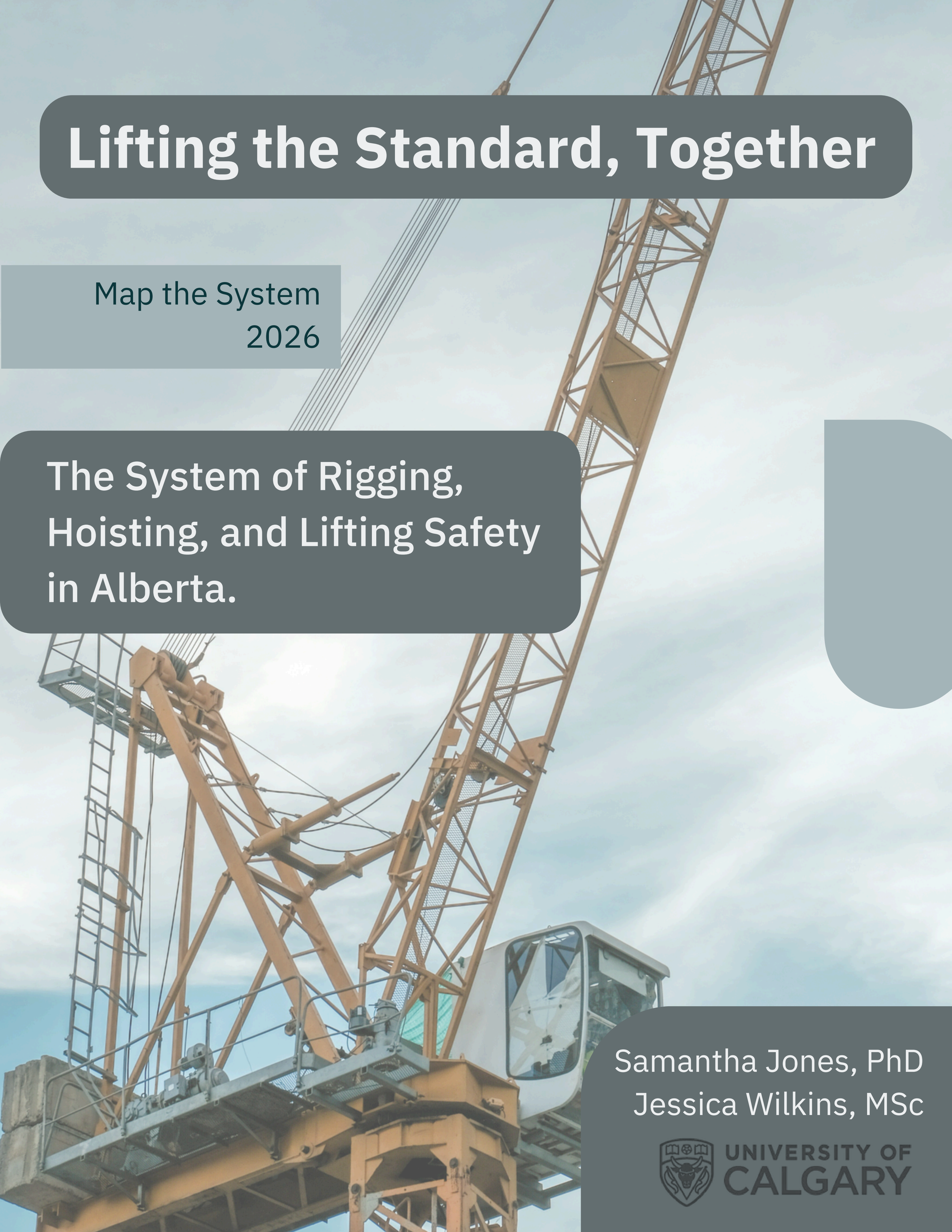

Lifting the Standard, Together

Map the System
2026

The System of Rigging, Hoisting, and Lifting Safety in Alberta.

Samantha Jones, PhD
Jessica Wilkins, MSc
UNIVERSITY OF CALGARY

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Acronyms

- AIT: Apprenticeship and Industry Training
- ASME: American Society of Mechanical Engineers
- CHRSC: Canadian Hoisting and Rigging Safety Council
- CS: Creative Sentencing
- CSA: Canadian Standards Association
- HOP: Human and Organizational Performance
- ID: Identification
- ILM: Individual Learning Module
- NAIT: Northern Alberta Institute of Technology
- OHS: Occupational Health and Safety
- RARE: Restricted Activities with Regulated Education
- RHL: Rigging, Hoisting, and Lifting
- SAIT: Southern Alberta Institute of Technology
- SCC: Standards Council of Canada
- SME: Subject Matter Expert
- WCB: Workers Compensation Board

Positionality

“

I am a Postdoctoral Scholar at the University of Calgary, specializing in Industrial/Organizational Psychology. Over the last two and a half years, I have applied my expertise and passion for protecting the safety of my friends and family to worksites in Alberta. I have worked extensively in collecting and analyzing the primary data presented in our analysis and have spent close to 50 days on site learning from frontline workers. My immersion in the data and the lived experience of those affected by rigging safety influences my perceptions of the system, and has been managed by checking in with non-experts, those with lived experience, and by adopting a Beginner’s Mindset.

Samantha Jones, PhD
Postdoctoral Scholar

“

I am a Researcher at the University of Calgary, specializing in Human Factors Psychology. With a partner who works in high-risk oil and gas sites, understanding safe work practices has become not only an important part of my research but also something quite close to home. I’ve spent over six weeks on mining sites interviewing and surveying workers to understand their perspective of how safety is felt and enacted. Connecting with the people who do the work has made me fully appreciate the lived experiences of those affected by unsafe rigging and lifting practices, including the families of those who the system has failed.

Jessica Wilkins, MSc
Researcher

Introduction

"[He] believed strongly in doing things properly, safely, and with respect for the people around you. Training, standards, and accountability mattered to him because he understood that in this industry, the smallest details make the biggest difference. ***He cared about the people beside him, and he cared about everyone going home at the end of the day****."*
- Occupational fatality widow

Last year in Alberta, 170 people died from occupational causes, the highest rate in 10 years[1]. Of these deaths, 31%, an increase since 2022, were due to traumatic occupational incidents where someone went to work to do a good job, take care of their family, contribute to their community, and never came home[1]. Further, 485 near-misses with fatality potential have been reported since 2019 in public sources[2], while researcher datasets suggest that number may be doubled due to unreported incidents[b].

