

# Areas of Research Interest

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# Introduction

## About HSE

HSE's mission is to prevent workplace death, injury or ill health. Over time, our role has broadened beyond worker protection to encompass public safety assurance on a wide range of issues. These include:

- enabling business to better manage risk for themselves;
- protecting the environment and enabling society to benefit from the appropriate regulation of chemicals;
- ensuring critical national infrastructure functions safely through our major hazard permissioning approaches; and
- our work on cyber security.

The government has also asked HSE to establish a new building safety regulator in the wake of the Grenfell Tower disaster and following recommendations in the 'Building a Safer Future' report<sup>1</sup> by Dame Judith Hackitt. The new regulator will oversee the safe design, construction and occupation of high-risk buildings so that residents are safe and feel safe. It will be independent and give expert advice to local regulators, landlords and building owners, the construction and building design industry, and to residents.

## Science, Engineering and Evidence (SEE) in HSE

SEE underpins HSE's risk-based, goal-setting regulatory regime. This ensures our approach to risk management is effective and proportionate, so that workers are protected and the public is safeguarded while enabling productivity, innovation and growth.

HSE's strategic approach to SEE focuses on practical problem-solving, drawing on the synergies between our regulatory, engagement and policy work. As the world of work changes, there is a continuing need for research on a wide range of topics to develop the evidence base for understanding and controlling current and emerging risks.

HSE's portfolio of strategic SEE work is divided into priority hubs. These have been identified following engagement with HSE policy, regulatory/enforcement and SEE specialists and are as follows:

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<sup>1</sup>

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/707785/Building\\_a\\_Safer\\_Future\\_-\\_web.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707785/Building_a_Safer_Future_-_web.pdf)

- [The right evidence for the future;](#)
- [The impact of social and workplace change on the health and safety of the future workforce;](#)
- [The right intervention strategy for the British industrial asset base;](#)
- [Taking responsibility for health at work;](#)
- [Lessons learned from investigations;](#)
- [Regulatory frameworks which are fit for the future;](#)
- [Enabling Society to Benefit from the Appropriate Regulation of Chemicals;](#) and
- [Construction and Building Safety.](#)

Collectively the hubs help ensure that:

- we address SEE intelligence needed to underpin HSE’s regulatory activities, including incident investigations and enforcement;
- we maximise the impact of SEE on the health and safety system; and
- we address potential future changes to the world of work, and likely implications for HSE and the wider health and safety community.

The COVID-19 pandemic has presented fundamental challenges to our society, economy, and ways of living, which have had considerable impact on the state of the nation. The long-term response to and recovery from these challenges must be informed by the best evidence, by engaging with the right stakeholders, at the appropriate time and HSE is fully involved in ensuring that this happens.

As part of this work, HSE has contributed to the Rebuilding a Resilient Britain programme of work, which was launched in July 2020 by the Government Office for Science under the leadership of the government’s Chief Scientific Adviser, Sir Patrick Vallance; to bring together researchers, funding bodies and policy makers to identify existing evidence, on-going research and recognise research gaps relevant to recovery from the pandemic, leading to the development of a set of cross-cutting areas of research interest (ARIs). A set of reports has now been published including: a summary report<sup>2</sup> (with the nine individual working group reports hosted by Universities Policy Engagement Network - UPEN<sup>3</sup>); a report summarising the evidence gaps and key research questions<sup>4</sup> from

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<sup>2</sup> <https://www.gov.uk/government/publications/rebuilding-a-resilient-britain-summary-report>

<sup>3</sup> [https://www.upen.ac.uk/go\\_science/](https://www.upen.ac.uk/go_science/)

<sup>4</sup> <https://www.gov.uk/government/publications/evidence-gaps-and-knowledge-exchange-opportunities>

across all nine working groups; and a report on the key data and evaluation<sup>5</sup> research and evidence gaps.

As part of Build Back Better<sup>6</sup>, we will support the delivery of the government's 10-point plan for a green industrial revolution and a safe transition to a carbon neutral economy.

