

Labor safety: a comprehensive approach in Colombia's construction sector

Seguridad laboral: un enfoque integral en el sector de la construcción en Colombia

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ABSTRACT

One of the difficulties in the workplace has been ensuring safety measures for workers in the construction sector. Currently, this concept should not be viewed in an isolation manner; rather, it should be understood as part of a global dynamic that determines physical and mental health, economic stability, social justice, and the protection of workers' fundamental rights. The present study proposes an analytical model about the relationship between the concepts of safety in the workplace and human security, focusing on the construction sector in Colombia and randomly compiling various experiences from the department of Santander. A search and analysis of the scientific literature was conducted using databases such as Scopus, SciELO, and Google Scholar, focusing on "human security." The results were processed with VOSviewer, which made it possible to identify relevant trends, authors, institutions, and keywords in the construction field. Based on this analysis, ten fundamental areas linking human security with occupational safety were established. As conclusion, this study, in addition to making visible the nodes and connections that are part of the current labor safety system, it provides a critical perspective on its current limitations, which the construction industry faces.

Keywords: human security; social development; globalization; development; construction.

RESUMEN

Una de las dificultades en el ámbito laboral ha sido garantizar las medidas de seguridad en el trabajo para quienes laboran en el sector de la construcción. En la actualidad no debe verse el concepto de forma aislada; más bien, debe entenderse como parte de una dinámica global que determina la salud física y mental, la estabilidad económica, la justicia social y la protección de los derechos fundamentales del trabajador. El presente estudio propone un modelo analítico sobre la relación entre los conceptos de seguridad en el trabajo y de seguridad humana, centrándose en el sector de la construcción en Colombia y recopilando, de forma aleatoria, diversas experiencias del departamento de Santander. Se realizaron una búsqueda y un análisis de la literatura científica en bases de datos como Scopus, SciELO y Google Scholar, centrados en la "seguridad humana". Los resultados fueron procesados con VOSviewer, lo que permitió identificar tendencias, autores, instituciones y palabras clave relevantes en el ámbito de la construcción. A partir de este análisis, se establecieron diez ejes fundamentales que vinculan la seguridad humana con la seguridad laboral. Como conclusión, este estudio, además de hacer visibles los nodos y las conexiones que forman parte del sistema actual de seguridad laboral, ofrece una visión crítica de sus limitaciones actuales, a las que el gremio constructor se enfrenta.

Palabras clave: seguridad humana; desarrollo social; globalización; desarrollo; construcción.

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Introduction

Safety in the work an important aspect of human security and is considered a key indicator of social well-being and sustainable development. It is not only a matter of preventing accidents or occupational diseases; occupational safety requires a comprehensive model that includes physical, psychological, social, organizational, and regulatory factors. This guide recognizes that workplaces must guarantee not only protection against risks, but also the dignity, stability, and quality of life of workers (Agudelo, 2025).

Working is not only a means of generating resources; it is also a daily space where social bonds are forged, feelings of belonging are generated, life plans are developed, and both personal and collective growth are promoted. The workplace is therefore a determining space for the exercise of rights, equal opportunities, and the consolidation of individual and social well-being. Consequently, ensuring decent and safe working conditions is an urgent task that must be assumed not only by employers, but also by the State and civil society, as part of a comprehensive commitment to social justice and sustainable human development (Sora et al., 2010).

In the framework of the concept of human security proposed by the United Nations Development Programme (UNDP) in the 1990s, employment security is incorporated as a central dimension, closely linked to other fundamental aspects, such as economic security, health, social justice, and human dignity. The model recognizes that the dangers that threaten people are not limited solely to armed conflicts or humanitarian crises (Devia and Hernández, 2017), but also arise from unsafe work environments characterized by precarious conditions, exploitation, discrimination, or chronic stress, factors that directly affect the physical, mental, and emotional integrity of workers (Ortega, 2022). In Colombia, as in many Latin American countries, the construction sector constitutes one of the main sources of employment; however, it is also one of the occupational fields with the highest levels of risk, both due to high accident rates and the frequency of occupational diseases associated with working conditions (Morales et al., 2021).

The present study arises from the need to understand the relationship between two key concepts: on the one hand, occupational safety, traditionally focused on the prevention of accidents and occupational diseases; and, on the other hand, human security, understood as the guarantee of decent living conditions, free from physical, social, and economic threats, and of comprehensive protection of human beings. Based on a literature review of various authors (approximately sixty), both national and international, the extent to which the concepts of occupational risk prevention are aligned with or not with the broader principles of human security is investigated.

The intention is to generate a critical perspective that makes it possible to identify the limitations of the current system, especially in a sector characterized by informality, precariousness, and high workforce turnover. As a result of this analysis, ten fundamental areas based on human security concepts are developed according to the VOSviewer network analysis, with direct application in the construction work environment.