Of these potentially fatal incidents, 10% are directly related to RHL activities while 42% are related to being caught or struck-by equipment, which often involve RHL indirectly[2]. OHS fatality reports suggest up to 32%-49% of fatalities since 2009 involve RHL activities[3], higher even considering underreporting[4].

RHL activities are the planning, setup, and movement of loads using cranes, hoists, or other lifting devices, including attaching rigging to safely raise, lower, or position materials or equipment.

Introduction

RHL activities warrant examination because they are underexamined in academic literature[5] and are concentrated in Alberta's mining and oil sands sectors, where they significantly contribute to occupational fatalities. Beyond the loss of life, traumatic occupational incidents create substantial long-term health, social, and financial consequences for surviving families[6,7,8].

Communication, timeliness, and transparency of a company's response influences families grieving and perceived justice[9]. Organizations are also affected by reputational harm, decreased workers morale, and revenue loss[10,11].

Oil production has doubled since 2005 and Alberta produces ~83% of Canada's oil[12]. Alberta produced 61% of Canada's total natural gas production in 2023[13].

Alberta mining fatality rates persist and even continue to rise despite existing regulation[14], educational institutions, and numerous safety associations and training companies. Combined with the documented ripple effects of occupational deaths, it is apparent that a system influences RHL activities in Alberta and, despite best efforts to protect workers, is "drifting towards failure"[15], with continued loss of life as a consequence.

Purpose Statement

Our project seeks to understand, document, and unpack the system that defines accepted RHL practices on mining sites in Alberta*, identify systemic structures that contribute to RHL-related traumatic workplace deaths, and explore leverage points for effective solutions to create sustainable change.*

Research Methods & Data Sources

Primary Data

We leverage qualitative[a] (359 SME interviews and two community events) and quantitative[b] data (4,761 survey responses) collected between 2024-2025[16] on the human and organizational factors impacting safety. We also spent over 100 days on mining sites observing RHL processes. Given this immersion, we held a session with external organizational effectiveness SMEs to activate a beginners mindset[17], integrating their ideas into our final analyses.

To protect the confidentiality of our research partners, we have removed names and company affiliations. All data were collected with research ethics board approval. This mixed methods approach[18] gave us insight into frontline workers' lived experiences and the systems shaping safe RHL activities.

Secondary Data

We explored academic literature on risk taking, human factors, and safety systems, WCB and OHS reports, OHS legislation, best practice guidelines, news articles, and occupational health newsletters and magazines. We draw mainly on mining literature while also considering findings from other high-risk industries.

Link to Systems Map in Kumu

[a] Conclusions derived from conducting thematic analysis[19] with qualitative data.
[b] Conclusions derived from quantitative data analyses (e.g., frequencies, means and standard deviations, correlations).

Challenge Landscape

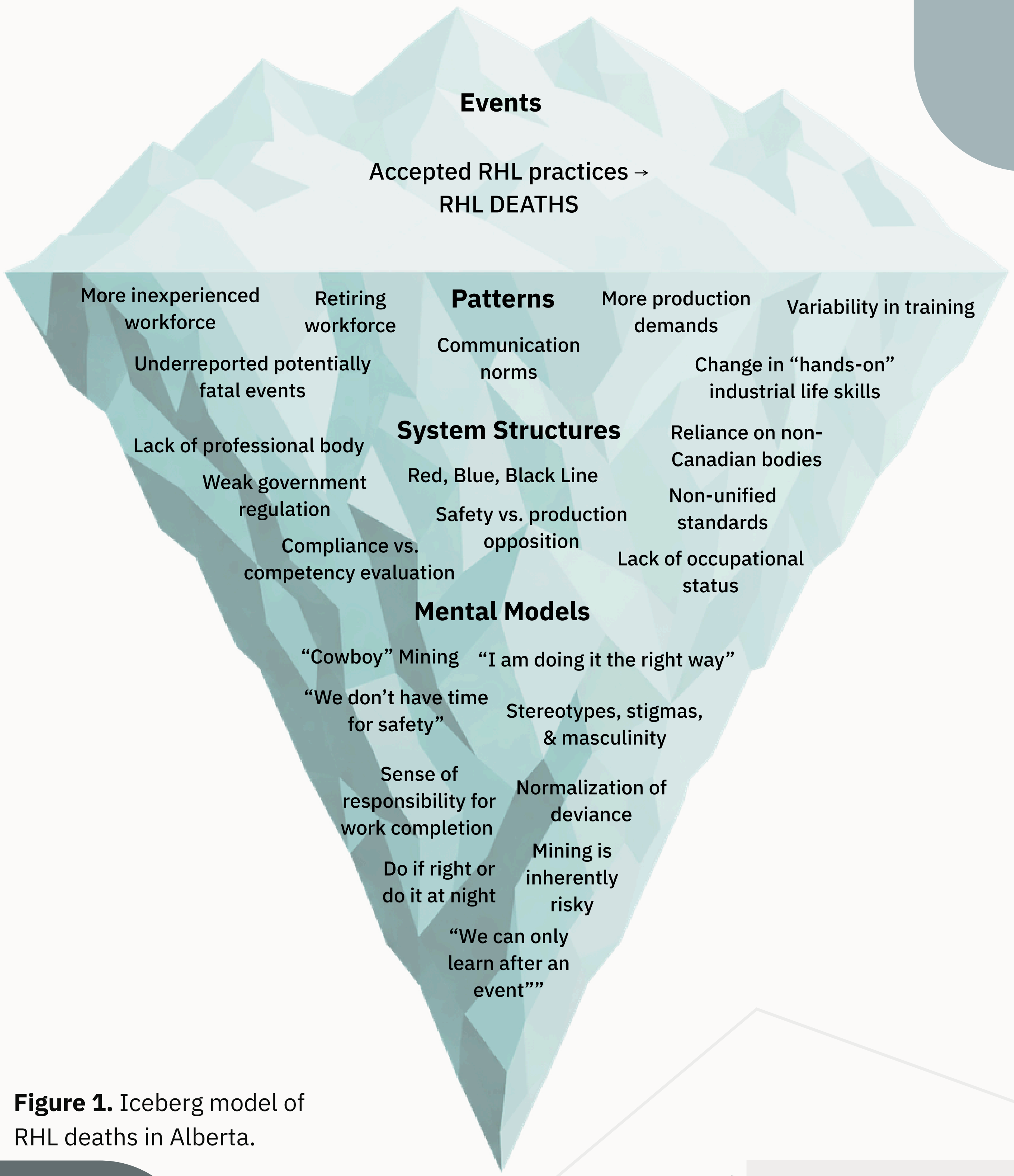


Figure 1. Iceberg model of RHL deaths in Alberta.

