Emerging Trends Shaping Future of Work-at-heights

Assoc. Prof. Goh Yang Miang
Department of the Built Environment
College of Design and Engineering

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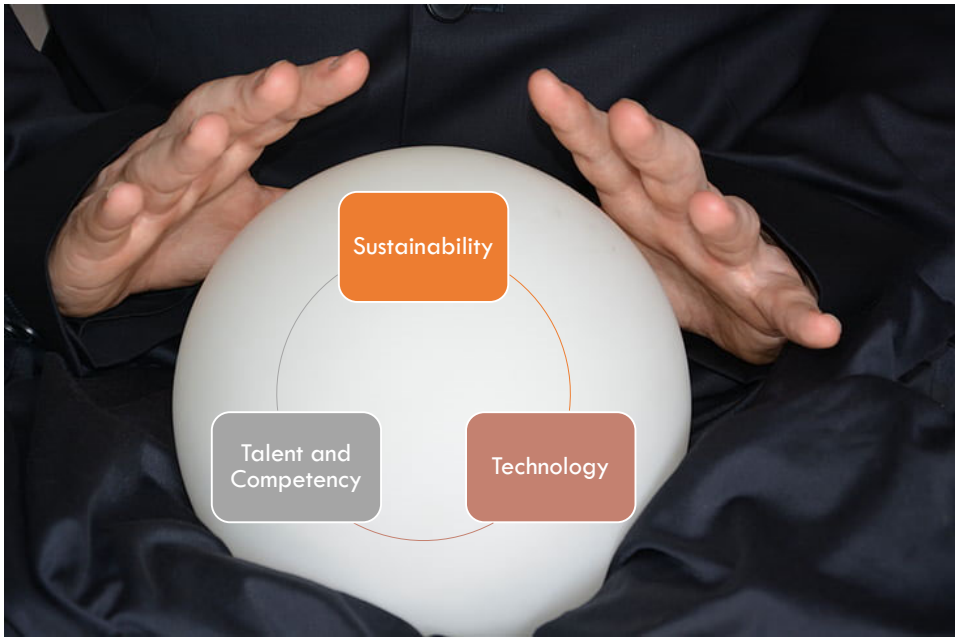

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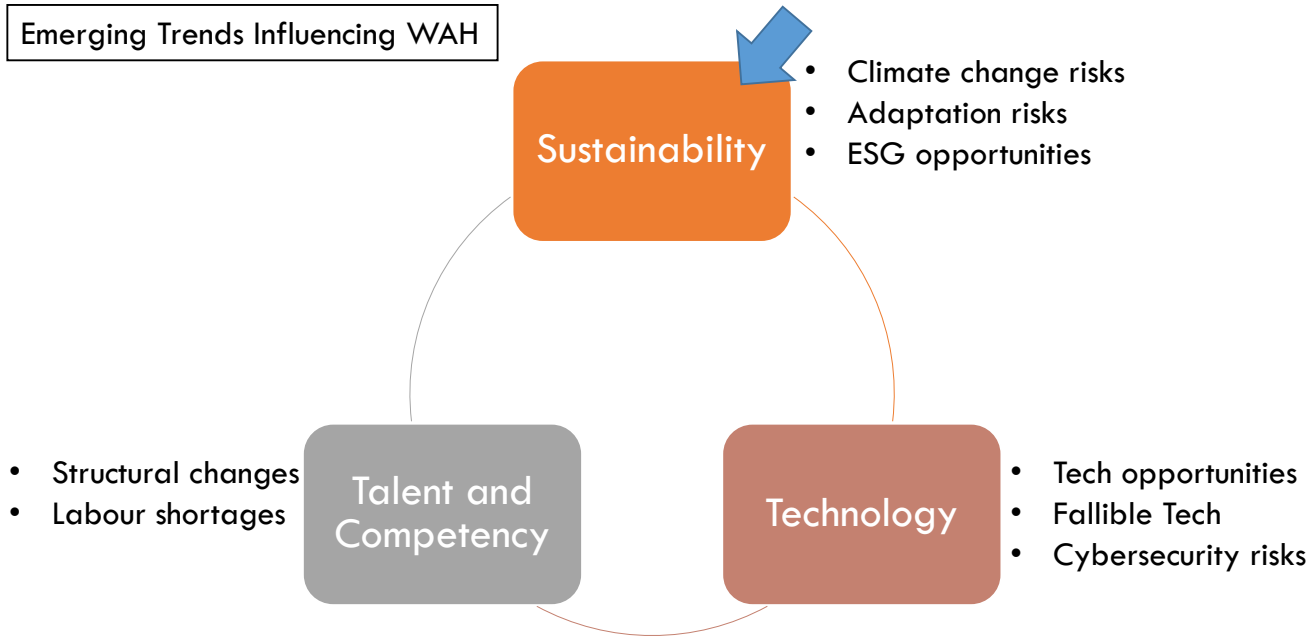
Emerging Trends Influencing WAH