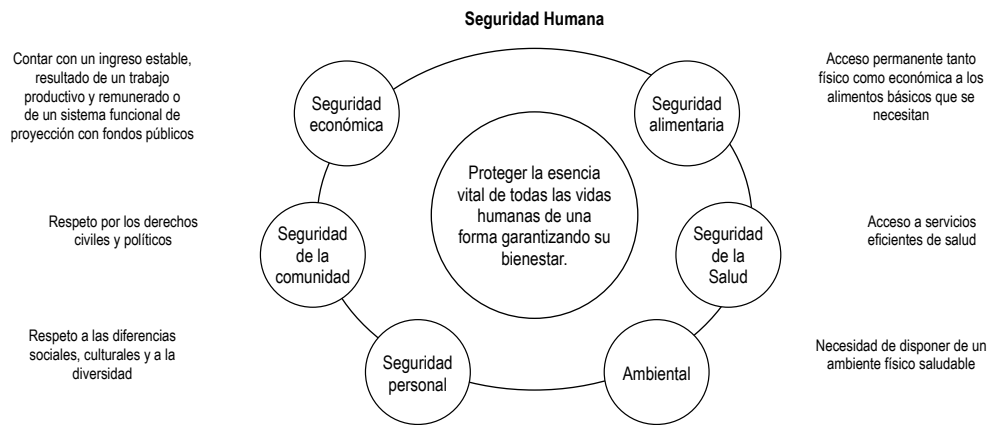
Concepts of human security

Human security is a concept focused on protecting people from threats that may compromise their integrity and overall well-being (see Figure 1). Unlike the traditional term of security, which is framed around the defense of territory against external threats, human security places people at the center of social protection, making it possible to recognize risks arising from territorial conditions such as poverty, violence, social exclusion, and environmental degradation (Fernández, 2023).

By 2030, the Sustainable Development Goals (SDGs) seek to address the issues affecting the lives of millions of people, including poverty, inequality, job insecurity, and the impacts of climate change (Sanahuja Perales, 2019), underscoring the need to build more resilient, just, and sustainable societies (Figure 2).

At the international level, human security has gained significant relevance in the formulation of public policies (Bassedas, 2007). This has made it possible to integrate a philosophical approach that seeks to address

Figure 1
Human security



Source: Adapted from UNDP (1994).

humanitarian and security shortcomings from a comprehensive perspective applied to modern society. In the Agenda, however, these issues have not been resolved in many countries around the world, with the situation in Latin America being critical, including social inequality, access to employment opportunities, urban management, and natural resources (Guarnizo Sánchez, 2017), which are fundamental for building sustainable urban environments.

In the various Colombian regions, the profound social and urban inequalities that characterize many cities in the country have been triggers of problematic urban conditions (Estévez-Suárez et al., 2021) and increased violence in informal settlements, which are often settings of social exclusion, unemployment, and limited institutional presence (Guarnizo Sánchez et al., 2024). These scenarios continue to limit development opportunities for broad sectors of the population. These neighborhoods are subject to social problems such as psychoactive substance use, homelessness (Guarnizo Sánchez et al., 2025), and the proliferation of urban fabrics marked by inequality in terms of transportation, security, and public space.

Figure 2
Sustainable Development Goals



Source: United Nations (UN, 2015).

Most of the population working in the construction sector faces high-risk working conditions, which involve constant exposure to physical hazards and the absence of full labor guarantees (Cantero and Ortiz, 2023). These people face adverse situations in their work environment on a daily basis and live with their families in areas of high physical, environmental, and social vulnerability. Thus, precariousness extends to both the occupational and housing spheres, deepening the levels of exclusion and risk that affect their quality of life and overall well-being.

Regulatory framework

Human security encompasses different related areas, including economic and food security, as well as protection against physical, environmental, and social threats. Since the reconceptualization of the term in contemporary debate (Barcena, 2000) to its practical application in regulations such as the NFPA 101 code (National Fire Protection Association [NFPA], 2021), human security incorporates social, environmental, and structural elements.

Table 1
Human security axiom

Human security axioms		
Title	Definition	Reference
The reconceptualization of security: contemporary debate	The term "security" encompasses a wide variety of interpretations, including concepts such as national security, international security, and collective security.	(Barcena, 2000)
The concept of human security	Human security involves ensuring social protection and prevention. It is based on values that include human rights, good governance, access to education, medical care, equal opportunities, and the full development of human potential.	(Mack, 2005)
Human security: contributions to the reformulation of the concept of security	The Human Security Commission defines human security as the protection of the vital essence of all human lives, with the aim of improving human freedoms and promoting the full development of the individual.	(Aravena, 2006)
Human security: A state of the art	Human security is defined as the protection of essential freedoms, safeguarding individuals exposed to threats and dangerous situations, while strengthening their capacity and human relationships.	(Rojas Aravena, 2012)
The new dimension of international and hemispheric security	Complete physical security would only be achieved when any form of widespread hatred toward others completely disappears.	(Soto Muñoz, 2021)
Citizens and consumers: relevant actors in the human security agenda	Human security is based on expanding the notion of security beyond territorial defense, encompassing the protection and development of individuals.	(Rodríguez and Martínez, 2014)
The international development cooperation system, CIDEAL	Human security is a comprehensive concept that encompasses various interconnected dimensions, such as economic security; food, health, environmental, and personal security; community security; and political security.	(Maoño, 2016)
Human security: securitization of development and threat assessment in the 21st century	The definition of human security involves understanding the internal historical and cultural causes of vulnerability within a specific community, as well as the characteristics of internal threats and the resources available to address them.	(Niño Pérez et al., 2016)
Human security and fire protection applied to R-2 construction projects	Construction should focus on components such as human security and sustainable projects.	(Gómez Contreras, 2016)
Human security: A new approach promoted by the UN	Human security focuses on the universal concern for human life and dignity, promoting a citizen-centered conception rather than a state-centered one.	(Moloeznik, 2002)
NFPA 101: Life safety code	It protects lives and property from natural or human-caused hazards.	(NFPA, 2021)
Climate and security: evidence, emerging risks, and a new agenda	It is a security approach centered on individuals and communities, encompassing conflicts, violence, and social and economic justice.	(Gemenne et al., 2014)
The interrelationship between human rights and the environment from the concept of human security	Human security consists of protecting the vital essence of all human lives, as well as promoting human freedoms and the full realization of the individual.	(Torres and Velandia, 2022)

