

## Review

# Sustainability of green jobs in Portugal: a methodological approach using occupational health indicators

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**Abstract: Objective:** This study aimed to develop a methodological tool to analyze and monitor the green jobs in the context of Occupational Health and Safety. **Methods:** A literature review in combination with an investigation of Occupational Health Indicators was performed. The resulting tool of Occupational Health Indicators was based on the existing information of “Single Report” and was validated by national’s experts. **Results:** The tool brings together 40 Occupational Health Indicators in four key fields established by World Health Organization in their conceptual framework “Health indicators of sustainable jobs.” The tool proposed allows for assessing if the green jobs enabled to follow the principles and requirements of Occupational Health Indicators and if these jobs are as good for the environment as for the workers’ health, so if they can be considered quality jobs. **Conclusions:** This shows that Occupational Health Indicators are indispensable for the assessment of the sustainability of green jobs and should be taken into account in the definition and evaluation of policies and strategies of the sustainable development.

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## Introduction

The “Occupational Health” (OH), frequently referred

as “Occupational Health and Safety” (OHS) - a concept established in 1950 by the Joint of International Labour Organization (ILO)/World Health Organization (WHO) Committee on Occupational Health - has a strong focus on primary prevention of occupational risks and deals with all aspects of health and safety in the workplace. The OH aims at fostering the promotion and maintenance of the highest degree of physical, mental, and social well-being of workers in all professions, the prevention of illness linked to work, but also workers’ health protection against occupational risks and ensuring the existence and maintenance of an occupational environment adapted to the physiological and psychological capabilities of each worker<sup>1</sup>.

The implementation and performance in OH requires the intervention of different areas/disciplines of work (Fig. 1) and a diversity of professionals, with distinct but complementary functions, due to the enormous complexity of themes and issues that holds the approach of the binomial “man-work,” a constant challenge for OHS services and their teams.

In spite of the huge transformation and development of the work in the recent decades<sup>2</sup>, many workers are still exposed to unacceptable occupational risks, being victims of occupational diseases and serious accidents at work, which show the need, importance, and urgency of effective implementation and strengthening of OHS services. It is considered that these services must cover all workers, regardless of the economy sector, the size of the enterprise, the profession, or situation at employment<sup>3</sup>.

The concerns with the sustainable development have led to the increase of economic activities<sup>4,7</sup> that help to protect ecosystems and biodiversity, reduce the consumption of energy, materials, and water, through strategies of high efficiency and a low-carbon economy, in addition to other jobs that minimize or avoid the generation of waste and pollution<sup>5</sup>. These are usually called “green jobs” and they integrate “all workplaces that depend on the environment or are created, replaced or redefined in the process

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Fig. 1. Multidisciplinary Occupational Health

of transition to a greener economy<sup>8)</sup>.

It is acknowledged that the policies and strategies in the context of sustainable development and the green economy have an un-precedent opportunity to promote a more inclusive workers' health, as well as to implement healthy work policies, especially in workers with vulnerable employment conditions<sup>9)</sup>. Ensuring health protection of the workers through the OHS Services coverage allows a suitable and continuous health surveillance, which will provide health gains not only for the worker, but also for the society in general. At the same time, the adherence to decent work codes and the compliance with the OHS requirements throughout the entire chain of production among different enterprises and countries in the green economy area may offer opportunities for a better distribution of health benefits among workers<sup>9)</sup>.

However, it is not yet clear "if green jobs are safe for workers"<sup>10)</sup> and if they "support the disadvantaged"<sup>11)</sup>. The transition toward a greener economy poses new challenges for OHS but besides traditional work-related risks, green workers could potentially be exposed to emerging risks related to the introduction of new technologies, substances, processes, and workforce changes.

In addition, the rapid expansion of green economy could pose further training requirements, leaving some unskilled workers involved in procedures for which they have not been adequately trained<sup>10)</sup>.

Stressing that the constant pressure associated with environmental, economic, and political factors, have led sometimes to the neglect of OHS issues in green jobs, tacking to a clear conflict among environmental objectives of green jobs and the OHS goals<sup>12)</sup>, that could put at stake the health and well-being of the involved workers as well as the sustainable development.

Thus, although the green jobs can foster dynamism and creation of employment, and so they represent an engine of development of the countries<sup>5)</sup>, it is considered that these jobs will not be able to meet only the "purposes of their use"<sup>12)</sup>, considering key that besides environmental concerns these green jobs should be decent jobs<sup>13)</sup>, mean-

ing that they are quality jobs, offer adequate wages and OHS conditions, which meet the workers' objectives, that allow stability at work, career perspectives, and ensure workers' rights, social dialog, and social protection<sup>5)</sup>. Therefore, assuming that the green jobs should be as good for the environment as for workers' health and must ensure the principles of decent work<sup>5,6,14)</sup>, in particular to be safe and healthy<sup>15)</sup>.