Root Causes

Root Cause 1. Economy (B1)

"They say that safety doesn't have a price, but it probably does."[a]
-Frontline worker

Employers spend an estimated $4433 annually per worker on occupational health and safety[25] .

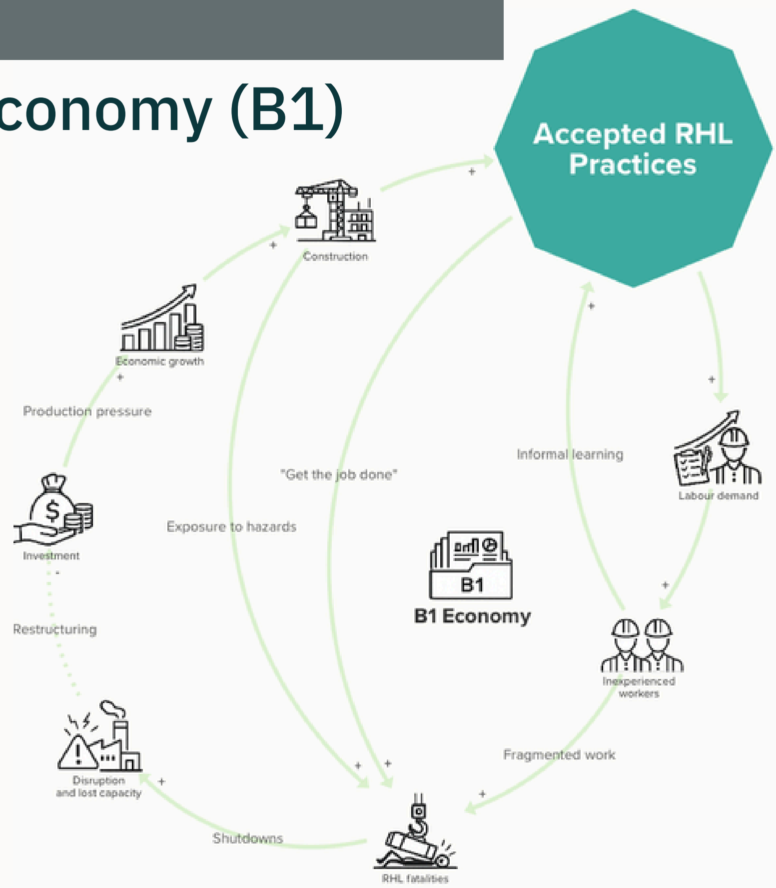


Figure 2. Balancing feedback loop of economy.
Click here for Kumu map.

RHL activities are closely tied to the global extraction economy's boom-bust cycles. High demand drives investment, increasing demand for scarce RHL labour, resulting in more inexperienced workers on site[20]. The relationship between high demand and safety is less clear, as injury rates may go down in mining but increase in other related sectors, indicating safety in RHL may reflect the resilience of the system rather than risk alone[21].

Recessions with layoffs may reduce worker exposure to hazards, but can also compromise workplace safety strategies. Simultaneously, job insecure workers may be less likely to report incidents, further decreasing safety investment[22,23,24].

Overall, this supply-demand cycle acts as a balancing feedback loop: booms amplify labour demand and production pressure, while busts weaken reporting and safety strategy. Over time, this loop can contribute to accepted RHL practices that justify unsafe behaviours to "get the job done"[21,23].

Root Causes

Root Cause 2. Reliance on Extraction Energy

Alberta's total energy demand was the largest in Canada in 2020 and the highest per-capita. Oil and gas accounted for 75% of total demand, combined with natural gas and petroleum products accounting for 90% of fuel consumption[13].

In a province structurally reliant on extraction energy, **lifting work is not optional but embedded in the extraction, transport, and maintenance systems that keep mines operating.**

That dependence is reflected in production trends which have doubled in the past decade and high emissions rates from oil and gas point to Alberta's vast consumption[13]. Further, expansion is still occurring with total expenditures hitting $30.9 billion in 2024[26].

While energy-transition pressures are reshaping extraction priorities, renewable energy **still relies heavily on RHL because many sources require construction and maintenance to build and expand capacity.**

Alberta's renewable electricity capacity grew by 221% from 2010 to 2023, accounting for 19.9% of provincial electricity in 2023[27]. This combination of continued extraction dependence and scaled transition creates strong pressure to keep production moving and make both safe work practices and unsafe shortcuts appear as accepted practice.

Root Causes

Root Cause 3. Global Systems (R1)