## Addressing future research needs

In this document, HSE has identified and outlined the forward-looking research that helps to ensure, within an ever-changing world, that it remains a modern, enabling regulator, within one of the most successful health and safety systems in the world.

This is a high-level summary of our wider research interests, presented as ARIs, which either HSE or other organisations – sometimes working in partnership – could usefully address. HSE's Shared Research Programme<sup>7</sup> supports external investment and collaboration in HSE's research portfolio. This allows resources and expertise to be shared for the benefit of all.



**Prof Andrew Curran**

**HSE Chief Scientific Adviser and Director of Research**

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<sup>5</sup> <https://www.gov.uk/government/publications/data-and-evaluation-areas-of-research-interest-across-government>

<sup>6</sup>

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/96840/3/PfG\\_Final\\_Web\\_Accessible\\_Version.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/96840/3/PfG_Final_Web_Accessible_Version.pdf)

<sup>7</sup> <https://www.hse.gov.uk/aboutus/shared-research-programme.htm>

# The right evidence for the future

## Overall aim

To develop the existing system of ongoing data collection, analysis, interpretation and result dissemination so that it continues to support HSE's current priorities and prevention strategies and is flexible enough to adapt to change.

HSE's work is underpinned by robust scientific evidence. Our evidence base needs ongoing updates to reflect the rapid and complex changes in the workplace, workforce, working patterns and working environment and, as a result, the changes in HSE's priorities and intervention strategies. To ensure that our evidence-gathering systems continue to be effective and efficient – not just fit for current priorities and intervention strategies, but flexible enough to meet future challenges – we need to make our evidence base coherent, strategic, future-proofed, and focused on priority areas.

*Questions arising within this area of research interest include:*

### On the use of evidence to understand the future better

How should we use evidence to identify the major changes in the work environment that will impact on health and safety risks - and how these changes may interact?

How can we use evidence better:

- to understand the nature and extent of future health risk exposures in British workplaces; and
- to inform the reduction of new cases of work related ill-health?

### On the use of evidence about interventions

- How do we know what is the best available evidence on which interventions have been – or will be – effective:
  - to support planning, monitoring and evaluating our interventions;
  - to assess whether our interventions will work;
  - to assess the impact of our interventions in the short, medium and long term; and
  - to monitor early changes following our interventions and provide timely feedback to improve them?

## On methodology

- How can we make more effective use both of existing and new data and analytic methodologies to generate the intelligence to support our decision making e.g.:
  - to include the right groups when developing evidence (e.g. workers and their representatives);
  - to update the reference data, processes and criteria used in risk-based decision making;
  - to ensure that hazard identification and consequence models are validated for new technologies and new ways of working; and
  - to incorporate new digital approaches?

# The impact of social and workplace change on the health and safety of the future workforce

## Overall aim

To identify health and safety hazards and risks arising from change in the GB workforce and their work.

A future health and safety challenge is how to manage the risks from changes in the workforce and their work. The aim of this science hub is to identify emerging hazards and risks arising from these changes, including consideration of the interaction between social changes, and changes to the work environment and work organisation.

*Questions arising within this area of research interest include:*

## On the inclusive workforce

- How is social change impacting on change in risks to workforce health and safety (e.g. ageing workforce, precarious work, remote work, incidents of work-related violence and aggression)?
- How are the prevalence and characteristics of vulnerable workers changing (and in what ways is social change impacting on the number of working carers, age and gender profile of the workforce and those working with disabilities)?
- What are the indicators that risk attitudes and/or behaviours are likely to change in the future: and for which groups of workers are they likely to change?
- How competent are managers and supervisors in supporting and managing: flexible and remote working; psychological ill-health; those with disabilities; carers; and multigenerational workforces. What information and training is required?
- What risks arise from lack of employer competence in engaging with, communicating with, and managing those who work virtually and/or remotely?

## On inclusive work

- How do inequalities in opportunity for flexible working vary across sectors and different groups of workers: what are the health implications for different groups?

