THE OSH INDICATOR:
Assessing national legislative and regulatory frameworks supporting occupational safety and health
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Background

The UL Safety Index™ is the quantification of the relative state of safety in 187 countries across the world. Based on societal drivers and outcomes related to unintentional injury, the UL Safety Index measures the contributions of national resources and institutions, safety systems and frameworks, and safety outcomes. In most industrialized and rapidly developing nations, it is typical for the employed to spend nearly one-third of their working lives in the workplace. This represents a substantial potential for unintentional injuries. According to the World Safety and Health Institute, there were an estimated 2.78 million fatal occupational injuries and 374 million nonfatal occupational injuries in 2015. Thus, the inclusion of a societal driver related to the prevention of work-related injury and illness in the UL Safety Index is paramount. In response, a newly created indicator has been included in the latest version of the UL Safety Index: the occupational safety and health indicator (OSH indicator). The OSH indicator addresses the extent to which a nation has implemented the legislative and regulatory mechanisms necessary to ensure the proper protection of its workforce from the hazards arising out of work. The OSH indicator arrives at a numeric value through a process of interpreting and quantifying the descriptive information on a nation’s regulatory framework supporting workplace safety and health captured by the International Labor Organization’s Global Database on Occupational Safety and Health Legislation (LEGOSH).

International labor organization’s global database on occupational safety and health legislation

LEGOSH is a database containing descriptive information on the national regulatory framework supporting occupational safety and health (OSH) in 131 nations of the world. Elements of the framework cover OSH management and administration, employers’ duties and obligations, workers’ rights and duties, and OSH inspection and enforcement. The LEGOSH classification structure is based on 11 themes derived from several key ILO standards including: Convention No. 155 on Occupational Safety and Health (1981), Occupational Safety and Health Recommendation No. 164 (1981), Convention No. 187 on the Promotional Framework for Occupational Safety and Health (2006), the Labor Inspection Convention C081, and other technical conventions as benchmarks. These 11 themes are further broken down into one to 27 detailed elements and subelements in each LEGOSH entry. Each LEGOSH entry includes an assessment of the presence or absence of the element or subelement (Yes, No or No Data Available), and/or a summary explanation of the presence of that element or subelement.

<table>
<thead>
<tr>
<th>LEGOSH themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Description of national OSH regulatory framework</td>
</tr>
<tr>
<td>2. Scope, coverage and exclusions</td>
</tr>
<tr>
<td>3. Institutions and programs relating to OSH administration and/or enforcement of OSH legislation</td>
</tr>
<tr>
<td>4. Employers’ duties and responsibilities to protect the safety and health of workers and others</td>
</tr>
<tr>
<td>5. Employers’ duty to organize prevention formally along generally accepted OSH management principles and practices</td>
</tr>
<tr>
<td>6. Employers’ duty to ensure availability of expertise and competence in health and safety</td>
</tr>
<tr>
<td>7. Workers’ rights and duties</td>
</tr>
<tr>
<td>8. Consultation, collaboration and cooperation with workers and their representatives</td>
</tr>
<tr>
<td>9. Specific hazards or risks</td>
</tr>
<tr>
<td>10. Recording, notification and investigation of accidents/incidents and diseases</td>
</tr>
<tr>
<td>11. OSH inspection and enforcement of OSH legislation</td>
</tr>
</tbody>
</table>

Table 1: Thematic structure of LEGOSH entries
Scoring a nation's legislative and regulatory framework supporting OSH

A method was established to translate the descriptive information in LEGOSH into a quantitative value. Elements and subelements from LEGOSH were selected by a subject matter expert in occupational safety and health for inclusion as items on a scorecard based on their potential impact and distinctiveness; only individual OSH protective elements indicative of substantial protections to workers’ physical and/or psychological health and safety, and not duplicative of other elements were included in the scorecard (see Appendix A). This led to a total of 77 OSH protective elements being included on the scorecard as items, with all of the 11 LEGOSH themes captured by at least one item. Each item on the scorecard is equally weighted and entered in the affirmative or negative, i.e., Yes = one or No = zero, depending on the presence or absence of the item within that nation’s LEGOSH entry. The sum of the affirmative responses is then used as that nation’s raw score.