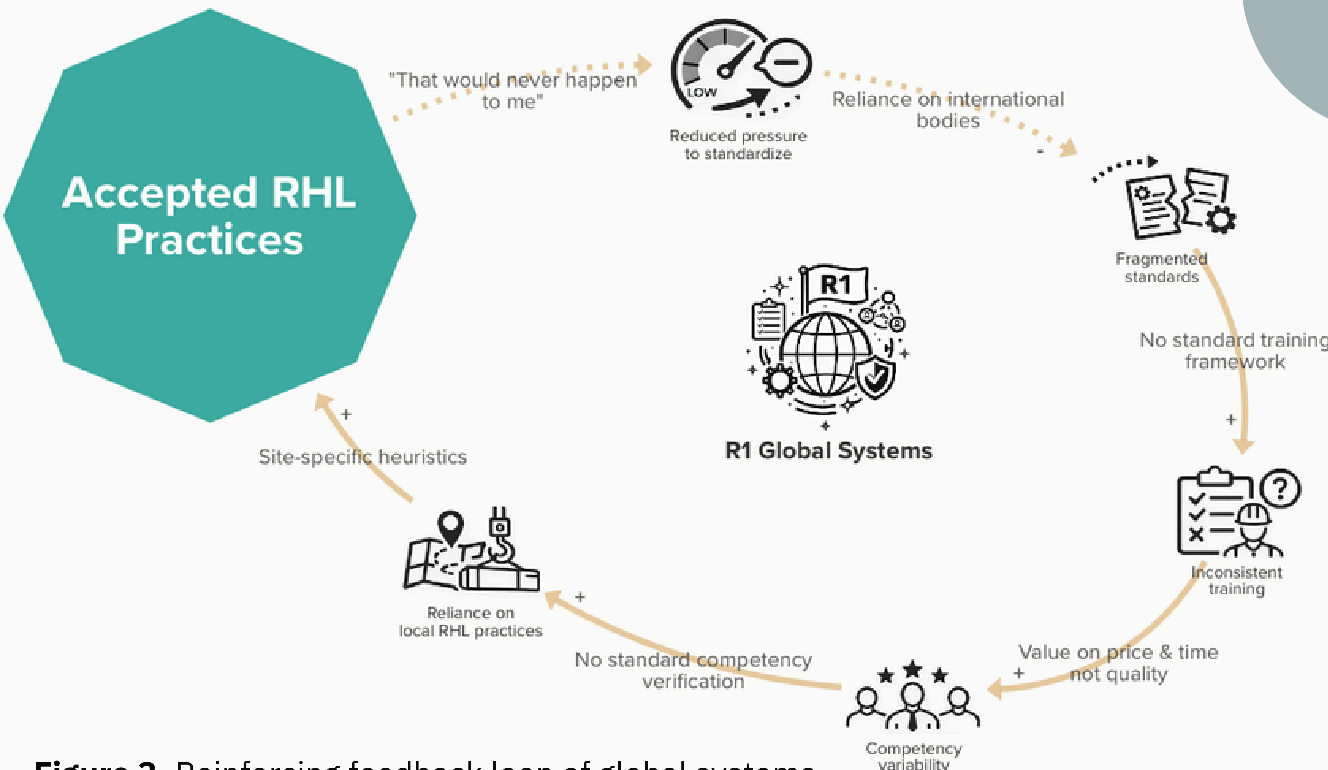


Figure 3. Reinforcing feedback loop of global systems.
Click here for Kumu map

RHL occurs within a broader governance and policy system where regulation is driven by local norms, legislation, trade agreements, standards bodies, and global supply chains, which all lack harmonization. The SCC found that differences in RHL standards and policy across jurisdictions create barriers to trade and labour mobility, increasing time and compliance costs for businesses operating in multiple provinces[29]. For example, policy on trade affects the cost and availability of construction materials, lifting equipment, and maintenance[28] (e.g., steel tariffs).

Recently proposed Canadian legislation promises to address these misalignments by harmonizing provincial standardization[30,31]. While such initiatives are promising, success depends heavily on adoption, regulatory amendment, and associated costs. Meanwhile, the fragmented adherence to piecemeal standards allows the continuation of site-level norms, even unsafe ones, to often dictate daily RHL practice.

A Systems Approach

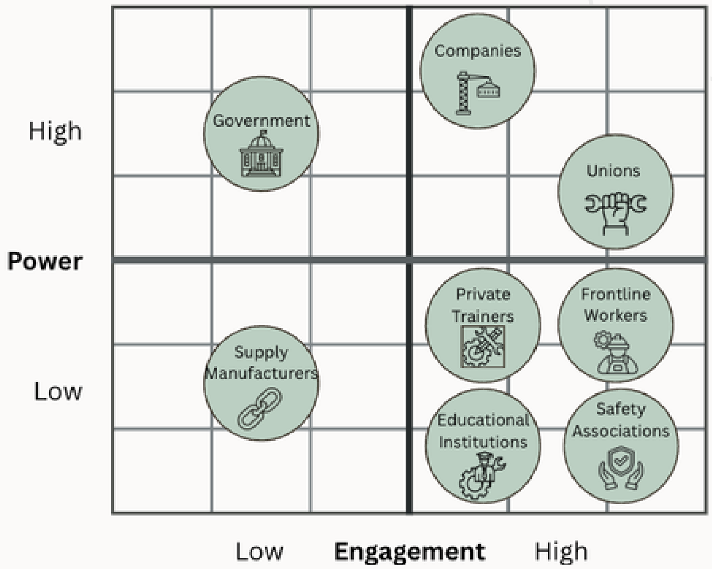


Figure 5. Power and engagement map for system agents.

RHL safety emerges from interactions among interconnected agents rather than any single actor. The system maps exchange relationships like labour supply, resources, and regulatory influence that shape power dynamics and accepted RHL practices. Safety outcomes depend on coordination across these agents, with norms shaped by practices, regulation, education, and industry conditions. Unpacking the subsystems of the three most powerful agents illuminated the strongest drivers of system behaviour and the strongest leverage points for change.

Through this lens, **frontline workers, companies** and **government** have the most exchange relationships. Notably, frontline workers have the least power and are most vulnerable to being impacted by accepted RHL practices that threaten their safety. By contrast, companies and government wield greater power and have several direct and indirect ties.

Subsystem connections defined with a positive and negative symbol can indicate balancing or reinforcing relationships, depending on the nature of the factor. For example, Individual Differences can have balancing or reinforcing on Fitness for Duty, depending on the Individual Difference (e.g., positive affectivity versus poor stress management).

