

# Stakeholders' perception of the possible implications of “green jobs” for health and safety at work in Italy

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**Abstract:** Despite all the emphasis laid today on the green economy, occupational health and safety (OHS) issues have still been talked only limitedly, as already noted in previous studies and literature reviews. The Department of Occupational and Environmental Medicine, Epidemiology and Hygiene of the Italian Workers' Compensation Authority (INAIL) has conducted a survey among some Italian stakeholders, social partners, institutions and “green” businesses to gather their perceptions of the potential effects of *green jobs* on OHS, particularly in the renewable energy sector. The survey involved a sample of 61 stakeholders in the following categories: institutions (11), trade unions (11), employers' organizations (13), businesses (11), research (15). Participation in this survey of national stakeholders who have a central role in the development and management of policies on renewable energy and OHS, allowed to analyze in depth the fundamental aspects for a fair transition towards green economy. Also, the good agreement among respondents brought to light quite clearly the main critical points as regards the OHS implications of green work in Italy, and pointed to the principal policies to be adopted to safeguard workers' health and safety.

**Key words:** Green economy, Renewable energy sources, Green technologies, Occupational health and safety, Emerging risk

## Introduction

The search for alternative growth models in these years of financial and economic difficulties has aroused increasing interest in the “green growth paradigm” as a path towards economic growth and sustainable development, limiting environmental degradation while conserving biodiversity and responsible use of natural resources. Accord-

ing to the Europe 2020 Strategy<sup>1)</sup> for “smart, sustainable and inclusive growth”, innovation and better use of natural resources constitute a driver for the creation of new jobs and services.

Recent estimates<sup>2, 3)</sup> show an increase in so-called *green jobs* defined as “work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contributes substantially to preserving or restoring environmental quality”. In 2008, the United Nations Environment Program (UNEP)<sup>3)</sup> estimated there were 11 million green jobs worldwide and statistics suggest they can be expected to rise to 20 million by 2030. Renewable energy alone has generated 2.3 million new

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jobs, mainly in the biomass and solar thermal industries. The European Union (EU) is in the lead as regards energy from renewable sources<sup>4</sup>: 950,000 new jobs were created in 2010 and 1.4 million are forecast for 2020. In Italy the number of people in *green jobs* is estimated at 850,000 to 950,000, and should reach 1.3 to 1.5 million by 2020, 250,000 of them in renewable energy<sup>5</sup>.

However, the transition towards a greener economy poses new challenges for occupational health and safety (OHS). On the one hand, *green jobs* aim to safeguard environmental quality and/or produce green goods or services but, on the other, it is not yet clear whether they are safe for workers. Besides traditional work-related risks (chemical, physical, biological, etc.), green workers could potentially be exposed to “emerging” risks related to the introduction of new technologies, substances, processes, workforce changes<sup>6, 7</sup>, etc. In addition, the rapid expansion of the “green economy” could pose further training requirements, leaving some unskilled workers involved in procedures for which they have not been adequately trained, and putting their health and safety at risk<sup>8, 9</sup>.

Forecasts and estimates—as far as possible—of potential new and emerging risks related to OHS are therefore needed before they arise, particularly for *green jobs*. The European Community Strategy 2002–2006 emphasized the need to step up efforts to “predict new and emerging risks”; the second Community Strategy, 2007–2012, defined the “risks related to the new technologies” as a field where risk prediction needs to be improved<sup>10, 11</sup>.

Research is needed to assess traditional and new OHS risks in different situations and combinations within *green jobs*. This would facilitate the transfer of existing OHS knowledge to green technologies, and the development of job-specific risk assessment for *green jobs*, as well as identifying OHS training needs. However, an analysis of the literature on the potential health and safety risks for green workers, referring to the period 1998–2009, issued by the European Agency for Safety and Health at Work (EU-OSHA) in the second phase of the project<sup>12</sup> “*Fore-sight of New and Emerging Risks to Occupational Safety and Health Associated with New Technologies in Green Jobs by 2020*”, found very few studies or detailed research into the impact of this type of work on health and safety, particularly in the renewable energy sector.

