militarisation?

## The concept of militarisation

Militarisation is both tied to the concepts of the military on the one hand and militarism on the other. In a narrower interpretation, militarisation is understood as an increase in military capacity (Lind, 2004). Eide and Thee (1980, p. 9), for instance, proposed to understand militarisation as an "increase in armaments, advance in the destructive capacity of weapons, growing numbers of people under arms, and dramatic increases in military expenditure". A broader interpretation looks at militarisation as a steady development towards the state of militarism (see Levy, 2015; Shaw, 1991). This is in line with Stearn's definition of demilitarisation as a process of "reducing the role of the military in the political and social life—with or without slimming the size of the military sector" (2013, pp. 23). By a combination of both interpretations, militarisation can be considered as a multidimensional phenomenon, which consists of a material, a political and a social dimension (Bowman, 2002). Such an interpretation also includes a discursive dimension that changes convictions and values of a society to such a degree that they legitimise the use of violence, the organisation and the financing of large, standing armies as well as the associated higher tax burden (Lutz, 2002, p. 723).

The GMI's approach is resource-based and measures the level of militarisation by the allocation of resources by the state to the military in relation with other areas of society. The annual measurement of the level of militarisation and the resulting time series can be used to map processes of militarisation or demilitarisation (see Wolpin, 1983, 130) of societies and regions. This means, inter alia, that the GMI is not (or only an indirect) an indicator of military power. In other words: The most heavily militarised country is not automatically the most powerful in military terms. Besides material (heavy weapons) resources, the GMI also takes account of human resources and thus records the aspect of social militarisation. Material militarisation measures the power resources in the hands of the military (Kühn & Levy, 2020)

manifested in heavy weapons. Social militarisation is understood as the size of the military compared to the total population (Bullock & Firebaugh, 1990). In our approach, we relate the resources allocated to the military to those allocated to the whole of society (see below). For instance, we consider resources allocated to the health sector as an indicator of human development.

In the past, we have witnessed frequent expansions of the concept of militarisation. At times, this concept is used to examine how military equipment is enhanced or how institutions, such as the police, adopt military tactics and attitudes (see Flores-Macias & Zarkin, 2019; Bieler, 2016). It can also serve to analyse private militarisation (Hutchful & Aning, 2001) as manifested by private military providers (Kinsey, 2006). In contrast to that, when looking at militarisation, we focus on the state and the military as its core institution of organised violence. In doing so, we include paramilitary units in our definition of the military, as the regular military alone does not adequately reflect the total size of the armed forces in many countries (see Personnel Index).

## Operationalisation

The GMI provides information on the level of militarisation. By analysing the level of militarisation, we can observe tendencies of an increase in or a scaling down of the military. Our Index ranks the countries according to their level of militarisation on a scale from 0 to 500 (whereby 500 represents the highest level of militarisation). The GMI consists of three sub-indices that assess different aspects of militarisation, namely **expenditures**, **personnel** and heavy **weapons**. These three sub-indices are made up of six indicators in total.

### Expenditure Index (EI)

For a long time, military expenditures have been considered the standard measure of militarisation (Gifford, 2006, p. 473). Financial resources made available by a government are a major factor that determines the ordnance, capabilities and size of a country's armed forces. According to our relational approach, the EI relates the budget of the armed forces to two important indicators: For one, the economic performance of a country and its society (measured as the gross domestic product, GDP), for another its government's spending on health. Data on military spending are sourced from the Military Expenditure Database of the Stockholm Peace Research Institute SIPRI. It is important to note that SIPRI uses a broad definition of military spending that goes beyond the defence budget of a country. It also includes other expenditures, such as pensions for military personnel or spending on military research and development.