Taking into account that healthy workforce is a vital prerequisite for social and economic development<sup>2,16,17)</sup> and for productivity<sup>2,17)</sup> of any community, health is recognized as an important reference for sustainability<sup>16,18)</sup> while an indicator and a motor of sustainable development: (a) by measuring health can show the progress of development in the three pillars of sustainability - social, environmental, and economic<sup>16,18)</sup>; (b) when putting human health at the center of sustainable development strategies ensures a wide public benefit, especially for the most disadvantaged population, besides reflecting the impact of the social capital<sup>19)</sup>.

The issues of health workers may still allow to complement the quantitative analysis of the transition to a green economy to assess, in a qualitative way, if the transition is fair and leads to a net increase in the employment quality<sup>6,20)</sup>, besides allowing to evaluate the existence of an adequate occupational risks management and to contribute to the assessment of the costs and benefits of occupational diseases and accidents at work prevention and their contribution to social development<sup>17)</sup>.

The creation/strengthening of information systems on "health, environment, and management of the safety" are outlined in the "UE Strategic Framework on Health and Safety at Work 2014-2020"<sup>21)</sup> that highlights the need to "improve the collection of statistical data." Considers that decision making on OHS should be based on concrete information from "reliable, timely, and comparable statistical data related to diseases and accidents at work, occupational exposure, and health problems linked to work," as well as the "cost-benefit analysis" in the field of OHS. In this context, the construction of OH indicator systems proves to be indispensable.

According to the WHO, surveillance/monitoring systems in OH must have capability of collecting and integrating data which enable, on the one hand, monitoring the state of workers' health and detecting and evaluating any significant deviation caused by the conditions and organization of work and, on the other hand, supporting the development and implementation of OHS programs<sup>1)</sup>. It is still considered that the two main aspects should be integrated in these systems: (a) the "workers' health surveillance" that involves the production and analysis of indicators of mortality, disability to work, occupational diseases, accidents at work, absenteeism at work, lifestyles<sup>1)</sup> among others; (b) "surveillance/monitoring of the working environment" that includes the identification and

evaluation of environmental risk factors in the context of work that may affect the workers' health.

It is still recognized that it is essential that the surveillance/monitoring systems in OH taking into account the continuous surveillance of health workers from the perspective of public health<sup>22)</sup> as a crucial aspect to ensure proper planning, implementation, and evaluation of OH programs providing the protection and promotion of workers' health<sup>1)</sup>, as well as for an effective prevention of the occupational diseases, the damage to health arising from accidents at work and related to deaths<sup>22,23)</sup>. Finally, these systems should also take into account the extension of the active life of workers at work "in order to ensure adequate systems and sustainable pensions"<sup>21)</sup>, which will require continuous monitoring and adaptation of working conditions.

## Subjects and Methods

The descriptive study - a literature review - aimed at the development of a methodological tool that enables to analyze the green jobs in Portugal in the context of the OHS, based on the information from the Single Report (SR). This study has an exploratory character given the diminutive knowledge about OH indicators applied to green jobs<sup>10)</sup>.

The SR was the data collection instrument, a Portuguese administrative source of data, resulting from a legal requirement established by the Labor Code (and then regulated by Decree no. 55/2010 of 21<sup>st</sup> January) which demands to all employers/economic agents that have at least one worker "on behalf of another" at their service fill in this report each year.

For the purposes of this study, it was considered the indicator "quantitative or qualitative factor or variable" of the SR that provides a simple and reliable means to measure achievement, to reflect the change connected with one intervention, or to help the assessment performing for sustainable development<sup>24)</sup> of green jobs.

Firstly, the identification and analysis of the indicators (Step 1) of several OH systems of indicators, was done for the study namely:

- a) Occupational Health Indicators - OHI<sup>22,23)</sup>, developed by the Council of State and Territorial Epidemiologists (CSTE) in partnership with the Centers for Disease Control (CDC) and Prevention of National Institute for Occupational Safety and Health (NIOSH);
- b) Epidemiological and Performance Indicators for Occupational Health Services - EPIOHS<sup>25)</sup>, developed by the Government of Belgium (Federal Belgian Government Service of Employment, Labor and, Social Affairs);
- c) Indicators for Work-related Health Monitoring in Europe - WORKHEALTH Project<sup>26)</sup>, a project funded by the European Commission;

- d) Work and Health Country Profiles - WHCP<sup>1)</sup>, developed by the Finnish Institute of Occupational Health (FIOH) and by the WHO;
- e) Health, Work, and Well-being: baseline indicators - HWWB<sup>27,28)</sup>, developed by the by the Scottish Government (Department for Work and Pensions, Department of Health, Health and Safety Executive, Welsh Assembly Government);
- f) Good Practice in Health, Environment, Safety and Social Management in Enterprises - GP HESSME indicators<sup>19,29,30)</sup>, developed by Regional Office for Europe of the WHO.