Our analysis of the literature on this topic for the period 2009 to date confirmed the interest in investigating certain basic aspects of *green jobs*; these included definition and measurement<sup>3</sup>, economic impact<sup>4</sup>, consequences for occupation<sup>13</sup>, environmental protection and management<sup>14</sup>,

and others. There was also a growing focus on emerging issues directly linked to technological innovation; these included the promotion of decent work in the green economy<sup>15–17</sup>, the importance of industrial relations and social dialogue<sup>18</sup>, identification of new green skills<sup>19–21</sup>, the importance of new education and training strategies<sup>22, 23</sup>, possible scenarios related to new and emerging risks in new green technologies<sup>24</sup>.

Although the number of scientific publications focused on identifying the potential risks for the health and safety of workers in single ‘renewable’ sectors and/or specific aspects is growing, there is still no systematic, thorough systematic approach to OHS in the green economy. The main investigation to date has been done by EU-OSHA<sup>12, 24, 25</sup>, which provided a detailed forecast and analyzed the possible development of *green jobs* up until 2020, and the challenges these might involve in OHS. The study envisaged a series of future scenarios related to the development of green technologies, in different economic and social circumstances.

Two literature reviews consolidated by 50 phone interviews and two online surveys resulted in the selection of key drivers of change that could shape *green jobs* and key new technologies likely to have an impact on OHS in *green jobs*. This was followed by eight technology workshops that explored potential new and emerging OHS risks for each of the key technologies and discussed ways in which to address them. These workshops showed the value of the scenarios in engaging with different groups of stakeholders and generating strategic discussions between them. The aim was to call attention to potential OHS risks in this sector and provide those responsible for EU policies with tools to help create jobs where European workers’ health and safety could be guaranteed.

In Italy there is a definite lack of studies on this question. Therefore, with the aim of drawing attention to OHS in the green economy, the Department of Occupational and Environmental Medicine, Epidemiology and Hygiene at the Italian Workers’ Compensation Authority (INAIL) has conducted a survey among some Italian stakeholders, social partners, institutions and *green* businesses to gather their perceptions of the potential effects of *green jobs* on OHS, with particular regard to the renewable energy sector, taking as its starting point the EU-OSHA study<sup>12, 24, 25</sup> and two previous INAIL investigations on emerging risks such as work-related stress<sup>26</sup> and nanotechnologies<sup>27, 28</sup>.

The survey was the first stage of an INAIL study mainly aimed at obtaining a thorough, detailed picture of the work-related risks of *green jobs*, and fostering the devel-

opment and adoption of tools to limit or prevent them.

## Subjects and Methods

The survey, started in May 2013 and completed in March 2014, analyzed the potential impact of the transition to a green economy from the viewpoint of the health and safety of Italian workers in the sector of renewable energy, where in recent years the numbers of workers have been growing constantly<sup>29</sup>). There were various reasons for focusing on Italians. First of all it was simple for us to identify and involve Italian stakeholders who had taken part in previous surveys<sup>26–28</sup>) organized by the Department of Occupational and Environmental Medicine, Epidemiology and Hygiene and related to this survey; there was also the fact that right now there are no studies of OHS in the green economy in Italy. The survey was conducted in several steps, described below.

### Questionnaire design

Before drafting the questionnaire we made a critical comparative analysis of international and European questionnaires with a view to identifying their weak and strong points in dealing with new and emerging risks for workers' health and safety in the green sector. Most of the international and Italian questionnaires looked at general aspects of green work (for instance, definition and quantification of *green jobs*, costs, benefits and barriers to the development of renewable energy, adoption of regulatory measures, and energy policies), and neglected OHS matters in this sector.