SIPRI, and thus the GMI also use absolute figures with regard to expenditure. This means that they are not adjusted for purchasing power. Critics often argue that data that is not adjusted for purchasing power is difficult to compare, since in different countries, due to their different wage and production costs, more personnel can be maintained or more defence equipment procured for the same absolute sum. However, the purchasing power for the military market is very difficult to determine. Moreover, such a calculation only makes sense with regard to military procurement if the military products are purchased on the domestic and not the global market and their components are also predominantly produced domestically. This is only the case for a few countries.

Even though SIPRI can be considered to be the most reliable source to date, data on military spending must be treated with the utmost caution. For many countries, in particular developing countries and autocratic states, the figures are only rough estimates. In those cases where SIPRI does not provide up-to-date data, we use the latest available figures, provided they are not older than three years. Data on health expenditures is obtained from the Global Health Observatory Data Repository of the World Health Organization (WHO).

Both EI-indicators are calculated as follows:

*With milex_gdp being the "military expenditure as percentage of the GDP", and health_gdp being the "health expenditure as percentage of the GDP":*

$$milex\_health\_norm := norm(log((milex\_gdp \, / \, health\_gdp) + 1))$$

*and*

$$norm(x) := (x - min(x)) \, / \, (max(x) - min(x))$$

### Personnel Index (PI)

Besides the Expenditure Index, we also use the Personnel Index (PI) to measure militarisation. The PI measures the level of "social militarisation" by the size of the military. and consists of three indicators:

The first and most important indicator in this category is active (para-)military personnel set in relation to the total population. As mentioned above (see The concept of militarisation), we include paramilitary personnel to adequately reflect the total size of the armed forces. The main criterion for coding an organisational unit as military or paramilitary is that the armed forces concerned are not only armed, wear uniforms and live in barracks but that they are also under the direct control of the government. Based on data of the International Institute for Strategic Studies (IISS), we count personnel in the army, the navy and the air force as well as additional (if applicable, such as from the coastguard, national guard or training commands) and paramilitary personnel.

For a comprehensive presentation of the available personnel and an appropriate presentation of the relative level of militarisation in society, a second indicator takes the percentage of reserve forces measured against the total population into account. This factor is particularly relevant for some countries, such as Switzerland, which have a comparatively small standing army but a larger amount of available reserves within society. We again rely on IISS data on military and paramilitary reserve forces.

The third indicator compares the total number of military and paramilitary forces with the number of physicians in a country to express the ratio of military to non-military expertise in a society.

All data on military personnel is taken from the *Military Balance* of the International Institute for Strategic Studies (IISS). Population figures are taken from World Bank sources. The number of physicians of a country is taken from World Health Organization (WHO) data.

The three indicators of the PI are calculated according to the following formulas:

$1.\ milpara\_pop\_norm := norm(log(milpara\_pop + 1))$

$2.\ reserve\_pop\_norm := norm(log(reserve\_pop + 1))$

$3.\ milpara\_phy\_norm := norm(log(milpara\_phy + 1))$

with

$1.\ milpara\_pop := milpara\ /\ population$

$2.\ milpara\_phy := milpara\ /\ physicians$

$3.\ reserve\_pop := reserve\ /\ population$

and:

$milpara := military + paramilitary$

**Heavy Weapons Index (HWI)**

To determine the degree of "material militarisation" of a country, the GMI takes into account certain types of heavy weapons. The Heavy Weapons Index (HWI) indicates the number of heavy weapons in the arsenals of the armed forces in relation to the overall population.

As a rule, we base our categorisation of heavy weapons on the classification of the United Nations Register of Conventional Arms and only summarise some of the categories mentioned here. With regard to artillery, however, in deviation from the UNROCA classification, we only count from a calibre of 100mm, not from 75mm.

We define heavy weapons as any military equipment that fits into one of four categories: Armoured vehicles (armoured personnel carriers[3], light tanks, main battle tanks), artillery (multiple rocket launchers, self-propelled artillery systems, pulled artillery systems) of 100mm calibre and above, combat-capable or armed aircraft (combat helicopters, fixed-wing aircraft) and large vessels of war (submarines, principal surface combatants larger than corvettes).