Noting that, in the construction of the indicators tool two other sources of information were taken into consideration:

- I. The "Indicative list of indicators of the Portuguese Programme of Occupational Health - PNSOC 2013/2017"<sup>31)</sup>, developed by the Directorate General of Health since this list had already foreseen the use of SR as the main source of data;
- II. The "Decent Work Indicators"<sup>32)</sup>, developed by the ILO for the aspects of social determinants.

Subsequently, using a double-entry table, confronted the theoretical information needed for the construction of indicators that integrate the selected Systems and the existing information in the SR, in particular in Annex D "Annual Report of the Activities of Occupational Safety and Health Service" (Step 2). The selection process of the national indicators (Step 3) followed a set of criteria which justified the choice made, satisfying, on the one hand, the convenience of choice and, on the other hand, the accuracy and relevance of the data. The main criteria of selection were:

- the necessary information existence in the SR for the construction of the indicator;
- the possibility of comparison with legal criteria either other standards or guidelines;
- an easy and rapid way to determinate and interpret the data;
- the importance and scientific validation of data; and
- the ability to be quickly updated and allow the construction of time series.

For a few selected indicators, which do not fulfill all the desirable criteria, an optimization commitment ensures their feasibility, which enable verifiability/comparison and relevance. All indicators respect the basic requirement "existence of necessary information in the SR."

Indicators (Step 4) were organized according to the conceptual framework of WHO on the "health indicators of sustainable jobs"<sup>17)</sup> which, although not set indicators, its goal "to evaluate the sustainable job" was underlying that it was intended to evaluate the green jobs in the context of OHS, besides appointing structural fields:

- a) policies/processes for improving workers' health protection;

- b) health risks at the workplace;
- c) health effects - occupational deaths, injuries and disabilities; and
- d) social determinants of workers' health.

To emphasize the last field (social determinants of workers' health) has been individualized since the WHO<sup>17)</sup> considers that the health indicators for monitoring the health impacts of sustainable development policies regarding employment should be used in conjunction with the set of indicators for measuring decent work.

In the collection and analysis of information from the SR, for the construction of the OH indicators, the data are disaggregated: by CAE codes (Portuguese Classification of Economic Activities, established by Decree-Law no. 381/2007, of 14<sup>th</sup> November) which allows to distinguish the Local Units (LUs) / Enterprises / Establishments "Green" and "Not Green" assuming "green jobs" and "remaining jobs," respectively; by size of LU in the categories of micro, small, medium, and large-sized enterprises, according to the Commission Recommendation 2003/361/EC of 6<sup>th</sup> May 2003 and the provided in article 100<sup>o</sup> of the Labor Code (Law no. 7/2009 of 12<sup>th</sup> February and respective changes).

The selected indicators were validated (Step 5) by national experts (non-random sample) belonging to the Ministry of Economy and the Ministry of Health.

## Results

A methodological tool was developed which integrate 40 OH indicators distributed by the four fields of the conceptual framework of "health indicators of sustainable jobs"<sup>17)</sup>. According to the WHO<sup>17)</sup>, the first field, "policies/processes for improving workers' health protection," is related to the implementation of OHS policy in enterprises and, consequently, with the organization and activity of OHS services. Moreover, this is done with the coverage of the working population by these services, as well as with whole information, formation, and surveillance process, that fosters the prevention of occupational risks and the promotion of workers' health in the workplace. In this context, 12 indicators were selected: distribution of LUs by organization level of OHS services; proportion workers covered by OHS services; frequency of admission/periodicals health exams; frequency of occasional health exams; ratio of occupational physicians; ratio of occupational nurses; distribution of LUs by workplace health promotion; proportion of workers covered by workplace health promotion; distribution of LUs by actions of OHS information; proportion of workers covered by actions of OHS information; distribution of LUs by OHS training actions; proportion of workers covered by OHS training actions (indicators 1-12 in Table 1).

In the second field, "health risks at the workplace"<sup>17)</sup> WHO points out essentially to indicators, which enable to

monitoring the working environment the analysis of occupational risk factors that may affect the health and safety of workers, as well as for occupational exposure and prevention measures incremented. Thus, 14 indicators were selected which include the different kinds of risk factors at the workplace, namely: distribution of LUs by occupational risks identification; distribution of LUs by occupational risk prevention program; distribution of LUs by physical hazard identification; occupational exposure by physical hazard; distribution of LUs by chemical hazard identification; occupational exposure by chemical hazard; distribution of LUs by biological hazard identification; occupational exposure by biological hazard; distribution of LUs by hazard identification related to the activity (able to cause changes in the musculoskeletal system); occupational exposure by hazard related to the activity (able to cause changes in the musculoskeletal system); distribution of LUs by psychosocial/organizational hazard identification; occupational exposure by psychosocial/organizational hazard; Distribution of LUs by other hazard identification; occupational exposure by other hazard (indicators 13-26 in Table 1).