We therefore used as a reference point the EU-OSHA questionnaire as part of their project<sup>12</sup>) *Foresight of New and Emerging Risks to Occupational Safety and Health Associated with New Technologies in Green Jobs by 2020*. This generated a series of scenarios relating to the use of new technologies in green work and their potential effects on workers' health and safety<sup>13</sup>). Once the questionnaire had been drafted, it was administered in the pilot stage to a restricted sample of people to test its applicability and efficacy. The final version was then posted on the Research Activity section of the INAIL website (<http://www.ispesl.it/greenjobs/>). The questionnaire is brief and easy to complete, comprising 15 questions, under four headings:

1. Socio-demographic characteristics of responders;
2. Introduction to the green economy;
3. OHS issues;
4. Policies for the protection of workers' health and safety in the green economy.

The web page provides a short description of the survey and a glossary with brief definitions of the main entries in order to make sure responders fully understood the terminology used in the questionnaire.

### Identification of the sample

On the basis of the nature of research design and aims and objectives, we select units to be sampled based on their skills, knowledge and opinion (*judgmental sampling*). It is the only viable sampling technique in obtaining information from a very specific group of people.

Firstly, for each category we selected the people holding the main roles in OHS management and sustainable development policies. Then, we looked for the same numbers of people for each category, to form a homogeneous sample.

We identified five categories: institutions, trade unions, employers' organizations, businesses, research. Regarding the first category, representatives belonging to institutions that play a central role in the development and management of OHS and renewable energy policies were chosen (e.g. Ministry of Environment, Ministry of Economic Development, Ministry of Health, Ministry of Labour, Lombardia Region, Lazio Region, Tuscany Region, INAIL).

In the case of employers and trade unions, OSH experts who have a decision-making role in the development of OHS policies were identified.

With respect to companies, groups of companies and professionals with expertise in the design, construction, installation and maintenance of energy production from renewable sources were selected.

The sector of research is represented by members with different expertise in the field of OHS and renewable energy (e.g. engineers, occupational physicians, researchers), belonging to universities, associations and research centers for the promotion of renewable energy sources, associations for industrial research or of industrial hygienist.

The 61 stakeholders from the different categories are listed in Table 1.

The individual stakeholders were sent access codes by e-mail to enable them to complete the questionnaire online.

### Analysis of the results

Replies to the questionnaire were uploaded into a database in Microsoft Excel format and analyzed using SPSS version 16.0 for Windows. In a preliminary analysis we calculated the response rates. For the multiple-choice questions, analysis was done on the following: "valid cases" (those who selected at least one response); "valid

**Table 1. Survey participants grouped by category**

Category	Number of participants
Institutions	11
Trade unions	11
Employers' organizations	13
Businesses	11
Research	15
Total	61

**Table 2. Response rates grouped by category**

Category	Responses (no.)	Responses (%)
Institutions	7	63.6
Trade unions	7	63.6
Employers' organizations	6	46.2
Businesses	7	63.6
Research	7	46.7
Total	34	55.7

**Table 3. How do you rate the importance of the green economy in Italy ?**

Category	Marginal importance (%)	Still marginal but growing importance (%)	Current importance (%)	Total (%)
Institutions	14.3	42.8	42.9	100.0
Trade unions	14.3	0	85.7	100.0
Employers' orgs.	-	-	100.0	100.0
Businesses	-	-	100.0	100.0
Research	-	57.1	42.9	100.0
Total	5.9	20.6	73.5	100.0

$$\chi^2=16.376. p=0.037$$

responses" (the number of times responders selected a specific answer, which could therefore be more than 100% of cases); and missing cases (no responses). Descriptive analysis was based on the percentages in frequency tables and graphs. Contingency tables were used to analyze the percentages in each category. To check for associations between the groups and the responses, we used the  $\chi^2$  test to verify the significance of differences between the observed and expected or theoretical frequency distributions, i.e. those expected if there is no relation between the variables investigated. We set significance at  $p<0.05$ .

We ensured that all responses would be considered confidential in the data analysis, as required by the Italian Deontological Code and Code for Good Conduct in the treatment of personal data for statistical and scientific purposes (*Provvedimento del Garante no. 2 del 16 giugno 2004, Gazzetta Ufficiale 14 agosto 2004, no. 190*).

## Results

In all, 34 questionnaires were completed, giving a response rate of 55.7% (Table 2). The majority of responders were male, with 20.6% female; the median age was 52 yr, with 33.3% aged between 55 and 64 yr; just under two thirds (61.8%) reported a college degree.