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Sustainability Issues Increase WAH

- Renewable energy – Solar power facilities
- Urbanization – Increase in high rise buildings
- Aging infrastructure – Maintenance and repair

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Fall from Height Accident in Australia

- 14 August 2020
- Apprentice electrician; worked for ~ 3 mths
- Carrying solar panel weighed 18.5 kg
- Roof of single-storey house
- Unsecured ladder slipped out
- Fell at height of < 2.4 metres
- Head injury; no recollection of the incident

https://www.owhsp.qld.gov.au/court-report/fall-height-during-solar-panel-installation-leads-55000-fine-electrical-business

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Event Causation Technique

Activity Level

Worker installing solar panel on single storey residential house

Ladder collapsed

↓

Worker fell

↓

Struck head on driveway

↓

Head injury

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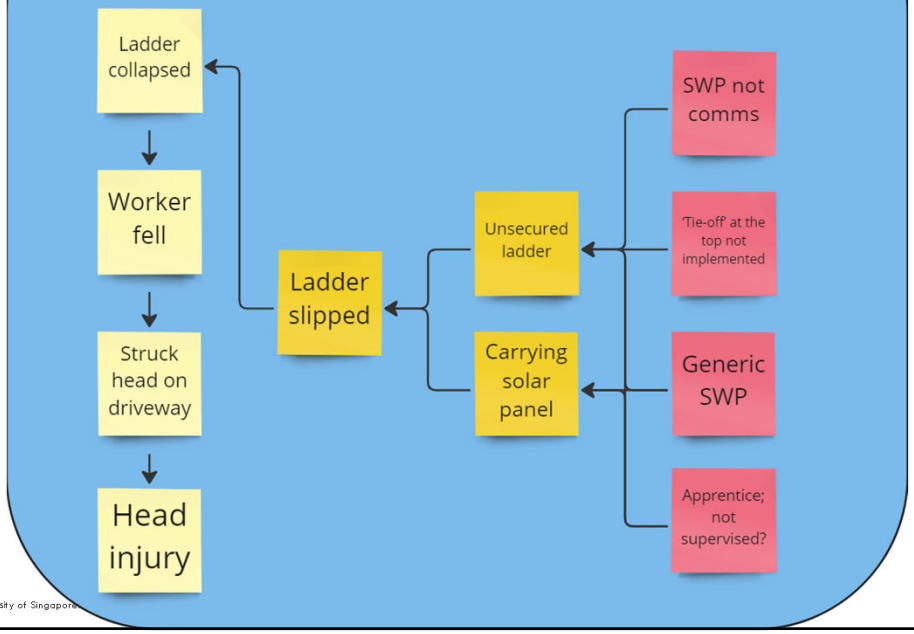
Activity Level

Worker installing solar panel on single storey residential house



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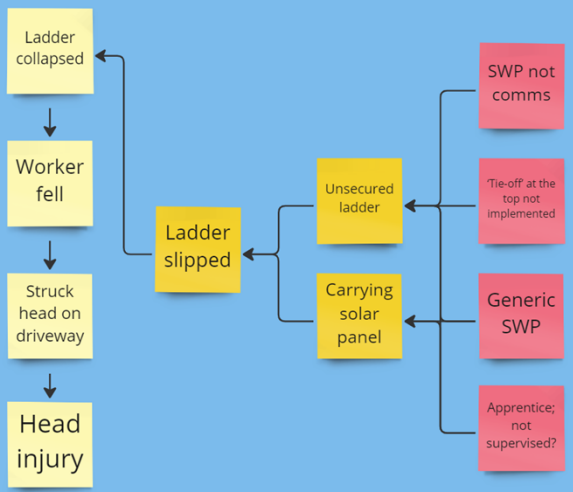
Company Level