On "health effects"<sup>17)</sup>, WHO states that this group of indicators is closely related to deaths, injuries, and inability to work, caused by accidents at work or occupational diseases. In this sense, were selected six indicators: incidence rate of accidents at work; incidence rate of fatal accidents at work; frequency rate of accidents at work; severity rate of accidents at work; absenteeism rate by accidents at work; incidence rate of occupational disease (s) reported (indicators 27-32 in Table 1).

The last field, "Social determinants of workers' health"<sup>17)</sup> is associated, according to the WHO, with the indicators that measure the "decent work," in order to check if this is a quality work. Aspects relating to the remuneration and the type of hiring and other aspects that ensure stability at work and social dialog were privileged in the selection: Distribution of workers by level of professional qualification degree; distribution of workers by type of employment contract; distribution of workers by working time arrangements; distribution of workers by the organization of working time; distribution of LUs by query actions (for workers); proportion of workers covered by query actions; average remuneration of workers; average charges of LUs with OHS services (indicators 33-40 in Table 1).

## Discussion

OH indicator systems in an international level<sup>1,22,25,27,30)</sup> are, in general, composed by indicators that measure the state of health/disease of workers (e.g., occupational disease, illness aggravated by work injury or accidents at work) or the factors that influence this state (e.g., workplace exposures or interventions in the work context)<sup>30)</sup>,

**Table 1.** Portuguese Occupational Health Indicators by field of the WHO conceptual framework in relation to the “Health indicators of sustainable jobs”

Field and approach established by WHO <sup>17)</sup>	Occupational Health Indicators
<p>Policies/processes for improving workers' health protection: Ratification of core international labour instruments for occupational safety and health - International Labour Organization (ILO) conventions 155 (Occupational Safety and Health Policy), 161 (Occupational Health Services) and 187 (Promotional Framework for Occupational Safety and Health).</p> <p><i>Examples of parameters/indicators:</i></p> <ul style="list-style-type: none"> <li>•Proportion of companies (public and private) with established health and safety committees, disaggregated by economic sector;</li> <li>•Proportion of workers covered by essential interventions and basic occupational health services for prevention of occupational and work-related diseases and injuries including noncommunicable diseases (NCDs), disaggregated by gender, occupation, type of employment, and economic sector;</li> <li>•Proportion of workers covered with occupational safety and health insurance, disaggregated by gender, occupation, type of employment, and economic sector;</li> <li>•Proportion of companies (public and private, formal and informal) that are implementing healthy workplace programmes including interventions for prevention of NCDs, disaggregated by gender, occupation, and economic sector.</li> </ul>	<ol style="list-style-type: none"> <li>1. Distribution of LUs by organization level of OHS Services</li> <li>2. Proportion of workers covered by OHS Services</li> <li>3. Frequency of admission/periodicals health exams</li> <li>4. Frequency of occasional health exams</li> <li>5. Ratio of occupational physicians</li> <li>6. Ratio of occupational nurses</li> <li>7. Distribution of LUs by workplace health promotion</li> <li>8. Proportion of workers covered by workplace health promotion</li> <li>9. Distribution of LUs by actions of OHS information</li> <li>10. Proportion of workers covered by actions of OHS information</li> <li>11. Distribution of LUs by OHS training actions</li> <li>12. Proportion of workers covered by OHS training actions</li> </ol>
<p>Health risks at the workplace: Proportion of workplaces in public and private sectors (formal and informal) that comply with basic national occupational safety and health standards by economic sector.</p> <p><i>Examples of parameters/indicators</i></p> <ul style="list-style-type: none"> <li>•Proportion of workforce exposed to carcinogens, air pollution, noise, risks of injuries, hazardous chemicals, biological agents, and ergonomic and psychosocial stressors at the workplace, disaggregated by gender and economic sector and type of employment (formal and informal);</li> <li>•Proportion of workers covered with policies for smoke-free workplaces by economic sector and type of employment (formal and informal).</li> </ul>	<ol style="list-style-type: none"> <li>13. Distribution of LUs by occupational risks identification</li> <li>14. Distribution of LUs by occupational risk prevention programme</li> <li>15. Distribution of LUs by physical hazard identification</li> <li>16. Occupational exposure by physical hazard</li> <li>17. Distribution of LUs by chemical hazard identification</li> <li>18. Occupational exposure by chemical hazard</li> <li>19. Distribution of LUs by biological hazard identification</li> <li>20. Occupational exposure by biological hazard</li> <li>21. Distribution of LUs by hazard identification related to the activity</li> <li>22. Occupational exposure by hazard related to the activity</li> <li>23. Distribution of LUs by psychosocial/organizational hazard identification</li> <li>24. Occupational exposure by psychosocial/organizational hazard</li> <li>25. Distribution of LUs by other hazard identification</li> <li>26. Occupational exposure by other hazard</li> </ol>
<p>Health effects - occupational deaths, injuries and disabilities Occupational injury rate (fatal) disaggregated by gender, occupation, employment type (formal and informal), and economic sector.</p> <p><i>Examples of parameters/indicators</i></p> <ul style="list-style-type: none"> <li>•Occupational injury rate (non-fatal) disaggregated by gender, occupation, employment type (formal and informal), and economic sector;</li> <li>•Occupational disease rate disaggregated by gender, employment type (formal and informal), and economic sector;</li> <li>•Occupational burden of disease - cancer, asthma and chronic obstructive pulmonary disease, noise-induced hearing loss, low back pain, and depression, disaggregated by gender and economic sector.</li> </ul>	<ol style="list-style-type: none"> <li>27. Incidence rate of accidents at work</li> <li>28. Incidence rate of fatal accidents at work</li> <li>29. Frequency rate of accidents at work</li> <li>30. Severity rate of accidents at work</li> <li>31. Absenteeism rate by accidents at work</li> <li>32. Incidence rate by occupational disease (s) reported</li> </ol>