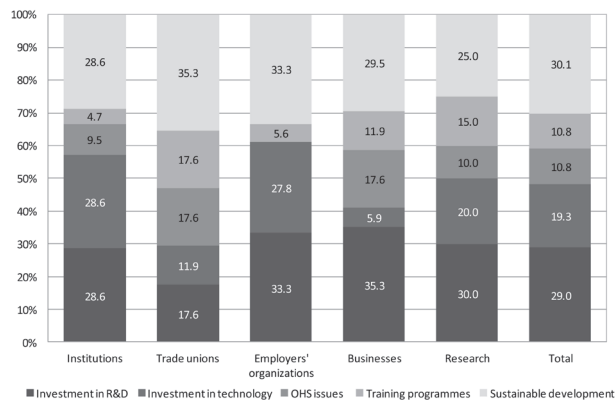
As regards the weight participants attached to the green economy, 73.5% considered it an important issue, 20.6% felt it was still marginal but could be expected to become

more important in the short and long terms, and only 5.9% considered it altogether marginal.

Analysis of the results based on the stakeholder categories brought to light significant differences ( $p<0.05$ ) (Table 3). Among employers' organizations (100%), businesses (100%) and trade unions (85.7%), the proportions of people indicating that the green economy is an important issue were larger than responders from institutions and research (42.9%).

Among the aspects considered fundamental for a fair and equitable transition towards a green economy, sustainable development ranked first (30.1% of responses, 82.4% of cases), followed by investment in research (29.0% of responses, 79.4% of cases). Trade unions and businesses were equally interested in enhancing workers' protection in the green economy (OHS issues), both with 42.9% of cases (17.6% of responses). The employers' association did not consider OHS issues important for ensuring a fair and equitable transition towards the green economy (no responses) (Fig. 1).

On the question of health and safety at work, one fifth of the cases (20.6%, 12.7% of responses) believed that, compared to traditional energy sources, renewable energies entailed new risks that could not be managed with current risk management approaches. However, most responders (61.8% of cases, 38.2% of responses) maintained that these new risks could in fact be managed with current procedures; or else they thought that renewables entailed the



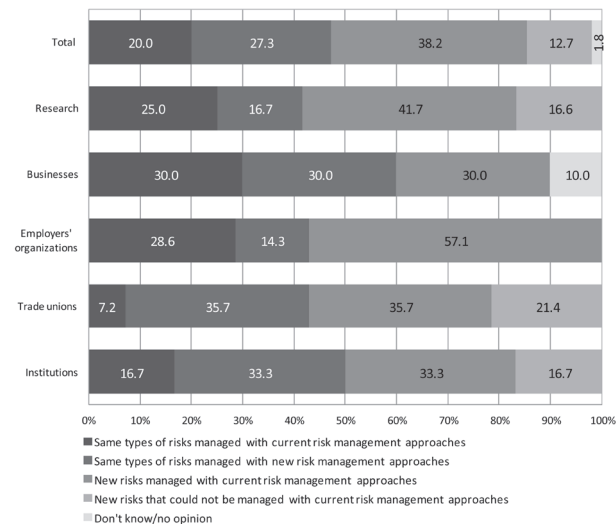
**Fig. 1. Aspects rated most important for ensuring a fair and equitable transition to the green economy: total sample and categories (percentage responses).**

same types of risks as other forms of energy but called for new risk management procedures (44.1% of cases, 27.3% of responses). In the first case, the percentage frequency were highest from trade unions (35.7%) and businesses (30.0%); in the second case employers' organizations (57.1%) and research (41.7%) gave the highest percentage frequency (Fig. 2). In this case each category could select all the options it considered pertinent.

Looking at OHS risks associated with various sustainable energy sources, wind, solar photovoltaic and solar thermal energy (41.2%) entailed low health and safety risks. Medium risks were identified for geothermal (47.1%), hydroelectric (44.1%) and biomass (38.2%) (Fig. 3). In this case, there were no significant differences between organization types and levels of risk associated with renewable sources; this explains the similar percentage frequency from the various organizations surveyed.