We also count stockpiled weapons as they are part of the military potential of a country. Data on weapons holdings are compiled from the ISS Military Balance. Data on small arms and light weapons

(SALW) is not only extremely difficult to come by but is also unreliable. This is why they are not included in the GMI.

In 2022, the GMI was expanded to include three additional weapon categories, data on which were retroactively collected up to the year 1990. These include unmanned combat drones (CISR drones) of classes II and III. Here we follow the categories of the NATO Standardisation Agreement 4670 and thus take the classes "Medium" and "Heavy" (i.e. MALE, HALE, Strike and Combat UAVs) from the Military Balance. These can be considered equivalent to the NATO categories.

Reconnaissance drones (so-called ISR, COMINT, ELINT or SIGIT drones) are only included if they are explicitly armed; conversely, explicitly unarmed CISR drones are not included. Category I (or light) drones are generally not included.

Furthermore, military satellites and kamikaze drones (so-called loitering munitions) are included as a category. All objects that are specified in the military balance are recorded here. Furthermore, with regard to loitering munitions, the Arms Transfer Database of SIPRI and relevant media reports, such as Jane's Defence, are also consulted. Although satellites are not weapons systems per se, they have become indispensable subsystems in many areas such as reconnaissance, communication, navigation and thus, for example, the control of missiles and precision-guided munition.

The HWI is calculated with the following formula:

$weapons\_pop\_norm := norm(log(weapons\_pop + 1))$

$weapons\_pop := weapons * 100.000\ /\ population$ *(Number of heavy weapons per 100.000 inhabitants)*

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3 \ Including multipurpose armoured vehicles, infantry fighting vehicles, airborne vehicles and armoured patrol vehicles.

## Note on missing data

To ensure the overall quality of the Index, we only use original data from the sources indicated in the section on Operationalisation. For various reasons, it is not always possible to use up-to-date data: For one, data are not always available or reliable (especially for fragile states). For example, the practice of using shadow armies that exist only on paper to divert their pay is common. For another, military expenditures and troop numbers are sensitive topics that governments sometimes keep secret. To fill such data gaps, the GMI also uses some data from previous years. For this, we interpolate the missing data via the "last observation carried forward" (LOCF) method. Otherwise, the coverage of the Index would be extremely limited. One exception are health expenditures between 1990 and 1994, as the World Health Organization (WHO) only started to collect such data as of 1995. These data are extrapolated via linear regression (based on the years between 1995 and 1999). To ensure that it reflects actual developments in militarisation, we limit the use of data that are not up to date. For this, we use two thresholds: As military expenditure and personnel data, as well as the number of heavy weapons, lie at the heart of the Index, this data must not be older than three years. Other data (such as on expenditures on health and number of physicians) must not be older than five years.

This means that military expenditure and data on personnel as well as data on heavy weapons contained in the GMI 2022 may refer to 2019, and the data on health expenditures and the number of physicians may date back as far as 2017. If no data is available, we will code this as missing data. Such missing data results in a '0' score for the respective indicator in the GMI ranking.

Beyond this, we apply a general quality policy to the data for each country. As explained in more detail in the next section on the Methodology, the GMI score is the result of three sub-indices and six indicators. Each indicator (like military spending as percentage of GDP) is weighted differently and then included in the overall GMI score. The already mentioned indicator "Military spending as percentage of GDP", for instance, is one of the most important and is, therefore, weighted with a factor of five. As Table 1 in the section on the methodology shows, the sum of all weighting factors for all six indicators is 20. If missing data results in a '0' score of indicators with a total weighting factor of 10 or more, the corresponding country is excluded from the GMI ranking. However, if data coverage is sufficient, we will list these countries in the ranking of the sub-indices.

The Democratic People's Republic of Korea is an example of an excluded country. It is most likely the most heavily militarised country in the world. But it is an autocratic state that keeps its data, especially that on military spending, personnel and heavy weapons, strictly confidential. There is also no reliable data on Yemen, Syria, Qatar or Myanmar, which is why we do not include these countries in the GMI.