- What knowledge and understanding do we have about the implications of changes in working patterns and the way in which work is organised (e.g. fatigue and shift patterns): what more do we need to know?
- What are the longer-term trends in home working and what are the best ways to minimise the risks of homeworking to health and safety?
- How do we ensure that working from home does not contribute to gender inequalities in work-related ill-health?
- What are employers' attitudes to implementing effective workplace mental health accommodations and interventions, and how could barriers to implementation be overcome?
- How do we ensure responsibility for health at work for those with multiple jobs?

### **On the interaction between the workforce and their work**

- What risks arise from the interface between humans and machines/technology and how do we manage these?
  - What are the risks from workers 'watching' or monitoring technology doing a task, compared to 'doing' a task themselves?
  - What are the risks of using technology to monitor and supervise remote workers?
  - How do human response and risk factors change in instances where technology/automation influences work rate and/or work intensification?
  - What are the implications of workers becoming de-skilled by technology?
  - Do individuals have the right skills to deal with situations where the technology goes wrong?
- How are the prevalence, and experiences, of good work changing for different groups of workers? What factors are driving this (e.g. wider social change, changing work practices and work organisation) and what impact is this likely to have on future health and safety?
- What are the longer-term trends and health and safety impacts of continued social distancing on working patterns and practices for different groups?

### **On interventions**

- Which interventions best support health equity and equality across different groups of workers, including those with health conditions and/or disabilities and/or caring responsibilities?
- How do we ensure that the health and safety of those with existing ill-health conditions is not disadvantaged at work?

- How do we address poor job quality? Which interventions improve job quality for different groups of workers: what are the barriers to good work and how do we overcome them?
- How do we help industry plan and manage the risks from changes in the workforce and the work they do?

# The right intervention strategy for the British industrial asset base

## Overall aim

To develop our understanding of initial and ongoing integrity considerations with respect to how the performance of materials and structures change over time, and the role key stakeholders (e.g. designers, manufacturers, operators, etc.) play in managing risk and maintaining safe operations.

Our work in this area supports all industrial sectors across Great Britain, including the many highly specialised industries which are strategically important to the country's economy and social infrastructure. These include oil and gas, chemicals, explosives, mining and the bioeconomy, and all operating assets within the major hazards sector.

*Questions arising within this area of research interest include:*

### On materials and structural integrity

- How the performance of materials and structures changes over time, whether this can be accurately predicted and measured in service and how this impacts the thresholds for safety (remnant life etc.)?
- How can we ensure evidence is used appropriately for completing effective safety checks, calibration and testing requirements for existing and new materials and structures?

### On technology design and manufacture

- How can designers and manufacturers contribute to incorporating improvements in occupational health and safety?
- How do we ascertain what evidence is needed about the use of new technologies - e.g. new and emerging energy technologies, use of novel materials, new manufacturing processes, etc. - to develop an appropriate, effective strategy?
- How do we ensure that technological advancements serve to maintain or improve existing levels safety and do not present additional risks (either immediate or latent)?

### **On the safe operation of industrial assets**

- What will the future industrial asset base look like and what will be the key health and safety challenges?
- How can we ensure that the asset base is robust enough to reduce the likelihood of low frequency, high impact catastrophic events?
- How do we identify the key long-term challenges and threats to the current ageing asset base?
- Where applicable, how do we know assets can operate safely beyond their original design life?
- How do we know the original design life remains valid in the face of changing use and creeping change?
- How do we identify what role human factors play in the effective operation or failure of the asset base?
- How can we ensure that the health and safety challenges presented by repurposing and decommissioning are appropriately addressed?
- How can we ensure that repair and replacement strategies and the technologies used are suitable?

# Taking responsibility for health at work

## Overall aim

To increase understanding of the extent, harm, costs and preventability of occupational ill-health.

We will identify and develop the evidence necessary for HSE to implement its Health and Work Programme, and more widely, to help people in the health and safety system take greater responsibility for health at work. The Health and Work Programme will focus HSE's major efforts on those conditions that are widespread, have life-limiting or life-altering impacts, and those with the greatest economic consequences. Stress, musculoskeletal disorders (MSDs) and occupational lung diseases (OLDs) are foremost among these.