Most of the total sample—70.6%—believed that micro-enterprises would have more problems/difficulties in managing OHS in the green economy.

As regards the adequacy of the current OHS legal framework for specific risks associated with new technologies in the green sector, 38.2% of responders claimed there were still deficiencies; the highest proportions were from trade unions (71.4%) and institutions (57.1%). In contrast, more than 50% of employers' organizations and businesses found no shortcomings. None of the differences were significant. Frequency analysis indicated that the best means to enhance the protection of workers' health and safety in the green sector were to include OHS issues in the early planning and design of plant, materials and equipment (33.8%) and to establish *ad hoc* risk management systems (32.4%). In the first case, the percentage frequency was



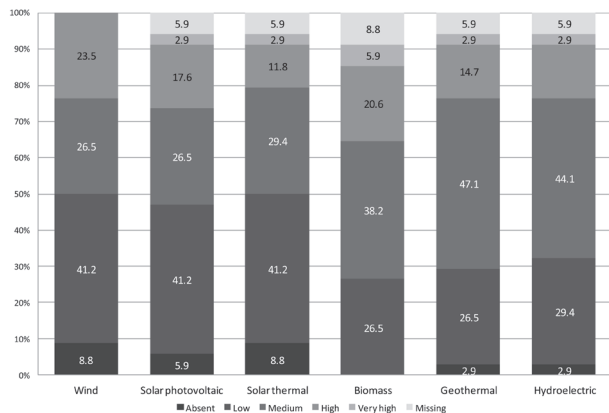
**Fig. 2. Risks more likely to be present in the renewable energy sector than in traditional energy areas: total sample and categories (percentage responses).**

highest among businesses (42.9%); in the second, trade unions (35.7%), institutions (31.2%) and research (46.7%) gave the highest percentage frequency (Fig. 4).

Promotion of OHS culture (79.4%) and investment in education and training (70.6%) were considered the best development strategies for the enhancement of OHS in the green sector, followed by the development of good practice (55.9%), investment in research (47.1%) and incentives to enterprises (26.5%).

Looking closely, the institutions (85.7%), businesses (85.7%) and employers' organizations (83.3%) were those who assigned high priority to promoting an OHS culture as a means of safeguarding workers' conditions in *green jobs*. Research (85.7%), the employers' organizations (83.3%) and the institutions (71.4%) gave high priority to education and training for effectively safeguarding OHS in green work. The other categories—trade unions and businesses—also expressed interest in education and training, as shown by the fact that more than half of them responded.

For good practice from the OHS viewpoint, the trade unions (71.4%) and employers' organizations (66.7%) assigned the highest priority. Incentives to business were given high priority from the OHS angle by employers' organizations (50.0%) and trade unions (42.9%). Businesses tended to consider this item much less important (14.3%); more than half—57.0%—gave incentives medium priority, 28.6% low. The institutions and trade unions, accounting for 57.1% of responses, were the main categories that



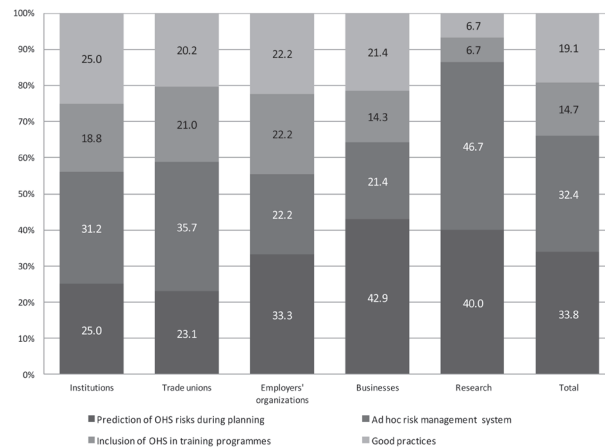
**Fig. 3.** Perception of the level of risk for workers' health and safety in several renewable energy sectors.

assigned high priority to research for improving the health and safety of green workers.