System Agents

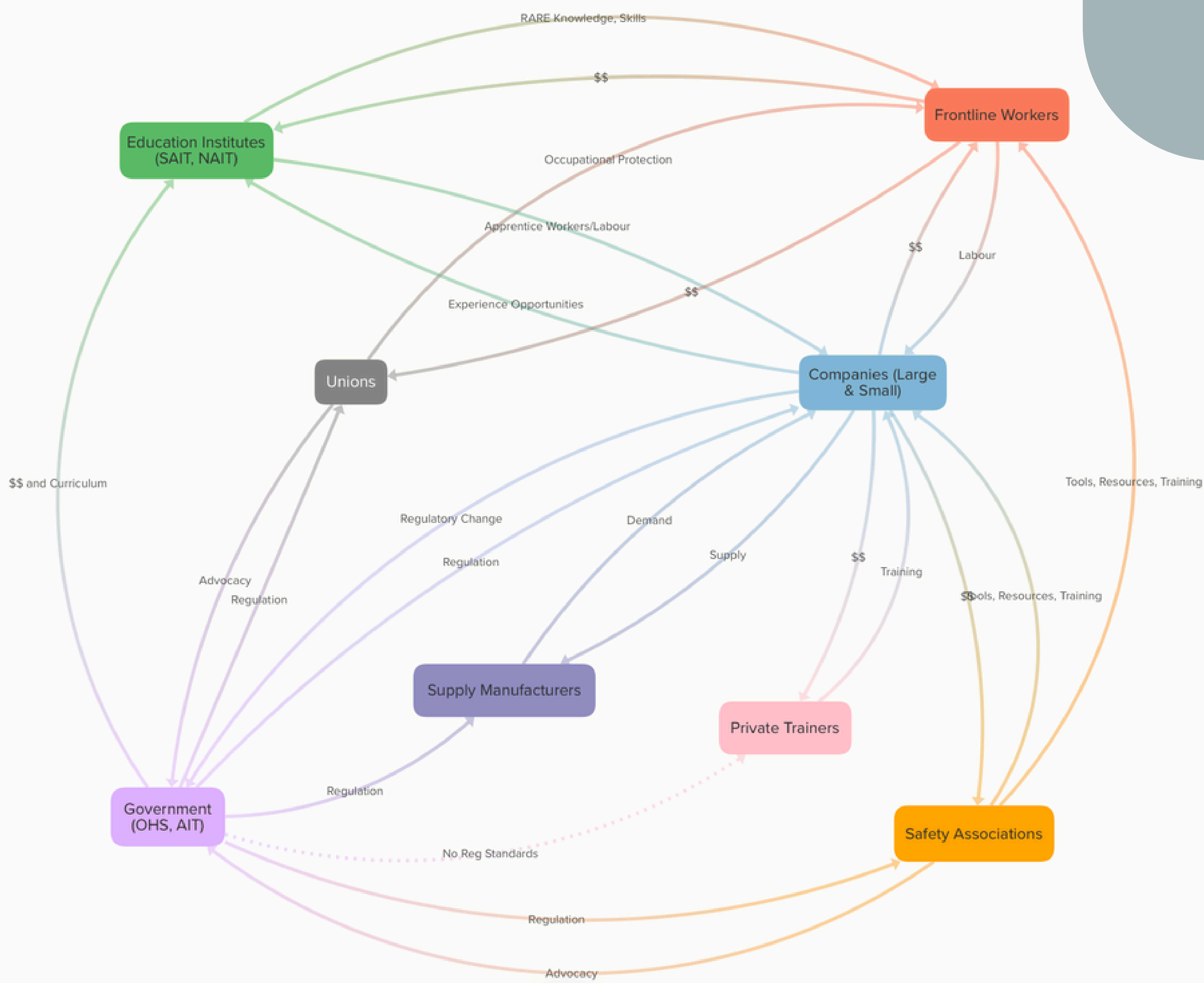


Figure 4. Systems map of power and commodity exchange among system agents.
Click here for Kumu map.

Frontline Workers

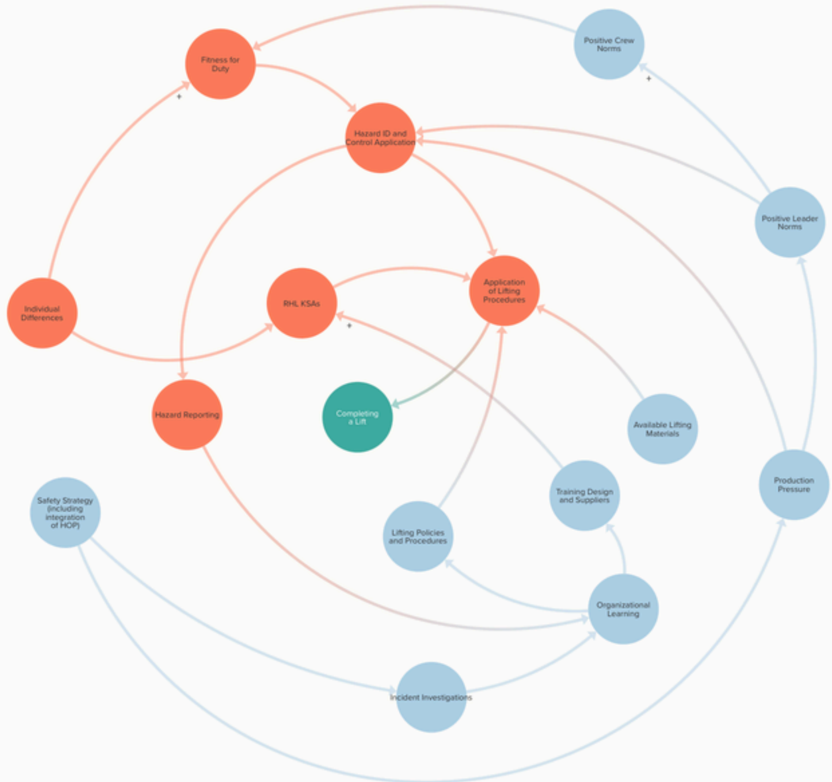


Figure 6. Subsystem maps of Frontline Workers (red nodes) & Companies (blue nodes). Click here for Kumu Map.

Individual differences like age, work experience, risk tolerance, stress management and affective disposition[a,b,32,33,34] affect a worker's fitness for duty (i.e., fatigue, stress, focus[a,35]) and their ability to notice and manage surrounding hazards.

Controls describes the available steps to protect workers and the workplace from a hazard[37].

Our data show only 44%-57% of workers exposed to line-of-fire or suspended loads are aware of the controls to mitigate these hazards[b]. Research also cites a lack of controls as a leading factor in workplace fatalities[36]. **This leaves nearly half of workers ill-equipped to manage risk during RHL activities.**

Frontline Workers

Production pressure, cited as the most common job demand[39], may exacerbate poor hazard management. A common sentiment among frontline workers is "*safety first, production firster*"[a], and when it comes to RHL activities, "*rushing is a recipe for disaster*"[a]. It also influences how leaders interact with crews, shaping the norms that guide everyday safe operational practices[32,38]. In our data, pressure to produce is associated with lower psychological safety, higher interpersonal conflict, and poorer safety perceptions, affecting workers' fitness for duty and ultimately their ability to complete a safe lift[a,b].