**Table 1.** Portuguese Occupational Health Indicators by field of the WHO conceptual framework in relation to the “Health indicators of sustainable jobs” (continued)

Field and approach established by WHO <sup>17)</sup>	Occupational Health Indicators
Social determinants of workers' health: <i>Health indicators for monitoring the health impacts of sustainable development policies regarding jobs should be used in conjunction with the set of indicators for measuring decent work.</i> <i>Note: Take into account the special aspects relating to employment/unemployment, the abolition of child labour, policies relating to the working poor, and the minimum wages.</i>	33. Distribution of workers by level of professional qualification degree 34. Distribution of workers by type of employment contract 35. Distribution of workers by working time arrangements 36. Distribution of workers by the organization of working time 37. Distribution of LUs by query actions (for workers) 38. Proportion of workers covered by query actions 39. Average remunerations of workers 40. Average charges of LUs with OHS Services

including the level of organization and implementation of OHS services and the level of coverage of the working population by these services.<sup>25)</sup> The use of OH indicators allows to know the level of workers' health<sup>22,26)</sup> or the occupational risk status<sup>22,30)</sup> in a country/region and compare the different areas, assess trends<sup>22,30)</sup>, and progress<sup>15)</sup> achieved during a period of time, measure the effectiveness of prevention activities<sup>23)</sup>, identify health and safety problems in the workplace that require further investigation, and guide the priorities of prevention and intervention<sup>23)</sup>, among others. Thus, these indicators, when applied to green jobs, enable the evaluation of the OHS of their workers.

To emphasize, that the several OH systems of indicators reveal a concern in establishing a field/specific area that integrates indicators linked to sustainable development: are examples of the field of “socio-economic impact”<sup>22)</sup>, the area of “environmental management and environmental health”<sup>19)</sup>, the area of “social capital and community development”<sup>19)</sup>, or the field of “quality of health care” (and safety/performance)<sup>26)</sup>. The latter includes the indicator “sustainability of work” measured by “ability to perform the same job at 60 years old.” Moreover, some OH indicators are now highlighted in sustainability reports<sup>17)</sup> or in government reports<sup>28)</sup>.

However, there are some OH indicator systems defined,<sup>1,22,25,27,30)</sup> but it was not possible to choose one in particular adequate to build the conceptual tool to Portugal, since the systems analyzed: (a) are made up of indicators that need information impossible to extract from the SR; (b) the calculation of some indicators implies the use of specific sample surveys - questionnaire; (c) some indicators do not have national applicability or major relevance in the context of green jobs. For this reason, it was decided to select the most relevant indicators of the systems.

The SR has proved to be a good data collection instrument and with enormous potential: (a) allows a regular data collection, meeting the ILO recommendation regarding periodic compilation of OHS data, the counseling,

wherever possible, an annual basis<sup>13)</sup>; (b) the information that is extracted features a huge scope and national representation because it includes most employers/economic agents have at least one worker “on behalf of another” to their service, which enables to get strongly realistic results; and (c) integrates a huge wealth of information that allows to evaluate specific issues of OHS and decent work.

In the field, “policies/processes for improving worker's health protection” one of the indicators selected was the “distribution of LUs by organization level of OHS services” (indicator 1 of Table 1) since it is the basic pillar which guarantees the policy and compliance of legal and regulatory requirements on OHS in an enterprise/establishment. This service, when organized by the employer, aims: (a) ensuring the working conditions that safeguard the safety and the physical and mental workers' health; (b) developing the technical conditions to ensure the implementation of preventive measures; (c) informing and training workers in the field of OHS; (d) informing and consulting workers' representatives for the OHS or in their absence the workers themselves (article 97 of Law no. 102/2009 of 10<sup>th</sup> September and respective amendments of the law). It is considered that the organization of the OHS services “itself” might reveal the OHS culture<sup>26)</sup> of the enterprise/establishment and so represent an important indicator<sup>26,31)</sup> of structural and political organization in OHS.