**Table 1**
*Indicators and weighting factors*

| Kategory | Indicator | GMI weighting factor |
|---|---|---|
| *Expenditures* | *Military expenditures as percentages of GDP* | **5** |
| | *Military expenditures in relation to health spending* | **3** |
| *Personnel* | *Military and paramilitary personnel in relation to population* | **4** |
| | *Military reservists in relation to population* | **2** |
| | *Military and paramilitary personnel in relation to physicians* | **2** |
| *Weapons* | *Heavy weapons in relation to population* | **4** |

# Methodology

The overall GMI represents a weighted sum of its six indicators. These are divided into three sub-indices: The Expenditure-, Personnel-, and Heavy Weapons Index. We consider expenditures and personnel as the two most important determinants of militarisation. Therefore, the indices on expenditure and personnel are weighted by a factor of two against the third index, which represents the heavy weapons in the arsenals of a country. This weighting is indirectly derived from the scores of the indicators belonging to the respective sub-index. As Table 1 shows, the Expenditure Index is made up of two indicators ("military expenditures as percentage of GDP" and "military expenditures in relation to health spending"), which are given factors of five and three. This results in a total weighting factor of eight. Similarly, the total weighting factor of the Personnel Index is eight, and that of the Heavy Weapons Index is four.

To increase compatibility between different indicators and to prevent extreme values from creating distortions when normalising data, in a first step, each indicator is represented in a logarithm with a factor of 10. In a second step, all data are normalised using the formula x = (y-min) / (max-min), where min and max represent the lowest and the highest value of the logarithm respectively. In a third step,

each indicator is weighted in accordance with a subjective factor, reflecting the relative importance attributed to it by BICC researchers. To calculate the final score, the weighted indicators are added up and then normalised one last time on a scale ranging from 0 to 500.

In the GMI ranking, the countries are ranked according to their overall GMI score. The Expenditure, Personnel and Heavy Weapons Indices can also be ranked independently. The ΔGMI, which is the difference between the current and the previous year's GMI value, is used to measure the militarisation trend compared to the previous year.

**Table 2**
*GMI ranking 2022*

| Country | EI score | PI score | HWI score | GMI score | ΔGMI | Rank |
|---|---|---|---|---|---|---|
| Israel | 2.4 | 1.7 | 3.1 | 363.2 | -3.8 | 1 |
| Armenia | 2.2 | 1.7 | 2.3 | 310.1 | 3.6 | 2 |
| Oman | 3.4 | 0.9 | 1.8 | 305.6 | -11.5 | 3 |
| Bahrain | 2.1 | 1.3 | 2.6 | 300.8 | 3.5 | 4 |
| Singapore | 2.0 | 1.3 | 2.7 | 297.2 | -23.2 | 5 |
| Saudi-Arabia | 3.1 | 0.7 | 2.1 | 293.6 | -18.1 | 6 |
| Brunei | 2.3 | 1.5 | 1.9 | 286.7 | 17.1 | 7 |
| Russia | 2.1 | 0.9 | 2.7 | 285.1 | -3.1 | 8 |
| Kuwait | 2.6 | 0.6 | 2.4 | 284.2 | -15.7 | 9 |
| Jordan | 2.2 | 1.1 | 2.3 | 279.3 | -20.4 | 10 |

*EI=Expenditure Index; PI=Personnel Index; HWI=Heavy Weapons Index*

# Model calculation

To make this Codebook a little easier to understand, we will recapitulate in detail Germany's GMI ranking for 2019, including its sub-indices. With an overall score of 114, Germany was ranked 106th in the GMI 2020, that is for the year 2019. On the valuation of the respective sub-indices, Germany's ranking was as follows:

1\ Expenditure Index: 0.96
2\ Personnel Index : 0.22
3\ Heavy Weapons Index: 1.12

To calculate the GMI for Germany for 2019, we calculate the sub-indices separately and then aggregate the interim results.