Authors such as Aravena (2006) and Mack (2005) emphasize the need for people-centered security that addresses both direct and structural threats. In turn, new actors are recognized in the security agenda, such as citizens (Rodríguez and Martínez, 2014); a model is promoted that links this security to sustainable development, climate change (Gemenne et al., 2014), and occupational protection in specific construction environments (Gómez Contreras, 2016). These authors, of great scientific and professional importance, place in context that human security is transversal to the structural formulation of public policies, urban planning, and risk management.

The Occupational Safety and Health Management System in Colombia (SG-SST)

In Colombia, the Occupational Safety and Health Management System (SG-SST) represents a tool that regulates work and the physical, mental, and emotional integrity of employees. Its objective focuses on preventing occupational risks through the implementation of safety policies and practices in work environments (Santana Londoño et al., 2023). For workers, this implies having a framework that ensures safe working conditions, minimizes exposure to hazards, and promotes their well-being and quality of life while performing their duties, as established in the Political Constitution of Colombia (1991).

Table 2
Regulatory matrix of the occupational safety and health management system in Colombia

Regulation	Description	Contribution to the worker
Law 1562 of 2012	Modifies the general occupational risk system and introduces the concept of the SG-SST.	Establishes workers' rights and duties regarding the management of their safety and health.
Decree 1072 of 2015	Compiles the regulations of the labor sector, including everything related to the SG-SST.	Defines the obligation to implement the SG-SST in all companies, regardless of their size.
Resolution 0312 of 2019	Establishes the minimum standards of the SG-SST according to the number of workers and the level of risk.	Allows verification of whether the company complies with basic occupational safety conditions.
Law 1610 of 2013	Strengthens inspection, monitoring, and control by the Ministry of Labor.	Provides workers with tools to demand safe working conditions and report non-compliance.

In the construction sector in Colombia, where risk levels are high, the effective implementation of the SG-SST also directly contributes to improving working conditions across various human dimensions. By reducing the rates of occupational accidents, illness, and absenteeism, not only the health and stability of workers are strengthened, but also productivity and efficiency in companies (Table 2). In this regard, the system acts as a mechanism of social and legal protection, as it requires employers and contractors to comply with specific regulations that safeguard the lives and rights of those who work (Pardo, 2023).

Method

The methodology applied was based on qualitative documentary search and analysis, with the aim of identifying the main trends and approaches related to the concepts of human and occupational safety. For this purpose, scientific databases were consulted. The selected documents were subsequently exported and processed using VOSviewer (van Eck & Waltman, 2010), a specialized tool for the analysis and visualization of bibliometric information that made it possible to identify patterns among various authors, both local and international, at random. For the consolidation of these areas, it is possible to combine relevant terms and establish thematic relationships among the different theoretical and empirical approaches. For this purpose, the Scopus, SciELO, and Google Scholar databases were consulted, selected for their coverage and complementarity.

Scopus was used because it is one of the main multidisciplinary databases of indexed scientific literature, which made it possible to identify high-impact research with international reach. SciELO was incorporated due to its broad representation of Latin American scientific publications, facilitating the retrieval of studies conducted

in regional contexts. Finally, Google Scholar complemented the search by including gray literature, theses, books, book chapters, and technical reports that are not always indexed in commercial databases.

Model matrix design

Based on the authors, the conceptual matrix was designed to integrate ten dimensions of human security (Table 3), each with its concept and related to a specific and critical aspect of occupational safety in construction. The matrix integrates ten fundamental areas that constitute a broad and systemic approach to human security, represented by the formula $HS = Sc * E * A * S * Pc * C * P * A * D * J$, where each component corresponds to factors such as health, education, the environment, culture, politics, among others.

Table 3
Matrix: Dimensions of human security and their relationship with safety

Conceptual matrix: dimensions of human security			
Code	Dimension	Description	Relationship with occupational safety in construction
Se	Social community	Community cohesion: solidarity, trust, mutual support, and participation for emotional well-being and resilience in the face of crises.	Occupational safety fosters trust between workers and employers, strengthens support networks, and improves cohesion among work communities.
E	Economic	Economic stability, access to employment, occupational safety, and equitable opportunities.	Occupational safety in construction is key to stable employment, the reduction of financial risks, and the promotion of sustainable development.
A	Food	Sufficient and stable access to nutritious food, from availability to economic access.	Safe work ensures regular income that allows workers and their families to access adequate food.
S	Health	Access to medical services, disease prevention, and promotion of physical and mental well-being.	Safety at construction sites reduces accidents, protects physical and mental health, and ensures access to healthcare systems in the event of occupational incidents.
Pe	Personal and conflict	Conflict prevention, peacebuilding, and protection of human rights.	Occupational safety prevents labor conflicts and protects the fundamental rights of workers in contexts of high vulnerability.
C	Cultural	Identity, diversity, respect, and preservation of cultural traditions.	The protection of construction workers respects cultural work practices and promotes inclusive work environments.
p	Political	Stability, democratic governance, the rule of law, citizen participation, and transparency.	Occupational safety is linked to public policies and clear regulations that protect workers and promote union participation.
A	Environmental	Sustainable access to natural resources and basic services.	Occupational safety includes sustainable practices and the prevention of environmental risks at construction sites, protecting both workers and the environment.
D	Digital	Technology, internet access, cybersecurity, and data protection.	The digitalization of occupational safety includes real-time monitoring, virtual training, and intelligent systems to prevent accidents.
J	Justice	Equity, respect for human rights, effective legal access, and protection against discrimination.	Occupational safety involves access to justice in the event of accidents or violations of rights, promoting equity in the construction environment.