Once the score sheet for quantifying the descriptive data found in LEGOSH was established, it became necessary to establish decision criteria for determining whether an affirmative or negative entry was warranted for the score sheet items. There is a certain degree of variability in the information captured in each LEGOSH entry. This variability across LEGOSH entries is due to both differences in the manifestation of the 11 themes across the various nations’ legislative and regulatory frameworks (intersource variability), as well as variability in the manner in which data is entered in LEGOSH for each nation by the ILO analysts (inter-rater variability).2

When the LEGOSH entry provides a definitive assessment on the presence or absence of a scorecard item, i.e., Yes or No, that assessment is determined to be conclusive, unless directly contradicted by summary information provided anywhere in that nation’s entry. Assessments of No Data Available are recorded as an absence of that item, unless summary information provided anywhere in that nation’s entry is sufficient to render a definitive assessment. When no definitive assessment as to the presence or absence of that element is provided by the LEGOSH data, a judgment is rendered based upon the summary information provided for that element or subelement entry. If no summary information is presented for that element or subelement, a summary explanation from anywhere in that nation’s LEGOSH entry is used for that determination. When an element or subelement is present with a threshold number of employees as a trigger, e.g., appointment of a person responsible for health and safety when 50 or more workers are employed, an affirmative entry is made. When an element, or subelement is addressed by the removal of a worker(s) from employment without compensation, e.g., every woman has the right to suspend her employment contract during 14 consecutive weeks including six weeks before the birth and eight weeks after the birth, a negative determination is entered in the scorecard; removal of an employee from the employment is not considered a method of addressing work-related hazards.

Each nation’s LEGOSH data was scored independently by two individual assessors trained together by the subject matter expert using the methodology discussed. Any differences in the scoring of individual elements between the two assessors was then examined. If the number of individual elements scored differently by the two assessors was six or fewer, the mean score of the two assessors was entered as the country score. Where a difference exceeds six, a reconciliation process occurs where the two evaluators go through all the disparate elements together and reach agreement on each of those items. The resultant consensus score is then entered as the nation’s raw score.
Validity of the OSH indicator

Disability-adjusted life year (DALY) data from the Institute for Health Metrics and Evaluation (IHME) and the Global Burden of Disease Study (GBD) has been incorporated into the UL Safety Index as the standard measure of safety outcomes. This choice of measure for larger Index combined with the paucity of data available on work-related injuries and illnesses globally, rendered DALYs and DALYs due to unintentional injury the choice for outcome measures to demonstrate the validity of the OSH indicator. DALYs are calculated as the sum of the years of life lost (YLL) due to premature mortality in the population and the years lost due to disability (YLD) for people living with the health condition or its consequences. The DALY is a standardized indicator of injury disability and death, and accounts for lost years of life due to premature death or disability.3

A Spearman’s rank correlation was conducted on DALYs due to unintentional injuries against OSH indicator values. Results demonstrated a significant inverse correlation, $r (129) = -0.21, p = .015$. A subsequent ordinary least squares regression was then performed on the national OSH indicator scores against the variation in DALYs due to unintentional injuries. OSH indicator score significantly predicted unintentional injury DALYs per 100,000 population, $\beta = -6.64$, $R^2 = 0.04$, $F (1, 129) = 21.27$, $p < 0.5$.

Limitations

OSH protections indicator scores are based on assessments of the data from the ILO LEGOSH database on national legislative and regulatory mechanisms for the protection of the workforce from the hazards of work. LEGOSH provides data on 131 of the 187 nations included in the UL Safety Index, and as consequence 56 nations in the index will have no OSH indicator score. The LEGOSH database includes information on the legislation and regulation promulgated by central governments (de jure protections). LEGOSH does not contain any information on the application of these requirements (the de facto protections), and therefore enforcement or application of the laws is not included in the determination of the OSH indicator score.