## Expenditure Index (EI)

The information from the respective data sources results in the following values:

**milex_gdp** = 1.2795 (**Military spending as percentage of GDP - SIPRI**)

**health_gdp** = 11.2 (**Health expenditures as percentage of GDP - WHO**)

We will first calculate their ratio:

**milex_health** = milex_gdp / health_gdp = 0.114241071

In a second step, we will calculate the shifted logarithm (to the base 10):

$\log(\text{milex\_gdp} + 1) = 0.3578$
$\log(\text{milex\_health} + 1) = 0.0470$

Now, we will do the same for all countries and years and determine the max and min values:

|  | min | max |
|---|---|---|
| $\log(\text{milex\_gdp} + 1)$ | 0 | 117.349 |
| $\log(\text{milex\_health} + 1)$ | 0 | 1.5263 |

In a last step, we apply the normalisation function (norm(x) = (x-min) / (max-min)):

**EI1** = milex_gdp_norm = 0.1726053
**EI2** = milex_health_norm = 0.03077972

## Personnel Index (PI)

We use the following data sources for the Personnel Index:

mil = 181,400 (number of military personnel - IISS)
para = 0 (number of paramilitary personnel - IISS)
Reserve = 29,200 (number of reservists - IISS)
pop = 83,132,799 (total population – World Bank)
phy = 351,195 (number of physicians – WHO)

**milpara_pop** = (mil + para) / pop = 0.002182051
**milpara_phy** = (mil + para) / phy = 0.5165222
**reserve_pop** = reserve / pop = 0.0003512452

Now, we will calculate the shifted logarithm (to the base 10):

$\log(\text{milpara\_pop} + 1) = 0.0009466203$
$\log(\text{milpara\_phy} + 1) = 0.1808488$
$\log(\text{reserve\_pop} + 1) = 0.001525171$

Then, we will do the same for all countries and years and calculate the max and min values:

|  | min | max |
|---|---|---|
| $\log(\text{milpara\_pop} + 1)$ | 0 | 0.03632710 |
| $\log(\text{milpara\_phy} + 1)$ | 0 | 3.310017 |
| $\log(\text{reserve\_pop} + 1)$ | 0 | 0.11805287 |

As a last step, we apply the normalisation function (norm(x) = (x-min) / (max-min)):

**PI1** = milpara_pop_norm = 0.02605824
**PI2** = milpara_phy_norm = 0.05463681
**PI3** = reserve_pop_norm = 0,.01291939

## Heavy Weapons Index (HWI)

For the Heavy Weapons Index, we use the following data sources:

weapons = 3,485 (number of heavy weapons - IISS)

pop = 83,132,799 (total populatition – World Bank)

**weapons_pop** = 100,000 * weapons / pop = 4.192088

First, we will calculate the shifted logarithm (to the base 10):

log(weapons_pop + 1) = 0.7153420

Now, we repeat this step for all countries and years and calculate the max and min values:

|  | min | max |
|---|---|---|
| log(weapons_pop + 1 | 0 | 2.560594 |

As a final step, we apply the normalisation function (norm(x) = (x-min) / (max-min)):

**HWI1** = weapons_pop_norm = 0.2793656

## Aggregation

To complete the calculation, we multiply the interim results by the respective weighting factors, sum up the results and divide the result by the total weighting factor 20:

ALL = (5***EI1** + 3***EI2** + 4***PI1** + 2***PI2** + 2***PI3** + 4***HWI1**) / 20 = 0.1144459

Finally, we multiply the result by the factor 1,000:

**GMI** = ALL * 1000 = **114.4459**

## Data set

BICC makes the GMI publicly available in a reduced version (the GMI score including the sub-indices) for download. The Codebook in its current version can also be found at
https://gmi.bicc.de/#rank@2019

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