The “universal health coverage of the workers”<sup>33)</sup> essentially achieved by the provision of appropriate OHS services and respective accessibility of workers to these services is one of the main objectives of the WHO<sup>2)</sup> and one of the five priorities set by WHO for the period 2014-2019.<sup>33)</sup> The priority given to the coverage of the working population is justified because it allows access to the needed services in order to achieve good health (including the level of promotion, prevention, treatment, and rehabilitation) avoid health problems that can lead to poverty.

The “universal” perspective still provides a “powerful unifying concept to guide the health and the development and to promote health equity in the coming years”<sup>33</sup>. That is why the “proportion of workers covered by OHS services” (indicator 2 of Table 1) is used as an indicator in some systems<sup>25,31</sup>, gathering a huge importance while defining an essential requirement to “improve health and promote social cohesion as well as human and economic sustainable development”<sup>18</sup>, having been a selected indicator.

The state OHS services activity in an enterprise/establishment may be indicated by the OHS professionals<sup>1</sup>, since these are responsible for the evaluation of the workplaces and the control occupational risks, as well as by developing health surveillance actions and assessing their effectiveness in the protection and promotion of the workers’ health<sup>34</sup>. These initiatives can have a strong impact in preventive terms<sup>22</sup>. The accounting of these professionals also allows to assess shortages/surplus and set priorities in this area<sup>22</sup>, being a common indicator of OH systems<sup>1,22,26,31</sup>. Thus, it is justified the selection of indicators to calculate the ratio of OHS professionals (Indicators 5 and 6 in Table 1).

At the level of policies and processes in OHS it is also important to exist “intervention indicators”<sup>22</sup> capable to measure, in general terms, the activities or the intervention capacity of the OHS services to reduce the occupational risks in the workplace. In this item may be included indicators associated with the periodic health assessments, for example, health examinations<sup>26,31</sup> (indicators 3 and 4 of Table 1), health promotion<sup>27,29,31</sup> (indicators 7 and 8 of Table 1) and the information and training of workers<sup>26,29,30</sup> (indicator 9-12 in Table 1) on OHS. By monitoring the existence of such actions/programs, it is possible to evaluate their impact and identify where the implementation is still unsatisfactory and where relevant actions/programs are needed.

To highlight, that the health promotion in the workplace is considered an important public health issue that matters to be monitorized<sup>26</sup>, specially at their coverage level (indicator 8 of Table 1), since it aims to maintain and improve the workers’ health. In the OH indicator systems, sometimes made the distinction among embracing health promotion programmes<sup>26</sup>, considered as the most effective, and the sectorial programs (e.g., smoking, physical activity, nutrition, stress management, etc.), although this aspect has not been the analysis target in this study.

With regarding the field “Health risks at the workplace” it is observed that these indicators are usually related to working conditions<sup>26,29,30</sup> that can cause damage to the worker’s health and with “exposure indicators”<sup>22</sup> that express the presence of a substance/factor potentially harmful in the exposed worker. Noting that a worker might be exposed at more than one occupational hazard,

of the same nature or of another kind, in the workplace.

In this context, it is further noted that some indicator systems<sup>1,25,29,30</sup> measure the risk factors according to their nature or stratify the most relevant of each nature to carry out their specific analysis. Thus, it was decided to select the indicators by nature of occupational hazard, according to the established in the SR: physical, chemical, biological, relating to work activity - able to cause changes in the musculoskeletal system, psychosocial/organizational and other factors, including these last ones the “mechanics” factors (indicators 15-26 of Table 1).

A proper identification and evaluation of occupational hazards is the basis of effective OHS management, being an essential tool for the prevention of occupational risks and, consequently, for the reduction of accidents at work, occupational diseases and work-related diseases. It is considered that nonexistence of this assessment, in an enterprise/establishment, is a good indicator (indicator 13 of Table 1), as it may reveal the low importance given to this issue by workers and OHS professionals and/or the difficulty in performing the process of occupational risk management<sup>35,36</sup>. It can also show that the control of occupational risks, as the most effective means of prevention<sup>22</sup>, is not assured for what could be at stake the safety and health of workers (indicator 14 of Table 1).

In the field of “Health effects” it is considered that the information about occupational diseases and accidents at work and the other data collection of health effects play a central role in public health surveillance<sup>22,26</sup> and on occupational health surveillance. They are usually classified as “health effect indicators”<sup>22</sup> since that measure the injury or illness and indicate the adverse effects of exposure to a known or suspected occupational hazards. These indicators are usually related to accidents at work and occupational diseases, considering essential to assess the development of better or new strategies of the prevention and/or regulations/legislation to protect workers<sup>22</sup>. Both occupational diseases and accidents at work reflect the lack of an alignment with the principle of “safe and healthy working environment”<sup>1</sup> and can show the existence of certain occupational risks.