Further, fear of social repercussions from leaders and crew members is one of the top reasons why hazards aren't identified or reported.

"Normal operating procedures would say don't go in there, but we will if there is the pressure to produce" - Engineer

"We had a day where all but one shovel was down and people aren't applying the pressure but you are feeling the pressure. It's a lot to process. It's like a slot machine in your pocket with how much your phone is going off."
- Team Lead, Maintenance

Figure 7. Word cloud of keywords reported in survey dataset for reasons why hazards are not identified or reported, with the most popular words appearing towards the center.

Frontline Workers

Individual differences also directly impact workers' RHL-related knowledge, skills, and abilities (RHL KSAs) and subsequently their ability to complete a safe lift. Although basic and advanced rigging courses are often available[b], workers rely heavily on "*experience and being guided by an operator with more experience*" (Equipment Operator, Tailings)[b]. This feedback loop can encourage high quality information but also perpetuate myths about safe RHL activities.

Key Crew Norm Factor [b]	Ties to Worker Safety Perceptions [b]
Collective Efficacy	Strong
Psychological Safety	Strong
Safety Attitudes	Strong
Crew Safety Norms	Strong
Interpersonal Conflict	Moderate

Figure 8. Crew norm factors and associated strength of ties to workers' perceptions about safety of the workplace.

Companies

A company's safety strategy, and by extension safety culture[32], informs how hazard and incident reports are managed. When safety messaging and action are prioritized[40], workers speak up, mistakes are learned from, training improves, capacity expands and crew norms support focused, planned, and safe lifts[b,32,41]. But when the safety strategy undermines information flow, learning is inhibited and relationships between frontline workers and leaders are degraded[42]:

> *"I want them to actually listen to us as the front line in this war. We are fighting. We see it [the work] first hand. You see it from the balcony. We work on equipment. You work on managing, so take your employees advice and find a way to work with your employees." - Serviceman*

Production pressures affect organizational learning by reducing hazard identification and reporting. As one worker said:

> *"There's always the perceived pressure of having to focus on production. People won't bring stuff up because they know it'll result in everything be frozen and no production moves forward." - Instrumentation Technician*

Learning organizations are more likely to design training systems to prevent incidents and enforce safe and functional lifting practices (e.g., knowledge transfer[43]), as one site had updated training standards and safe work procedures following a local rigging fatality[b]. Conversely, limited safety strategies may favour shorter trainings that minimize time away from the job site[a], but compress theory and practice, allowing competency, policy, and procedure gaps to persist and creating vulnerabilities in lift execution.

Complex relationships exist among individuals, crew members, and organizations that reinforce what RHL practices are accepted as safe, and are driven by social, technical, and environmental factors[38,44]. These factors intertwine to influence how workers develop a shared understanding of accepted RHL practices.

Government

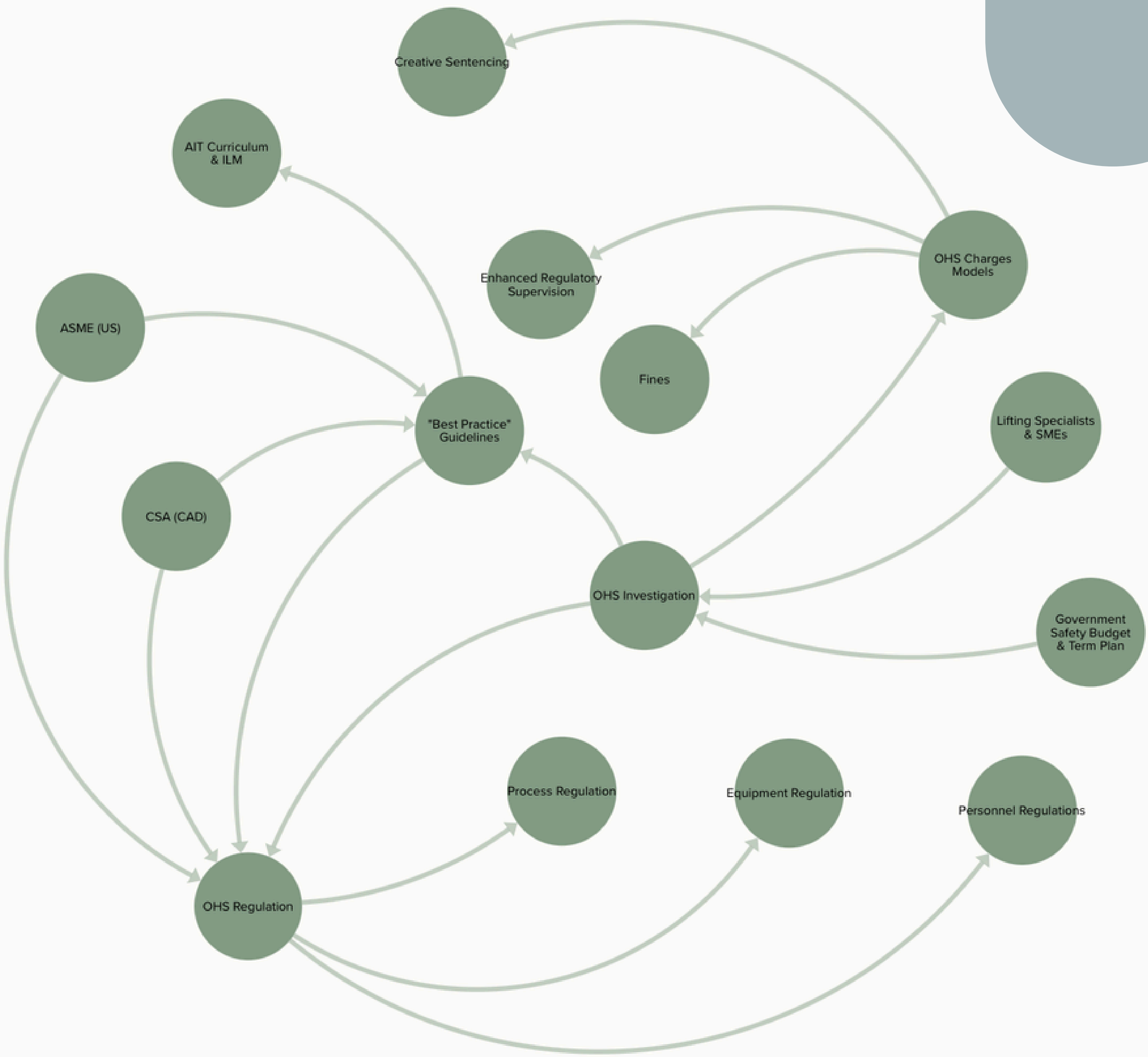


Figure 9. Government subsystem map (green nodes).
Click here for Kumu Map.