Analysis of the studies

This research mainly employed keyword co-occurrence analysis, through which VOSviewer identifies the frequency with which certain terms appear jointly in the analyzed documents. Based on this relationship, the tool generates thematic clusters represented graphically by nodes and links, where the size of each node indicates the relevance or frequency of the term, and the proximity between them reflects the strength of their association. This procedure made it possible to identify research trends, recurring concepts, and thematic lines related to university cities, urban planning, student housing, and the production of space.

As a result, bibliometric co-occurrence maps and thematic networks were obtained, allowing the visualization of the relationships among the concepts associated with human security and occupational safety.

Results

Ten network and density map-type graphs are structured to demonstrate the dynamic relationships among the different nodes that make up the analytical areas of human security. These graphs make it possible to visualize how key concepts such as health, the environment, and access to justice, among others, are interconnected, and reveal significant connections among contextual factors that facilitate the interpretation of the levels of adoption, omission, or fragmentation of these concepts in the construction sector in Colombia, based on a total of 60 documents focused on human security (Table 4).

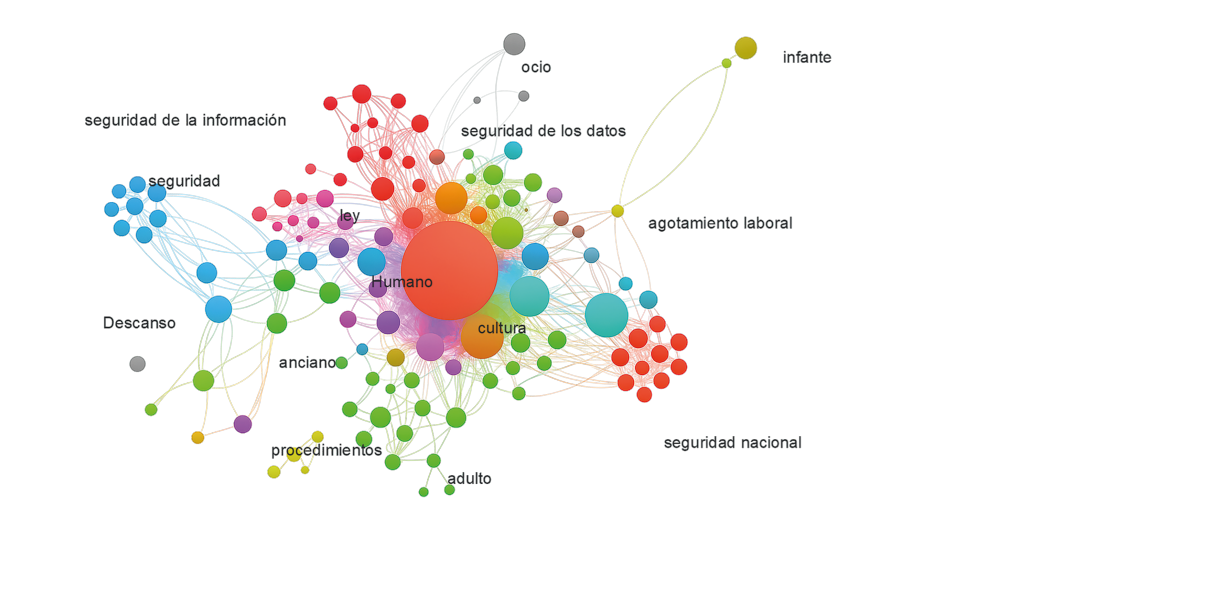
Table 4
Documents analyzed in the literature review

Document type	Quantity	Percentage (%)
Scientific articles	35	58.3
Master's and doctoral theses	10	16.7
Books	5	8.3
Book chapters	4	6.7
Institutional reports	6	10.0
Total	60	100

Social community component

One of the most prominent nodes is “work-related burnout,” closely linked to workload. Burnout resulting from long working hours represents a problem that directly affects workers’ safety. Physical exhaustion reduces workers’ ability to perform their tasks safely; furthermore, it increases the risks of accidents and mental health problems. For this reason, rest becomes an important factor in maintaining a healthy balance between work and the individual, ensuring their mental and physical well-being (Figure 3).

Figure 3
Social community network



The relationship between the “human” and “data security” emphasizes the appropriate learning and management of social media in the workplace. In a digital environment, the threat of an accident resulting from the improper use of mobile devices during working hours is constant. Workers in the construction sector have begun to incorporate technological tools into their daily work practices, such as mobile applications, digital measurement devices, and instant communication systems.