Accidents at work are considered as structural indicators of many systems<sup>1,22,23,27-30</sup> for revealing a negative overall result, an adverse effect in the workers’ health and, consequently, the need to improve the occupational risk management process and above all the need for severe preventive measures. In this sense, selected indicators in the context of accidents at work had taken into account the incidence (indicators 27 and 28 in Table 1), frequency (indicator 29 in Table 1) and severity (indicator 30 of Table 1) of these accidents.

The same systems indicate, similarly, that occupational diseases, in a whole or with some degree of stratification (e.g., occupational deafness, musculoskeletal disorders, occupational cancer, etc.) are also important in the area of

health surveillance when showing the morbidity of working population and their relationship with the working conditions<sup>26)</sup>. However, this is recognized that the greatest difficulty in collecting the data of occupational diseases as well as in their interpretation<sup>21,26)</sup>, while comparing with accidents at work. Considering their importance of integrating the national system of indicators, it was decided to use the occupational diseases reported by doctors (indicator 32 of Table 1), although they have not been certified by the competent national authority.

In this context, it should be noted the importance of absenteeism at work (indicator 31 of Table 1) by illness or accidents at work, since it is an important indicator that provides information about the state of workers' health<sup>26)</sup>, besides being able to estimate the extent of direct and indirect costs<sup>22)</sup> associated and the need of the adoption of preventive measures<sup>26)</sup> in enterprises that have a high rate of absenteeism. This indicator also reveals the negative performance of the enterprise<sup>27,28)</sup> and the impossibility of calculating the "burden of occupational disease," can give an idea of the associated cost.

Regarding the field of "Social determinants of workers' health" and having underlying the concept of decent work<sup>17)</sup>, it turns out that in the selection of indicators is not enough to know the number of persons employed in a given sector and their working conditions. It is also necessary to identify the characteristics of workers, in particular, the level of professional qualification degree, training received, and wages<sup>5,13)</sup>, in order to become easier the analysis of the economic and social situation of the working population and the specific groups of workers (e.g., women, youth, seniors, etc.). This field required the use of the information, even in a very restricted form, of Annex 0 "Identification of the employer" and Annex A "Human resources framework" of the SR.

Whereas enterprises with strong innovation component, such as those associated with green jobs, usually require a wide range of abilities/skills<sup>6)</sup> and "more intensively high level cognitive and interpersonal skills compared to non-green jobs"<sup>37)</sup>, the professional qualification degree of workers (indicator 33 in Table 1) was one of the selected indicators. This indicator might reveal the change, the requalification and the improvement of workers' skills, as well as to overcome needs in this area, once professionally qualified workers are crucial to the competitiveness of enterprises and to ensure employability, as they are essential to the development of innovative capacity and productivity of an enterprise.

On the opposite the precarious work also exists in green jobs, a key social determinant of health inequalities among workers, of extreme importance<sup>20)</sup> especially in a context of economic crisis, which expresses the weakening of the wage relationship as a result of the flexibility of the work and the resulting asymmetry in the power relationships. Stressing that, among of eleven indicators used

by Puig-Barrachina et al<sup>20)</sup> to measure the precarious work through the data of the European Working Conditions Survey, were considered the following: (a) unstable employment/type of employment contract (indicators 34 and 35 in Table 1) since the type and duration of the contract reflect the degree of certainty of continuous work, taking into account that the short-term contracts can prevent the workers from planning the future of their personal or professional lives<sup>19)</sup> beyond they may indicate lower standards of OHS; (b) the wages (indicator 39 of Table 1), bearing in mind the income is insufficient when does not cover regular or unexpected expenses<sup>20)</sup>, and that this income shows the purchasing power of workers to buy goods and services, of extreme importance in the context of social protection<sup>32)</sup>; (c) low control over work schedule (indicator 36 of Table 1), when considering the flexibility of working time is a way for the organization of work<sup>21)</sup>, but working beyond the normal hours can lead to difficulties among work, family, and social life, tending to have more health's problems<sup>20,32)</sup>.

On a social and economic perspective, it is also important that green policies formulated enable to ensure that workers negatively affected (e.g., job loss in carbon-intensive and pollutants industries) are protected<sup>5)</sup> through assistance, new job opportunities, qualification, training, among others. In this context, social dialog (e.g., consulting workers about OHS) among employers, workers, government, and social partners<sup>5)</sup>, has been shown to be one of the fundamental ways to make the work safe and healthy<sup>7,15)</sup> and essential to determine the design of new production systems and sustainable working practices<sup>5)</sup> should, therefore, be viewed as a good indicator (indicators 37 and 38 in Table 1). It should be noted, that the consultation of workers' representatives is a legal obligation contained in Law No. 102/2009, of September 10<sup>th</sup> (and respective amendments of the law).