Leadership **Management** **Culture**

Activity Level

Worker installing solar panel on single storey residential house



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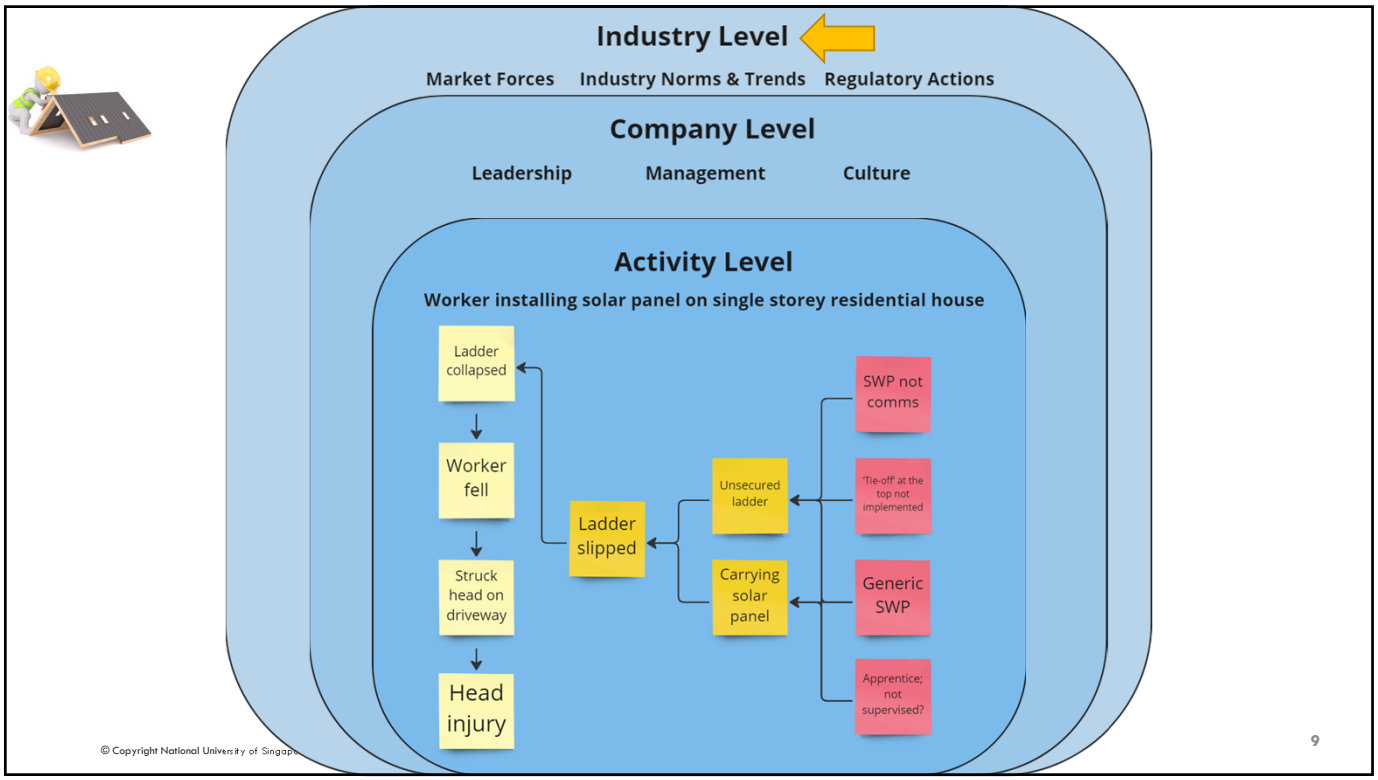
Industry Level
Market Forces
Industry Norms & Trends
Regulatory Actions
Company Level
Leadership
Management
Culture
Activity Level
Worker installing solar panel on single storey residential house
Ladder collapsed
Worker fell
Struck head on driveway
Head injury
Ladder slipped
Unsecured ladder
Carrying solar panel
SWP not comms
'Tie-off' at the top not implemented
Generic SWP
Apprentice; not supervised?
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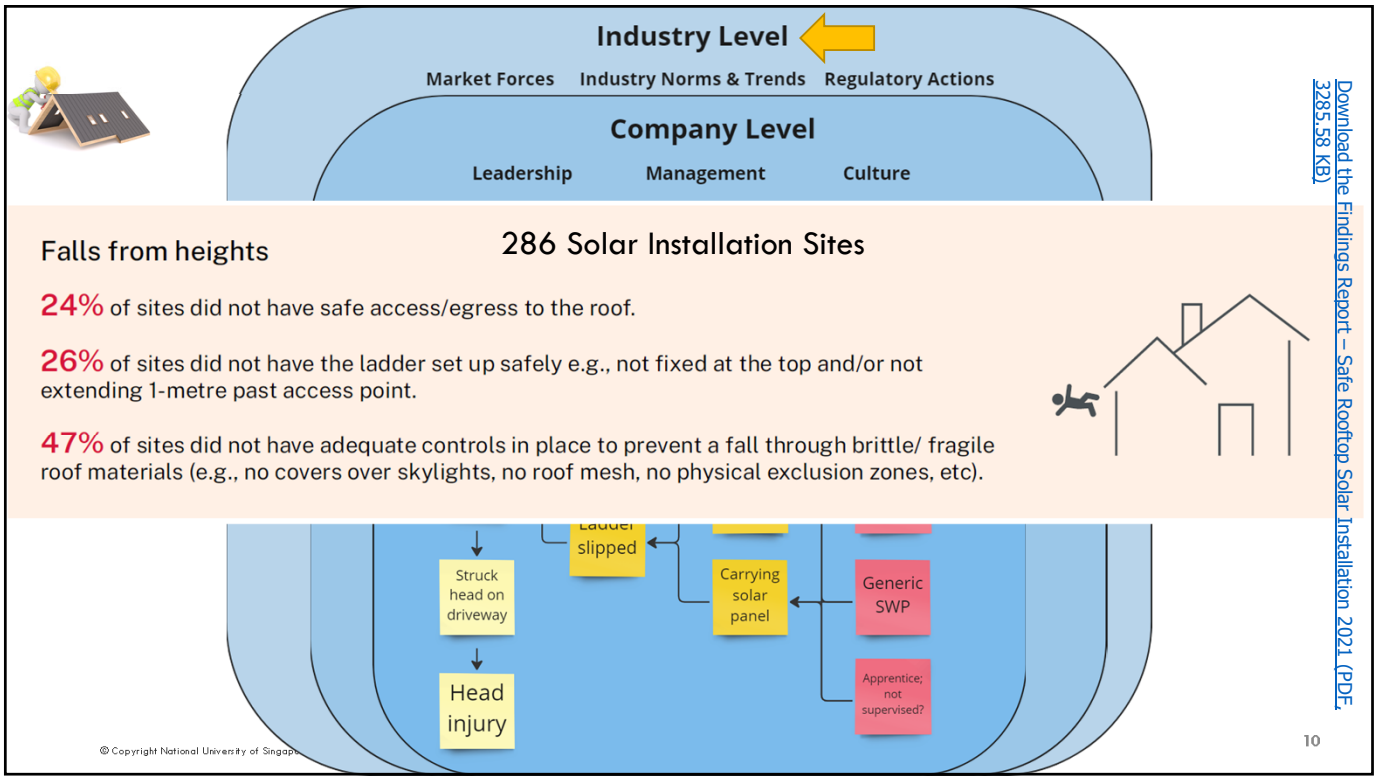