A majority of those interviewed (82.4%, 41.2% of responses) indicated that the “green” skills necessary for the workforce to perform their duties adequately were technical, followed by OHS-related competence (32.4%). Finally, half the responders believed that specific training programs had to be planned by public prevention institutions (such as the Regions, or INAIL) to create adequate green skills; the rest opted more or less in equal proportions for social dialogue and university curricula including OHS issues related to the green economy. Percentage frequency among the other organizational categories showed no significant differences.

### Discussion

As the possible implications of green work for workers' health and safety are an emerging question still involving a certain degree of ambiguity, the present survey employed a method based on a subjective approach, questioning various stakeholders about their perceptions of OHS risk in the green sector. This can be considered the first level of analysis, to obtain information on the level of knowledge about this issue in Italy. The approach based on risk perception, and the sample of stakeholders with a general understanding of OHS, but no detailed knowledge of the emerging risks in the green economy might be the main reasons why the findings differ from the results reported by other groups. Many studies, for instance, found particularly critical OHS points in the photovoltaic sector<sup>30, 31)</sup> on account of the harmful chemicals employed in manufacturing the cells; these include crystalline silica



**Fig. 4.** Main measures to be taken to safeguard the health and safety of green sector workers (percentages of responses for each category).

(x-Si), amorphous silica ( $\alpha$ -Si), cadmium telluride (CdT), copper indium selenide (CIS), gallium arsenide (GaAs). Then in the wind sector<sup>32, 33)</sup> there is the risk of falling from heights and exposure to resins, styrene, solvents, hazardous gases, vapors and dusts.

Despite these limitations, the lack of statistically significant responses (apart from the first question) by the single stakeholders indicates a certain uniformity of opinion. This brought to light quite clearly the main critical points as regards the OHS implications of green work, and pointed to the principal policies to be adopted to safeguard workers' health and safety. A point in favor of the method is that the categories sampled represented various interests in OHS, enabling us to analyze the topic from several viewpoints.

Although the green economy is a matter of current interest, the question of health and safety in the workplace has still not been adequately examined. This is borne out by the low perception of its importance as part of the fair and equitable transition towards the green economy. Italian productive, scientific and political circles are also being slow to analyze possible critical points for workers' health and safety arising with the introduction of new green technologies. This might be a consequence of the stakeholders' medium/low perception of the risks, especially in the renewables industry, which therefore leads them to believe they will be easily managed. Probably they are not fully aware—or not informed—about the risks involved in each of the renewables sectors, as indicated by the number of “no answers” in the questionnaire. The total lack of interest in the OHS aspect of green work by employers' organizations is worrying, whereas businesses and trade unions were

the categories ‘most sensitive’ to the topic. This confirms other investigations that have found the small Italian firms most willing to invest in the green economy<sup>34</sup>.

These findings highlight the need for systematic assessment of the OHS factors involved in any new technology, new product or development process, not only in the early stages but throughout its lifespan; this comprises planning, manufacture, transport, installation, operation, maintenance, demolition and disposal, etc. It will also be essential to foster regular contact between the various disciplines and social partners, so as to ensure OHS is properly integrated into innovative and technological developments, and to generate further knowledge and new skills with a view to identifying future challenges better and the related OHS requirements. Here again, the replies to this survey mirror the results of the main studies to date on this subject<sup>2, 35</sup>.

A top-down approach based on consultation with the stakeholders is probably the most appropriate way to define nation-wide policies to strengthen safeguards for the health and safety of workers dealing with green technologies. The promotion of OHS culture, and education and training will play a decisive role in boosting awareness of the conditions for health and safety of green workers.

To sum up, this survey indicated that one way to ensure what the ILO defines as *decent work*<sup>17</sup> must involve at least three categories: research, education and training, and policy. Research, for example, can identify the risks arising with the introduction of new green technologies and investigate alternative planning methods. Education and training can bring OHS issues into professional and vocational programs. Policy-makers can develop standards on the knowledge of certain OHS features, or on partnerships between health and safety professionals, businessmen, environmentalists, workers, and any other stakeholders.

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