It should be alignment that the expense/investment with OHS measures can have huge relevance in health and well-being of workers, which include a variety of measures with various costs<sup>26)</sup>, having been selected an indicator in this context (indicator 40 of Table 1). It is considered that knowledge of the average values of investment can help to calculate the cost-benefits, to justify the programs and activities carried out<sup>22)</sup>, and to direct more investment to provide a healthy and decent work to the workers.

Aspects related to employment/unemployment, such as the abolition of child labor or certain occupational diseases, as recommended by WHO<sup>17)</sup> for the field in question, were not included in the Portuguese indicators tool, since this information is not included in the SR.

Not existing at the time a harmonized methodology for the calculation of the green job and due to the statistical uncertainty of this concept<sup>4,38)</sup>, it was established that, for the application of the methodological tool developed, the



green job should be calculated by using the CAE codes of “environmental job.” Thus, all the indicators, listed above, are disaggregated into “Green” LUs and “Not Green” LUs assuming, respectively, as “green job” and “remaining job.” It is considered that the disaggregation of the data by economic sector allows the monitoring of the effects of sectorial policies for sustainable development, including green policies, on health and well-being of workers<sup>17)</sup>.

Taking into account the national business with numerous SMEs (micro, small, and medium-sized enterprises) and the relevance of the various international bodies and some authors provide the disaggregation of statistical information by the size of enterprise<sup>12,20,21,36)</sup>, it was established that all the statistical data of selected indicators will be subject to disaggregation by “size of LU.” Although it is considered that there should be a “high level of compliance with OHS principles, regardless of enterprise size”<sup>21)</sup>, SMEs might have a greater difficulty in fulfilling some regulatory requirements and present lower levels of compliance with the measures of OHS management, compared with large enterprises/establishments, due to “lack of specialized knowledge,” “lack of awareness to the obligations,” “absence of guidelines or application deficiencies” and “compliance costs”<sup>21)</sup>. It is understood that this is an extremely important approach because it can highlight and identify organizational and technical weaknesses in the field of OHS by size of enterprise, which can enhance a preventive and/or corrective and a more targeted/focused action, according to the needs, and should be taken into account in the structuring of OH indicator systems.

## Conclusions

The diversity of indicators used in this study were selected from the OHS indicator systems, as referred in the text. These indicators are used in the surveillance of worker’s health, in the monitoring of working conditions<sup>1)</sup> and in follow-up and monitoring of OHS policies and strategies, safeguarding, mostly, a public health perspective. Several OH indicators that integrate these systems require specific questionnaires and/or sampling for data collection, not applicable to the annual regular collection and national scope intended to establish with the methodological tool developed.

Like other studies,<sup>22)</sup> it was found that the process for definition and establishment of OH indicators is useful as the data itself, since it requires a reflection on the data needed, as well as the one available. Moreover, it requires knowledge about where the data is located or may be extracted.

The WHO conceptual framework for “health indicators of sustainable job”<sup>17)</sup> allowed to structure 40 feasible OH indicators, supported by information collected from the

SR, which will enable the construction of long-time series.

Whenever the OH indicators are applied to green job, they can assess if the associated work complies the OHS requirements and, thus, if it follows the principles of decent and quality work. It should be stressed that safeguarding of the worker’s health and well-being can only be ensured by an adequate coverage by OHS services, a sustainability requirement that is essential for alignment of green job with the principles of sustainable development.

Therefore, the management of green job should value, in the same way either “environmental” or “economic” goals, as well as the “OHS issues.” It is relevant integrating OH indicators in the assessment of green jobs in order to achieve a more realistic evaluation of the sustainability of these jobs and to ensure that the economic and environmental development of green jobs does not be disconnected from the health and from the integrated development of the human. Thus, it is considered that the enhancement of the active and healthy worker is crucial to sustainability.

The methodological tool proposed integrates many indicators for the basic OHS issues which essentially are laid down in the national legal device. Thus, although the tool has been developed in the context of green jobs, it might be applied to all types of jobs. In this tool, selecting specific CAE, prior to the calculation of the indicators, enables the national comparison between the “green job” and “remaining job,” still allowing the comparison between the various sectors and economic activities. The collection of disaggregated information by size of enterprise (micro, small, medium, and large enterprise) proves to be an asset for a more targeted definition of preventive strategies on OHS context.

The evaluation of the results of the indicators might contribute to the continuous improvement the tool created, to improve the recording of information in the SR made by employers, as well as enhance the validation of obtained results.

In the context of the green job, should be stresses that the specifications and the requirements that integrate OH indicators must be seen not only as an expression of social responsibility<sup>39,40)</sup> and ethics of green enterprises, but also an investment in workers and their families, in businesses and communities, once an adequate, and continuous health surveillance will provide health gains for the worker and for society in general, contributing positively to the sustainable development.

*Conflicts of interest:* The authors declare that there are no conflicts of interest.

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