*Questions and identified needs arising within this area of research interest include:*

### On the nature of ill-health at work

- As workers often have multiple complicated health conditions that may interact with each other, how do we develop our understanding of what related ill-health looks like in real workplaces?
- How do work and non-work factors - i.e. the impact of work on health and of health on work - interact and influence chronic health conditions? How can these be optimised to enable continued work where this is needed or wished for?
- What are the impacts and consequences of work-related ill-health on individuals and society, including human costs, costs of ill-health and impacts upon productivity and employment?
- How will the future burden of occupational disease be influenced by new ways of working, new materials and demographic changes, such as an ageing and a more sedentary workforce? In particular, what risks do the longer-term trends in remote working pose to musculoskeletal and psychological health and what are the best ways to minimise these?
- How do we identify new and emerging health risks before they become health problems?

### On people's understanding about health at work

- Identify and develop the evidence needed to help people in the health and safety system take more effective responsibility for health at work.

- How do workers' attitudes and awareness of workplace health hazards influence their behaviour and affect their risk of occupational disease? In particular, does raising awareness lead to changes in behaviour and reduced exposure to risks?

### **On exposures and risk factors**

- Understanding current occupational exposure levels (chemical, biological, particulate, ergonomic and psychosocial), how these best controlled and whether improvements being made.
- Improving characterisations of exposure-responses and other risk factors including the application of wearable sensors, Exposome, health informatics and other innovative approaches to achieve this.
- How can we better understand the nature of exposures that cause ill health, in comparison to those that are known to be safer?

### **On interventions**

- Designed interventions or natural experiments that demonstrate primary prevention, i.e. a reduction in causation, or reduced re-occurrence of chronic health conditions, e.g. through effective return-to-work strategies.
- How can employers and employees monitor their health and better utilise such information to improve control of occupational health risks, especially musculoskeletal and mental health?
- Identification/demonstration of interventions that enhance well-being at work, especially reducing work-related stress, and make positive contributions to mental health.

# Lessons learned from investigations

## Overall aim

To equip ourselves with new insights into the reasons why particular failures in health and safety occur.

We will maximise the generation of lessons learned insights from our routine sources of health and safety data, and use these lessons across HSE and the wider health and safety community. Benefits will include the development of more effective, targeted risk control strategies and guidance provided to industry. There will be opportunities for us to better engage with, and influence, stakeholder groups, particularly SMEs.

*Questions arising within this area of research interest include:*

- What are the best methods by which knowledge generated through our incident investigation activities (for both safety and health) are captured and recorded?
- How can we develop approaches for storing outputs from our investigation activities that will maximise the ability for re-use?
- How can we make best collective use of the stored knowledge to inform measures designed to prevent failures in health and safety from occurring?
- How do we ensure the intelligent use of the entirety of the knowledge gained (both tacit and explicit) from our investigation activities?
- How can we improve the sharing of knowledge, insights and learning, across the wider health and safety system?
- How can we capture and make best use of the lessons learned from other significant events to help inform the health and safety system?

# Regulatory frameworks which are fit for the future

## Overall aim

To further develop understanding of the current and future world of work to ensure that our regulatory approach remains suitable and sufficient, including where our regulatory interests extend beyond preventing harm to workers, e.g. covering assessment of potential adverse impacts of chemicals on the general public, consumers and the environment.

HSE has undertaken an extensive review of health and safety regulations and simplified the regulatory framework, making complying with and understanding legislation easier. We will continue this work, ensuring science, engineering evidence and analysis underpins and contributes significantly to meeting the government's better regulation agenda and Business Improvement Target.

*Questions arising within this area of research interest include:*

- How do we ensure that our regulatory approach can accommodate future trends in work demographics, working patterns, new technologies, health hazards and new uses for old substances?
- How we identify in the future who it is that owns the 'risk' in an increasingly complex workplace?
- What alternative regulatory models, interventions and instruments could improve/encourage innovation and improve health and safety outcomes whilst minimising regulatory burdens?
- How do we know we have sufficient evidence to support an effective and efficient approach to regulatory policy and risk assessment, e.g. for the management of existing, new and emerging health risks from chemicals and to enable their safe and sustainable use?
- How do we ensure that deregulation supports safe working practices, and does not create or increase risks?