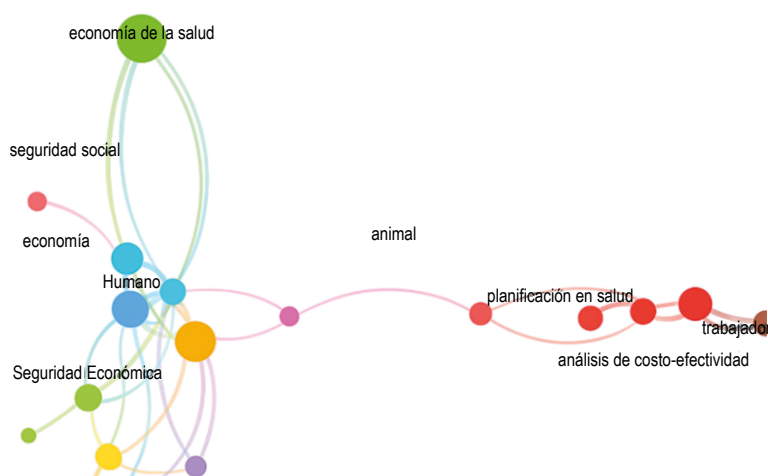
However, some companies have adopted policies that restrict the use of social media in work environments, without differentiating between age groups, in order to prevent distractions that compromise physical integrity, especially in activities that require operational coordination.

Economic component

The “health economics” node has an impact on workers, as it highlights how investment in health resources improves human conditions and reduces costs associated with chronic diseases. The network also shows how social security directly affects the capacity of the State and companies in the construction sector to implement social programs that positively impact the living conditions of workers and their families. Institutions such as the Ministry of Housing, Prosperity Social, and compensation funds facilitate access to health, housing, education, and recreation benefits, as well as subsidies (Figure 4).

Figure 4

Economic security network

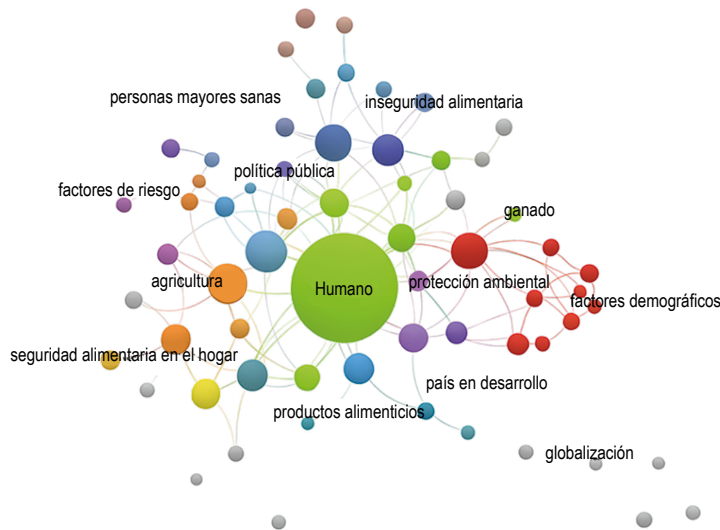


In addition, the inclusion of the term “animal” suggests that human security should also consider environmental aspects, recognizing that animal health may have negative implications for the health of construction workers, such as exposure to animal feces during roof dismantling, insect bites in tropical areas, among other biological risks present in poorly controlled work environments.

Food security component

Around the central node, several important connections can be observed that address aspects such as the fact that “agriculture” is strongly related to “food products,” suggesting that, in Colombia, although it is an agricultural pantry, there are still difficulties in accessing food due to inadequate wages. The connection with “environmental protection” also establishes the responsibility to preserve natural resources and encourage food production in Colombian households. Food security depends on the productive capacity and responsible management of natural resources by local institutions (Guarnizo Sánchez and Contreras Gómez, 2023).

Figure 5
Food security network

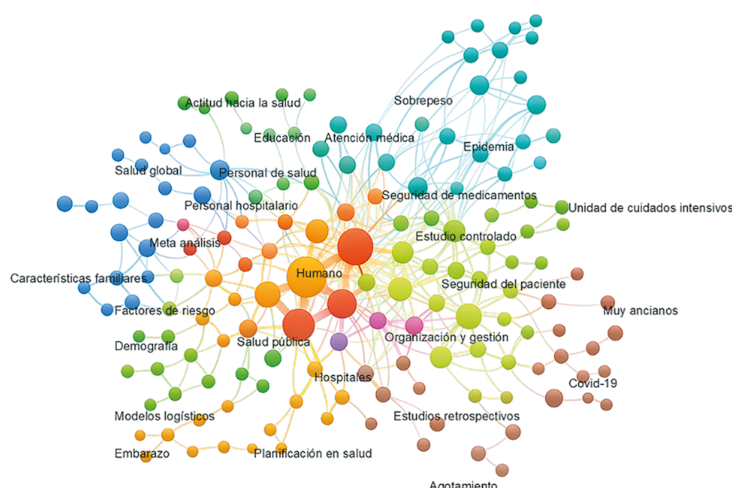


A construction worker with malnutrition may experience chronic fatigue, decreased muscle strength, and an increased risk of injuries, affecting both productivity and safety at the construction site (Figure 5). In addition, at the edges of the network, the concept of a developing country emerges. This condition has perpetuated significant social inequalities, reflected in employment instability, low levels of social protection, and limited opportunities for economic growth for workers in the sector.