Government

Government safety budgets and political priorities influence how investigations are carried out by determining available staffing and resources[45]. Lower funding can limit the depth, timeliness and learning from investigations, influence charges models, and impact how regulations and best practices are maintained. OHS defines lifting safety through Part 6[47] and 21[46], referencing technical standards from both national[48] and international[49] bodies. These structures reinforce what industry understands as accepted RHL practices and provides the framework for OHS investigations.

Education, led by AIT, defines the trades curricula delivered by polytechnic institutions[a]. This pathway shapes how tradespeople are trained in rigging (although rigging is not a designated trade), influencing initial operator competency and standards of practices, while supporting streamlined training systems and improved labour mobility[50,45]. While legislation, standards, and apprenticeship frameworks shape training; **competency assurance occurs within workplaces.**

"An employer must ensure that a lifting device is only operated by a competent worker authorized by the employer to operate the equipment."[47]

Yet, no measurable criteria like required training hours, practical assessments, or competency benchmarks are specified and competency is not defined in OHS Code[14].

Best Practice Guidelines documents have attempted to close this gap, but are now archived[51].

Competency verification forms help employers assess workers' knowledge and skills after training[52], but their content and use vary because **no standardized regulatory framework** exists. **In this way, the government subsystem shapes, but does not fully determine, the practices that become normalized across the industry.**

Solutions Landscape

The current RHL solution landscape remains fragmented and, without stronger alignment, **the system will likely continue drifting toward poorer outcomes and more entrenched but incorrect views of acceptable RHL practice.**

Building on existing efforts through greater coordination and transformative change[53] can help redirect the system toward consistently safer outcomes.

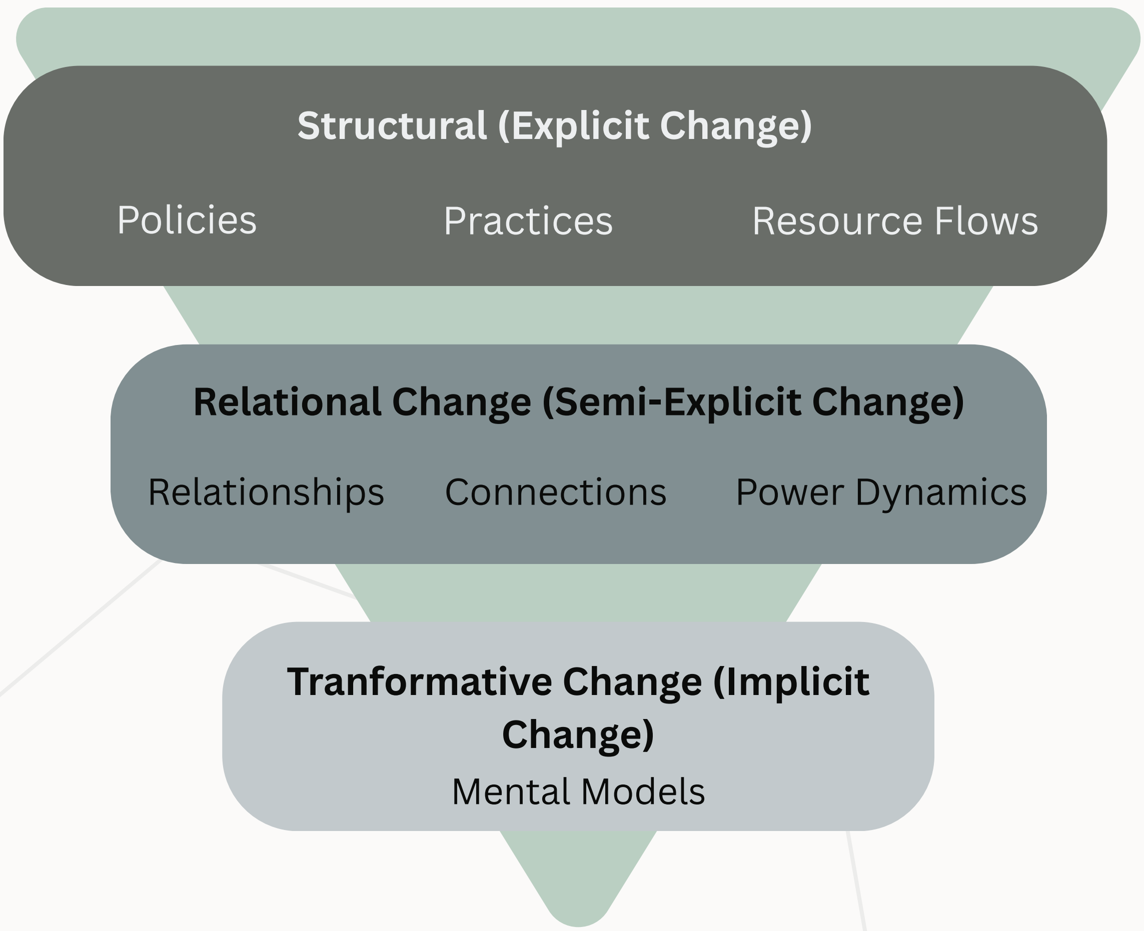


Figure 10. Levels of change diagram.

Past & Current Initiatives

Structural Change

CS in Alberta is a court-ordered provision under Section 49 of the OHS Act that directs fines from regulatory convictions toward specific safety improvement initiatives[14].