LEGOSH entries are updated infrequently. As such, any change in law or regulation that occurs will not be captured until the next update. The current OSH indicator is based upon the LEGOSH data available as of July 2018. As LEGOSH evaluates national frameworks for OSH protections, countries that operate through subnational frameworks at the provincial or state level, i.e., Canada, Australia, etc., may receive scores that do not accurately reflect the level of protections in place throughout that nation. Finally, sources of information on important nongovernmental activities that support OSH at the national level, such as the activities of professional associations, labor organizations, nongovernmental organizations (NGOs) and trade associations are absent from LEGOSH and likewise not factored into the calculation of the OSH indicator score.
Statistics across nations

An OSH indicator score was determined for 131 nations of the world (see Appendix B). The scores ranged from a low of zero to a high of 100 with a mean OSH indicator value of 52.66 and a standard deviation of 23.6. The median score was 51.67 with a mode of 38.33 (Figure 1).

![Distribution of OSH indicator scores](image)

**Figure 1: Distribution of OSH indicator scores**

Thirty nations made up the top quartile with OSH indicator scores above 71.67 (Table 2). The top quartile includes nations from developing and developed U.N. Development status levels.

<table>
<thead>
<tr>
<th>Country</th>
<th>OSH indicator score</th>
<th>Country</th>
<th>OSH indicator score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>73.33</td>
<td>France</td>
<td>86.67</td>
</tr>
<tr>
<td>Thailand</td>
<td>73.33</td>
<td>Greece</td>
<td>86.67</td>
</tr>
<tr>
<td>Croatia</td>
<td>75.00</td>
<td>South Korea</td>
<td>86.67</td>
</tr>
<tr>
<td>Ecuador</td>
<td>75.00</td>
<td>Ireland</td>
<td>83.33</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>76.67</td>
<td>Sweden</td>
<td>83.33</td>
</tr>
<tr>
<td>Vietnam</td>
<td>76.67</td>
<td>Poland</td>
<td>90.00</td>
</tr>
<tr>
<td>El Salvador</td>
<td>78.33</td>
<td>Portugal</td>
<td>90.00</td>
</tr>
<tr>
<td>India</td>
<td>78.33</td>
<td>Romania</td>
<td>90.00</td>
</tr>
<tr>
<td>Mauritius</td>
<td>80.00</td>
<td>Australia</td>
<td>91.67</td>
</tr>
<tr>
<td>Macedonia</td>
<td>80.00</td>
<td>Latvia</td>
<td>93.33</td>
</tr>
<tr>
<td>Venezuela</td>
<td>80.00</td>
<td>Netherlands</td>
<td>93.33</td>
</tr>
<tr>
<td>Albania</td>
<td>81.67</td>
<td>Italy</td>
<td>95.00</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>81.67</td>
<td>Norway</td>
<td>95.00</td>
</tr>
<tr>
<td>Cyprus</td>
<td>85.00</td>
<td>Spain</td>
<td>96.67</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>85.00</td>
<td>Bulgaria</td>
<td>100.00</td>
</tr>
</tbody>
</table>

**Table 2: Nations with top quartile OSH indicator score**
Looking at the distribution of U.N. Development status of the nations across the top and bottom quartile of scores (Tables 5 and 6), we see a stark contrast. The top quartile scoring nations are predominantly ranked among the highest level of development on the U.N. development scale, developed, with another third ranked as developing and just one, Burkina Faso, as least developed. Juxtaposed to this is the bottom quartile of OSH indicator which is populated almost exclusively by nations at lower levels of development including the U.N. categories of developing and least developed, with only a single nation, the Republic of Moldova, classified as developed.

Thirty-one nations made up the bottom quartile with OSH indicator scores below 35.