Health component

Regarding occupational health, the network highlights terms such as “health personnel” and “burnout,” which are indicators of occupational stress and directly affect safety and performance, especially in sectors such as construction. In addition, the connection between the concepts of patient safety and health personnel safety makes it possible to contextualize the importance of timely care and accurate diagnoses in the occupational health system. These elements directly impact the quality of the services provided to workers, since an incorrect diagnosis or delayed intervention not only compromises the effectiveness of treatment but may also put the patient's life at risk.

Figure 6
Health security network



On the other hand, the inclusion of terms such as “controlled study” and “meta-analysis” indicates that this network also incorporates methodological components, suggesting that case studies are highly relevant in construction companies. A clear example of the relationship between health and the work environment was the emergence of COVID-19, which led to multiple experiences worldwide aimed at establishing protocols for a safe return to working life. The health emergency forced companies to adapt their work protocols to the environment, implementing biosafety strategies, physical distancing, and health monitoring (Figure 6).

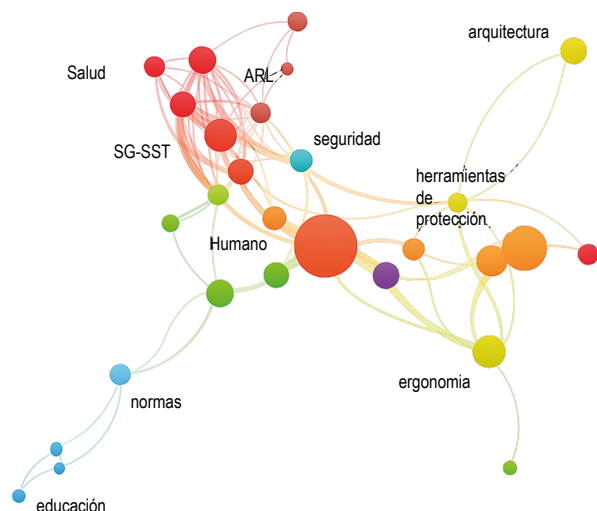
Personal and conflict component

The term SG-SST (Occupational Safety and Health Management System) refers to a set of organized regulations that make it possible to ensure safe working conditions for workers, particularly in high-risk sectors such as construction; it seeks to prevent occupational accidents and diseases through an approach based on continuous improvement. In addition, the relationship between the SG-SST, regulations, and education highlights the importance of having solid legal frameworks, such as Law 1562 of 2012 and Resolution 0312 of 2019, which regulate and promote safe practices in the workplace.

The term architecture refers to the design and construction activity aimed at creating habitable spaces. In this process, various workers who participate in different stages of construction are integrated into the workforce. Their participation occurs at different scales, whether in small-, medium-, or large-scale projects, which demonstrates the direct relationship between architecture as a discipline and the labor dynamics of the construction sector (Figure 7).

Figure 7

Personal and conflict network



Another prominent node is “safety,” linked to concepts such as “protective equipment” and “ergonomics,” thus reflecting that safety depends on the regulations applied and on the implementation of equipment and tool-handling practices to protect workers. In addition, ergonomics emerges as a critical aspect, indicating that tools must be handled efficiently, adapted to the human body, and used in a manner that prevents occupational injuries.

At the edges of the network, concepts such as “regulations,” “education,” and “health” are found. “Regulations” constitute the legal and regulatory frameworks that establish minimum safety and health standards, while “education” is vital for training workers and employers in business practices and equipment handling. Finally, the “health” node highlights that all safety efforts are aimed at preserving and promoting people’s health.

Cultural component

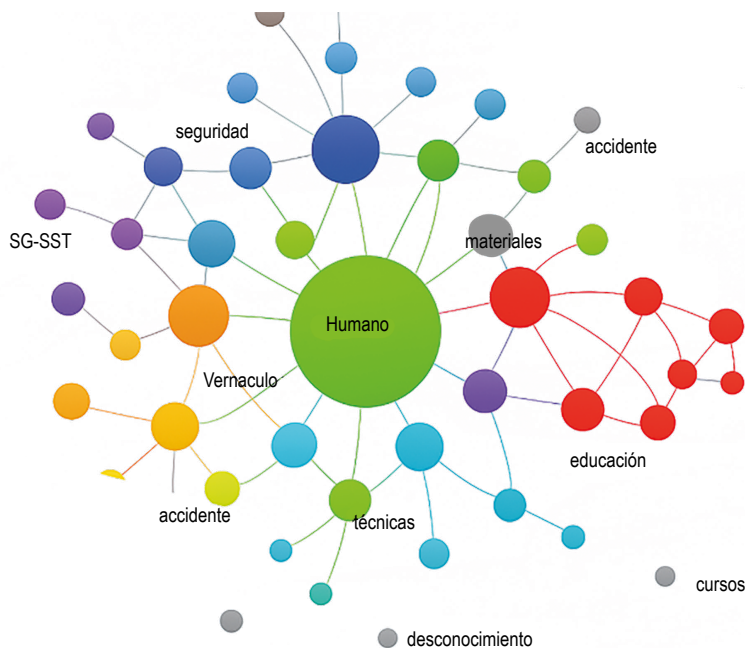
The concept of “vernacular” refers to informal practices specific to workers; when these are not properly monitored by construction companies, they can increase the risk of accidents due to poor practices. On the other hand, “education” is a key factor in reducing empirical practices, since training construction personnel in regulations, procedures, and good practices minimizes occupational risks.