CS represents the opportunity for an ongoing and meaningful contribution to preventing RHL-related fatalities by **reinvesting enforcement fines directly into education, research, training development, and industry-wide safety programs** thereby increasing the resources in the system to tackle safety challenges. This **Structural Change** approach turns tragedy into prevention by funding practical solutions that address risk factors like competency gaps and knowledge translation barriers. Evidence shows that it can improve the mining industry and decrease injury rates for up to two years post incident[54,55].

CS creates a pathway for incidents to generate safety improvements, making it a sustained and adaptive tool, strengthening Alberta's lifting safety system over time. However, **CS in Alberta has not yet realized its full potential**, and while surface level improvements have been noted[54], barriers to true systematic change still exist. **Reflected in our systems map, there are missing feedback loops from CS to other structural factors** like regulatory change and enforcement, education, and organizational change impacting companies and frontline workers. In its current form, it cannot tackle deeper levels of change.

Other attempts for change have included related associations (CHRSC[56]), training accreditations (e.g., LEEA[57]), and specialized rigging roles[a], however these initiatives have not produced lasting change.

Past & Current Initiatives

Discussions with over 350 SMEs point towards why previous attempts have not been successful, revealing some of the barriers to sustainable RHL-safety change as[a]:

Identified Barrier to Change	Levers of Change
Lack of clear ownership or leadership for RHL safety across the system	**Advocacy** 1. Lead and amplify a unified industry voice to define and promote what "safe" looks like in RHL 2. Influence standards, regulation, and enforcement toward consistent adoption of safest practices
Inconsistent competency requirements and verification grounded in a lack of unified standards for RHL activities	**Common Standard** 1. Establish clear, unified, and practical requirements for RHL practices across industry 2. Harmonize existing standards into usable guidance that reduces variability in execution
Difficulty coordinating across system agents and limited opportunities for impacted parties to work together	**Promotion, Community, and Network** 1. Connect fragmented stakeholders to enable collaboration and shared learning across the system 2. Facilitate industry-wide exchange of incident learnings and best practices
Limited dedicated time and resources in an industry fueled by production pressures	**Sustainability and Capacity Building** 1. Establish strong governance structures and practices to ensure credibility, accountability, and effective decision-making 2. Secure sustainable funding and resource models to support ongoing operations and long-term impact

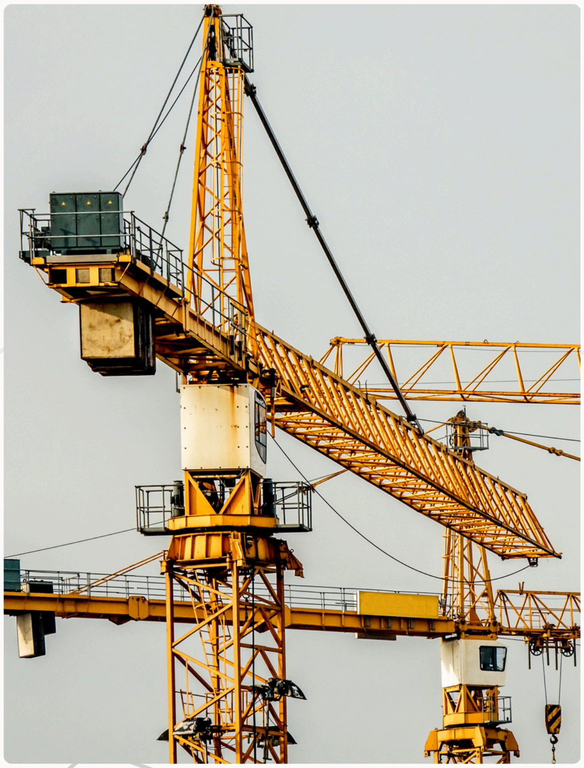
Figure 11. Identified barriers to change and their associated levers of change.

Future Solutions Directions

Relational & Transformative Change

Our synthesis shows that industry-accepted RHL activities, whether safe or unsafe, connects all system agents. To truly leverage transformational change, **we need to fundamentally shift what are considered acceptable RHL practices,** to the point where no one in the system would *ever* consider conducting or endorsing a RHL practice that is not the absolute safest way to do it.

To achieve this, what is missing is alignment, shifts in power structures, and advocacy for deep transformative change, with a dedicated society for RHL activities in Alberta as one possible avenue. Our engagement with system agents shows that a provincial movement would strongly align with Canadian-wide pushes for harmonization led by the CSA and the safety priorities of other provinces[a].



A collaborative, member-driven organization with strong governance, technical credibility, and cross-industry representation could create a coherent voice and coordinated strategy aimed at measurable reductions in RHL-related harm. Each change lever above could serve as a strategic pillar of the society and address barriers to sustainable change.

By aligning system agents, advocating for improved policy and regulation, and strengthening coordination across training and practice, the society could help shift what the industry accepts as safe RHL practices toward consistently choosing the safest way.

Insights & Lessons Learned

This work highlights that RHL fatalities are not isolated failures, but the outcome of a complex, interconnected system in which multiple agents, pressures, and practices interact. A key insight from the analysis is that unsafe outcomes often emerge not from a lack of rules, but from variability in how those rules are interpreted, applied, and reinforced across the system. **Practices that are widely accepted within the industry are not always the safest, and over time, these norms can become embedded and difficult to challenge.** As a result, improving safety requires more than incremental changes — it demands a shift in what the system collectively defines as acceptable practice.

Fragmentation across system agents limits consistent, sustained improvement. Gaps in ownership for RHL safety, inconsistent standards, limited mechanisms for shared learning, and production-driven constraints all contribute to a system where **risk persists despite good intentions.** Our system map highlights that meaningful change depends on alignment across these agents; without it, even well-designed standards, training, and enforcement struggle to translate into safer outcomes.

A central lesson from this work is that improving RHL safety requires structural, relational, and transformative shifts that move the system from fragmented efforts toward a more integrated and effective approach to preventing harm.

We are honoured to work on a critical issue that impacts our communities. Through our investigation of RHL incidents, we have met affected friends and families that have changed our lives forever.

We dedicate this work to the over 1,700 people that have lost their lives to occupational incidents in the last decade[58].

Thank You.

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Note. Underlined indicates a clickable link → check out our sources!

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