<table>
<thead>
<tr>
<th>Country</th>
<th>OSH indicator score</th>
<th>Country</th>
<th>OSH indicator score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belize</td>
<td>0.00</td>
<td>Central African Republic</td>
<td>25.00</td>
</tr>
<tr>
<td>Georgia</td>
<td>6.67</td>
<td>Eritrea</td>
<td>25.00</td>
</tr>
<tr>
<td>Saint Vincent and the Grenadines</td>
<td>8.33</td>
<td>Mali</td>
<td>25.00</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>10.00</td>
<td>Saudi Arabia</td>
<td>25.00</td>
</tr>
<tr>
<td>Haiti</td>
<td>11.67</td>
<td>Senegal</td>
<td>25.00</td>
</tr>
<tr>
<td>Grenada</td>
<td>13.33</td>
<td>Congo</td>
<td>26.67</td>
</tr>
<tr>
<td>Somalia</td>
<td>13.33</td>
<td>Guinea</td>
<td>26.67</td>
</tr>
<tr>
<td>Jamaica</td>
<td>15.00</td>
<td>Equatorial Guinea</td>
<td>30.00</td>
</tr>
<tr>
<td>Niger</td>
<td>15.00</td>
<td>Bahamas</td>
<td>31.67</td>
</tr>
<tr>
<td>Antigua and Barbuda</td>
<td>16.67</td>
<td>Ghana</td>
<td>31.67</td>
</tr>
<tr>
<td>Dominica</td>
<td>16.67</td>
<td>Republic of Moldova</td>
<td>31.67</td>
</tr>
<tr>
<td>Burundi</td>
<td>21.67</td>
<td>United Arab Emirates</td>
<td>31.67</td>
</tr>
<tr>
<td>Yemen</td>
<td>21.67</td>
<td>Uzbekistan</td>
<td>31.67</td>
</tr>
<tr>
<td>Mauritania</td>
<td>23.33</td>
<td>Chad</td>
<td>33.33</td>
</tr>
<tr>
<td>Suriname</td>
<td>23.33</td>
<td>Djibouti</td>
<td>33.33</td>
</tr>
</tbody>
</table>

Table 3: Nations with bottom quartile OSH indicator score

Looking at the distribution of U.N. Development status of the nations across the top and bottom quartile of scores (Tables 5 and 6), we see a stark contrast. The top quartile scoring nations are predominantly ranked among the highest level of development on the U.N. development scale, developed, with another third ranked as developing and just one, Burkina Faso, as least developed. Juxtaposed to this is the bottom quartile of OSH indicator which is populated almost exclusively by nations at lower levels of development including the U.N. categories of developing and least developed, with only a single nation, the Republic of Moldova, classified as developed.

Table 4: U.N. Development status for top quartile scores

Table 5: U.N. Development status for bottom quartile scores
Looking across the 131 nations for which we have OSH indicator scores, we see some interesting patterns in the implementation of OSH protective elements as well (Figure 1).

### Percent of nations implementing

1. **1.5%**
   - 9.4.10 Risks related to nanotechnology

2. **11.5%**
   - 8.5 Right of workers’ representatives from outside the undertaking to address OSH issues at the workplace

3. **18.3%**
   - 7.7 Right to enquire about risks and preventive measures in relation to their work

4. **19.1%**
   - 7.3 Supervisors’ duty to take reasonable steps to protect the safety and health of others

5. **23.7%**
   - 9.7.4 Duty to purchase machineries from authorized/certificated suppliers or only if approved/certificated

6. **24.4%**
   - 7.5 Self-employed persons’ duty to take reasonable steps to protect their own and others’ safety and health

7. **26.0%**
   - 2.4.5 Others are included within the scope of OSH legislation

8. **27.5%**
   - 7.9 Right to be reassigned to non-hazard work when their health has shown signs of alteration

9. **28.2%**
   - 9.5.2 Occupational violence

10. **30.5%**
    - 9.5.1 Psychosocial risks

11. **30.5%**
    - 4.2 Employers’ duty to protect safety and health of people other than their own employees

12. **32.8%**
    - 9.8.2 Protection of lactating women at work

13. **32.8%**
    - 2.2.1.4 Self-employed persons are included within the scope of OSH legislation

14. **33.6%**
    - 4.3 Employers’ duty to collaborate in ensuring OSH legislation when two or more undertakings are engaged simultaneously at one workplace

15. **34.4%**
    - 5.1.3 Undertaking a written risk assessment

16. **36.6%**
    - 9.4.11 Contraction of HIV in the workplace

17. **37.4%**
    - 9.7.3 Duty of designers, manufacturers, importers or suppliers of machineries to provide machineries information

18. **37.4%**
    - 3.1.6 Periodically reviewing or assessing the results of preventive measures taken

19. **37.4%**
    - 5.2 A national OSH research program or institute is established by law

20. **38.2%**
    - 9.3 Ergonomic hazards

21. **39.7%**
    - 9.7.5 System and frequency of maintenance of machinery and equipment and/or requirement for those carrying out plant and equipment maintenance to be approved/certificated