In addition, the connection between the concepts of “materials” and “techniques” makes it possible to consolidate continuous training processes and appropriate resources to strengthen the quality of construction processes and reduce the risks associated with work activities.

The term “accident” and education indicate that a construction worker is at imminent risk: low risk, associated with tasks with minimal exposure to hazards (administrative work on site); medium risk, where there is a probability of minor injuries (handling lightweight materials, use of hand tools); high risk, characterized by frequent exposure to falls, machinery, or heavy loads; and critical risk, which includes work at heights and the handling of hazardous substances. Therefore, there must be ongoing technical training in the prevention of and response to accidents on the construction site (Figure 8).

Figure 8

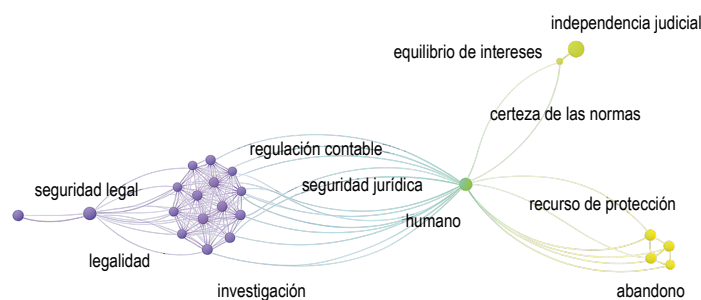
Cultural component network



Political component

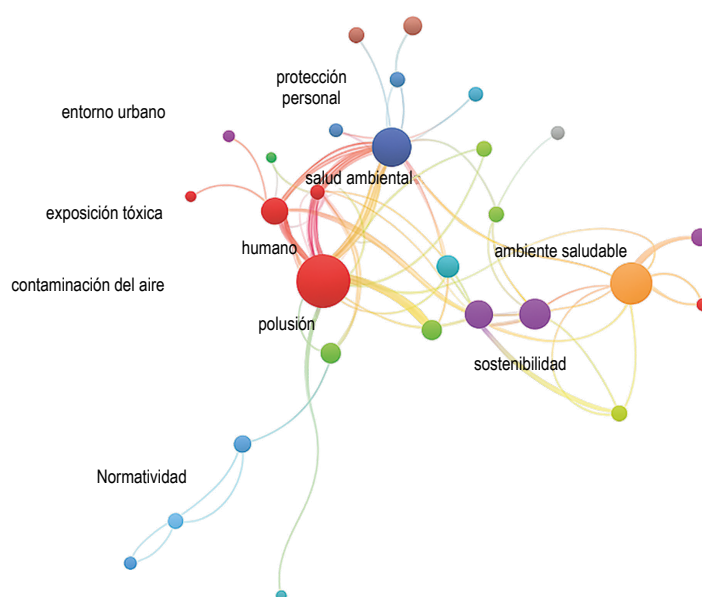
This network figure shows that, although there are various regulations and public policies aimed at protecting workers, only some specifically regulate working conditions in the construction sector. Despite their existence, many of these provisions are unknown to the workers themselves, which increases their vulnerability to irregular or unfair labor practices.

This lack of knowledge may lead to violations of fundamental rights, such as access to social security, safe working conditions, or fair remuneration, which, in turn, leads to litigation and claims before judicial or administrative authorities and, in other cases, to abandonment by the State (Figure 9).

Figure 9*Political component network*

Environmental component

The concept of “health” and the promotion of “healthy” environments are important for workers’ well-being, especially in contexts of high exposure to risk, such as construction sites. These factors make it possible to prevent and control occupational diseases, as well as mitigate risks in work environments that affect the physical integrity of those working in the sector. The proper use of personal protective equipment (PPE), together with effective access to social security, provides guarantees for responding to accidents, diseases, and occupational contingencies.

Figure 10*Health security network*

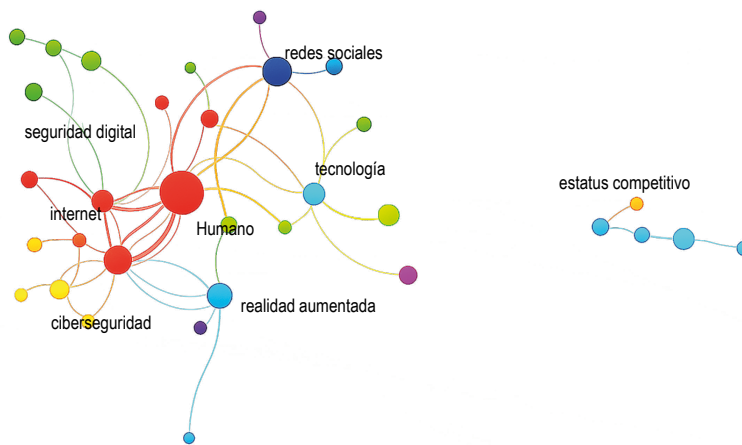
However, construction workers are constantly exposed to various risk conditions that affect their health and safety. These include air pollution generated by cement dust and particulate matter, sudden temperature changes resulting from weather conditions, and direct exposure to toxic substances, such as solvents, paints, gases, and chemical additives, which, if not properly controlled, can trigger respiratory and dermatological diseases and even chronic conditions.