# Enabling Society to Benefit from the Appropriate Regulation of Chemicals

## Overall aim

To ensure that our approach to regulating chemicals and microbial control agents:

- Is effective, efficient and agile, reflecting current and developing scientific understanding and technical knowledge.
- Reinforces our position as an internationally influential regulator.
- Enables society to derive the benefits of access to safe and sustainable use of chemicals; and ensure there is no harm to workers, bystanders and consumers or unacceptable effects on the environment.

*Questions arising within this area of research interest include:*

- How do we ensure that our regulatory approach can accommodate future trends in new technologies and health and environmental hazards?
- What alternative regulatory models could encourage innovation and minimise chemical use and regulatory burdens?
- How do we ensure we have sufficient evidence to support an effective and efficient approach to regulatory policy and risk assessment to enable the safe and sustainable use of chemicals?

# Construction and Building Safety

## Overall aim

To enable strategic and transformative advances in health & safety across this diverse sector through technology and innovation associated with the construction industry of tomorrow and new opportunities and risks arising from it; and

To underpin the new regime for building safety with evidence based regulatory approaches and effective oversight across the whole built environment; and to inform building safety standards and guidance development and develop effective strategies to build sector competence.

*Questions arising within this area of research interest include:*

## On Foresight

- **A changing world of work:** How is the work environment changing across the diverse construction and building safety sectors and what are the health and safety implications in five key areas; construction project drivers, working conditions, employment conditions, demographics, and health & wellbeing?
- **Modern Methods of Construction (MMC):** How is the MMC health and safety risk profile of a building or asset different through its life cycle (from design and build through occupation, refurbishment and demolition) compared to more traditional construction methods and what are the opportunities to maximise risk reduction at the design stage? How might new techniques of construction be assessed to maximise the benefits of innovation whilst ensuring a proper emphasis on building safety?
- **Enabling Technologies:** How are new and emerging technologies being adopted across the diverse construction/building safety sectors currently ( e.g. emerging energy technologies including net zero developments, use of novel materials, new manufacturing processes, etc) and which emerging innovations are considered most viable (e.g. wearables, smart assets, site monitoring, exoskeletons, drones, etc) and likely to become mainstream and transformative. What are the H&S implications of their mass adoption including implications for effective regulation and appropriate intervention strategies?

## On Regulatory Approaches

- **A changing legislative environment:** How are existing and potential new regulators, duty holders and other stakeholders responding to legislative developments and what

are the implications and opportunities for policy and regulatory approaches to engage effectively to secure improved health & safety outcomes?

- **Digitisation:** How can digital innovation and technologies be effectively harnessed to better share, use and structure health and safety data in a way that best informs health and safety decisions during the design, construction and use of an asset or building?

### On Oversight

- **Metrics and benchmarking:** For the new building safety regime in particular, how can we set performance benchmarks for building control bodies in the absence of meaningful data; and more generally across building safety and construction, how can we shift duty holders towards adopting leading indicators to measure, track and drive improved health & safety performance e.g. as an integral part of a construction/refurbishment project and its value profile across the full life cycle of the built asset.
- **Leading Indicators:** Which construction metrics are providing the best leading indicators for health and safety performance on projects across the different sectors and for employers of different sizes?

### On Competence

- **Building competence:** What is the opportunity to transfer knowledge into and across the diverse construction and building safety sectors to build competence levels aided by appropriate benchmark standards.
- **Measuring competence:** What systems and processes exist currently to build and assure competence levels, how are these arrangements measured for success and how do they compare in terms of their effectiveness? How else might the sector and the regulators be able to measure competence and use this to drive improvements in competence forward over time?

## Contact for further information

Simon Armitage

Head of Science and Engineering Profession (HoSEP) Business Partner

Email: [simon.armitage@hse.gov.uk](mailto:simon.armitage@hse.gov.uk)



## Further information

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