22. **39.7%**
    - 4.4 Working in confined spaces

23. **39.7%**
    - 4.5 Duty to ensure surveillance of the working environment and working practices which may affect workers’ health

24. **41.2%**
    - 9.4.9 Asbestos

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*Figure 1: Inclusion of OSH protective elements in national frameworks*
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The least common OSH protection mechanism implemented within a nation’s legislative and regulatory framework was specific regulatory content related to protection from the risks related to nanotechnology with just two nations of 131 (1.5%) including provisions for this. Looking at the remaining four least common OSH protections implemented across nations, we see the right of workers’ representatives from outside the undertaking to address OSH issues at the workplace captured in just 15 (11.5%) of the nations’ frameworks. The right of workers to inquire about risks and preventive measures in relation to their work is in place in only 24 (18.3%) nations’ laws and regulations. A duty of supervisors to take reasonable steps to protect the safety and health of others can be found across 25 countries (19.1%). Finally, the duty of employers to purchase machineries from authorized/certificated suppliers or only if approved/certificated is captured in the framework of 31 of 131 (23.7%) nations.

The most common element of a nation’s legislative and regulatory mechanisms providing proper protection of its workforce from the hazards arising out of work is the presence of a national OSH law(s) with 130 of the 131 nations (99.2%) having such law(s). Following closely behind is the presence of specific provisions limiting workers’ access to specific occupations, undertakings or shifts by reason of age, with 126 nations (96.2%) having such provisions in their frameworks. The provisions on the appointment of inspectors to carry out OSH-related duties ranks third among the most widely implemented protective measures in 125 nations (95.4%). Including construction within the scope of OSH legislation is the fourth most commonly adopted element found in 123 countries (93.9%). Rounding out the top five most commonly implemented OSH protective elements across national frameworks is providing inspectors with enforcement powers under OSH legislation, with 122 nations (93.1%) equipping their inspectors with such powers.
The newly created indicator, added to the UL Safety Index, the OSH indicator, addresses the extent to which a nation has implemented the legislative and regulatory mechanisms necessary to ensure the proper protection of its workforce from the hazards arising out of work. Workplace exposure represents a substantial potential for unintentional injuries to large portions of a nation’s population and, thus, the inclusion of this societal driver related to the prevention of work-related injury and illness represents a substantial improvement in the overall UL Safety Index.

Following a methodology established to translate the descriptive information on OSH protective measures in the ILO’s LEGOSH database into a quantitative score, the OSH indicator provides a measure of the number of protective measures adopted into law by a nation. Using data on unintentional injuries per 100,000 workers from Global Burden of Disease Study 2016 as a quick check on the validity of the OSH indicator demonstrated that the indicator significantly predicted unintentional injury DALYs per 100,000 persons.

Some limitations on the use of the OSH indicator are observed, most notably the absence of LEGOSH data for several countries included in the UL Safety Index, and the lack of information on the adherence to these legal and regulatory requirements by employers within each nation scored (the de facto protections). Limitations of the indicator aside, interesting patterns have been noted in the level of development among top quartile OSH indicator scoring nations and bottom quartile OSH indicator scoring nations, with those nations higher on the U.N. Development scale scoring generally higher on the OSH indicator. This lends support to the commonly held belief that social and labor protections, including OSH, receive more attention in nations where the more basic economic concerns have largely been surmounted. An analysis of the 77 individual protective elements across nations also yield some interesting insights. Some OSH protections appear to be fundamental, such as national enabling legislation for OSH and an enforcement mechanism, i.e., inspectors, for OSH legislative and regulatory requirements, as indicated by their wide spread adoption across the spectrum of nations.

For more information about the UL Safety Index™, visit ULSafetyIndex.org
End Notes

1. Non-fatal occupational injury being defined as causing at least 4 days of absence. For a full description of the methods of estimating both fatal and non-fatal occupational injuries see Hämäläinen, P., Takala, J., & Kiat, T. B. (2017). Global estimates of occupational accidents and work-related illnesses 2017. Workplace Safety and Health Institute, Singapore.

2. LEGOSH entries may include an assessment of the presence or absence of the element or subelement, i.e., Yes, No, or No Data Available, a summary explanation of the presence of that element or subelement, both bits of information, or neither.