Digital component

Within the digital component, there is a close link to the use of social media and technological platforms that can facilitate communication, training, and management processes in the workplace. However, significant limitations persist in the construction sector regarding access to and effective use of the internet and digital tools for work.

The competitive status in a digitalized society has limited the performance of numerous construction workers, restricting their opportunities for development and their inclusion in more formal and technological work contexts in the country. This can be interpreted as an opportunity for new generations who migrate to other countries in search of better working conditions, allowing them to access more stable, safer, and better-paid jobs (Figure 11).

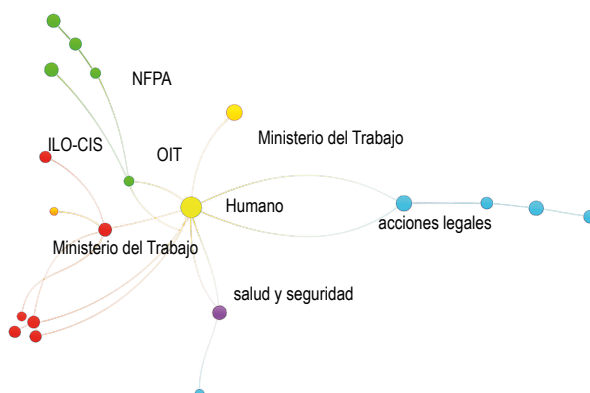
Figure 11
Digital component network



Justice component

There are various legal and institutional mechanisms within the network, both nationally and internationally, aimed at protecting workers in the construction sector. Organizations such as the International Labour Organization (ILO) and state entities, such as the Ministry of Labor in Colombia, have formulated guidelines and regulatory frameworks that seek to dignify employment in this sector. However, in practice, many workers continue to face situations of vulnerability, especially in contexts of informality and lack of knowledge of regulations (Figure 12).

Figure 12
Health security network



Discussions

The results evidence that human security constitutes a concept that transcends the prevention of occupational accidents, by integrating social, economic, health, and cultural dimensions that condition workers' well-being. As stated by the Commission on Human Security, human security seeks to "protect the vital core of all human lives" (Commission on Human Security, 2003), which makes it possible to interpret that occupational safety should be oriented toward the comprehensive protection of people and not solely toward the control of occupational risks.

In the economic dimension, the findings show that access to social protection, education, housing, and health services constitutes an essential component of occupational well-being. This interpretation is consistent with Sen (1999), who argues that "true development consists of expanding the real freedoms that people enjoy." Consequently, economic security should be understood as a condition that strengthens human capabilities and reduces situations of vulnerability (Sen, 1999).

Regarding the food, health, and environmental dimensions, the analysis shows that workers' health depends on factors that transcend the workplace. The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). From this perspective, human security requires integrating prevention, health promotion, and environmental protection actions as interdependent elements to improve workers' quality of life.

Regarding personal security and the cultural dimension, the results show that the implementation of management systems and regulatory compliance alone do not guarantee safe work environments. The ILO states that "a safe and healthy working environment is a fundamental principle and right at work" (ILO, 2022), which implies strengthening training, the adoption of a preventive culture, and organizational leadership to consolidate safe practices.

The political and justice dimensions reveal that the existence of regulations is insufficient when high levels of labor informality and difficulties in accessing social protection mechanisms persist. This finding confirms that human security depends on institutional capacity to guarantee the effective exercise of labor rights, an aspect widely highlighted by UNDP (1994) and the ILO (2022).

Finally, the environmental and digital dimensions show that technological transformation and new environmental risks are modifying the management of occupational safety. Bibliometric evidence confirms that these components are increasingly related to the comprehensive protection of workers, which requires interdisciplinary approaches that integrate innovation, sustainability, and human development. In this sense, human security represents a conceptual framework that makes it possible to understand occupational safety from a broader perspective, where the social, economic, political, environmental, and technological dimensions converge.

Conclusions

Occupational safety in the construction sector can no longer be regarded as a set of technical standards or operational protocols isolated from construction workers. This study has shown that its understanding makes it possible to integrate actions within companies that consider human factors, which make workers important actors in society and in the construction of territory. Worker protection is ensured through the prevention of occupational accidents and the guarantee of dignified and stable living conditions.

Environmental, economic, and food security should be included as essential pillars in occupational matters, considering environmental conditions, access to adequate nutrition, tools in optimal condition, as well as workers' health and productivity. On the other hand, institutional weakness, evidenced by insufficient oversight and impunity in the face of regulatory non-compliance, perpetuates abusive practices, especially in contexts of informality and outsourcing.

Despite regulatory advances in occupational safety and health, a significant gap persists between the legal, technological, digital, and environmental framework currently faced by construction workers in Colombia. The high incidence of informality, widespread lack of knowledge of labor rights, and limited effectiveness of legal mechanisms continue to leave one of the most essential sectors of the construction industry vulnerable.

Finally, it is recommended to consolidate safe work environments and employment guarantees, which require an ethical approach that recognizes decent work as a fundamental pillar for social cohesion and community resilience, in which ensuring workers' safety and well-being represents not only a legal responsibility but also a commitment to social justice and respect for human dignity.

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DEGC conception and design of the article, data collection.

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