Industry Level
Market Forces
Industry Norms & Trends
Regulatory Actions
Company Level
Leadership
Management
Culture
Falls from heights
286 Solar Installation Sites
24% of sites did not have safe access/egress to the roof.
26% of sites did not have the ladder set up safely e.g., not fixed at the top and/or not extending 1-metre past access point.
47% of sites did not have adequate controls in place to prevent a fall through brittle/ fragile roof materials (e.g., no covers over skylights, no roof mesh, no physical exclusion zones, etc).
Download the Findings Report – Safe Rooftop Solar Installation 2021 (PDF, 3285.58 KB)
Struck head on driveway
Head injury
slipped
Carrying solar panel
Generic SWP
Apprentice; not supervised?
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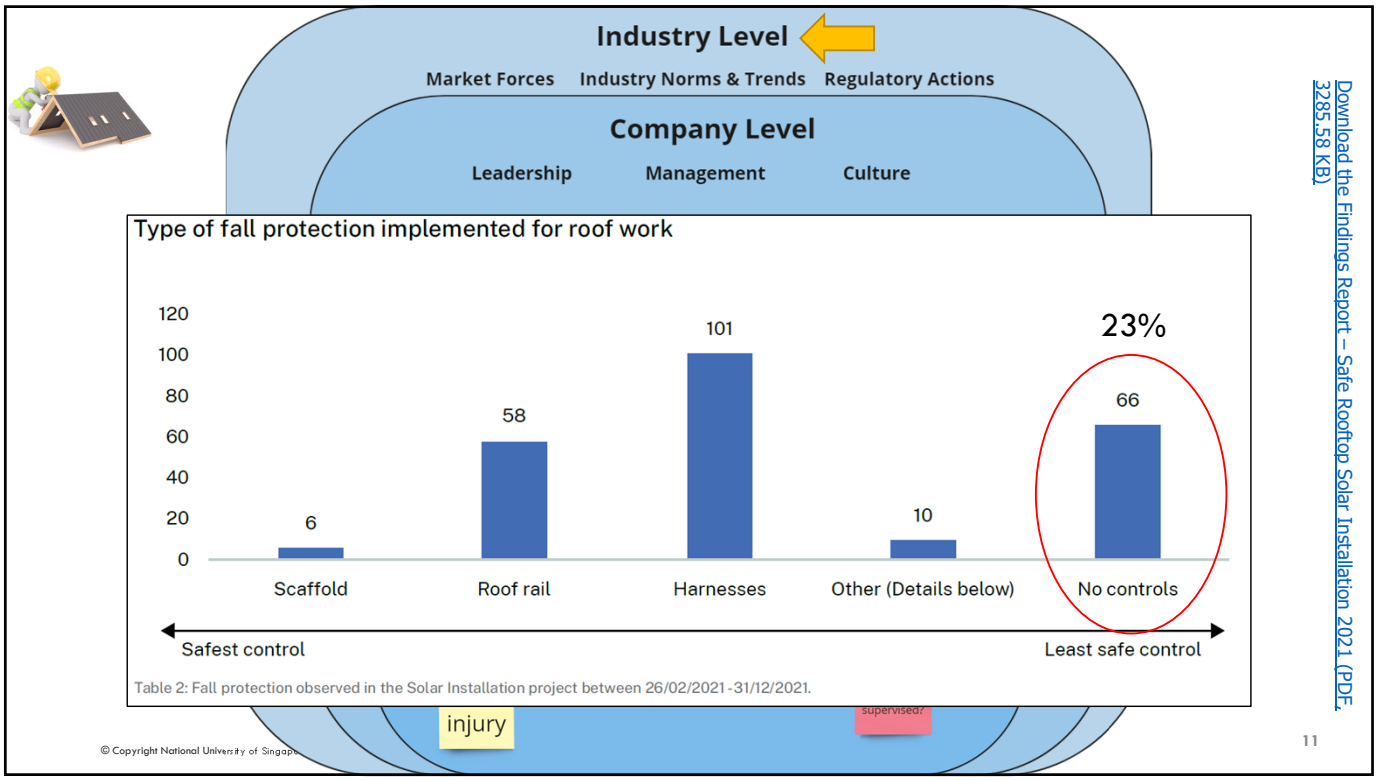
Industry Level
Market Forces
Industry Norms & Trends
Regulatory Actions
Company Level
Leadership
Management
Culture
Type of fall protection implemented for roof work
120
100
80
60
40
20
0
6
58
101
10
66
23%
Scaffold
Roof rail
Harnesses
Other (Details below)
No controls
Safest control
Least safe control
Table 2: Fall protection observed in the Solar Installation project between 26/02/2021 - 31/12/2021.
injury
Download the Findings Report – Safe Rooftop Solar Installation 2021 (PDF, 3285.58 KB)
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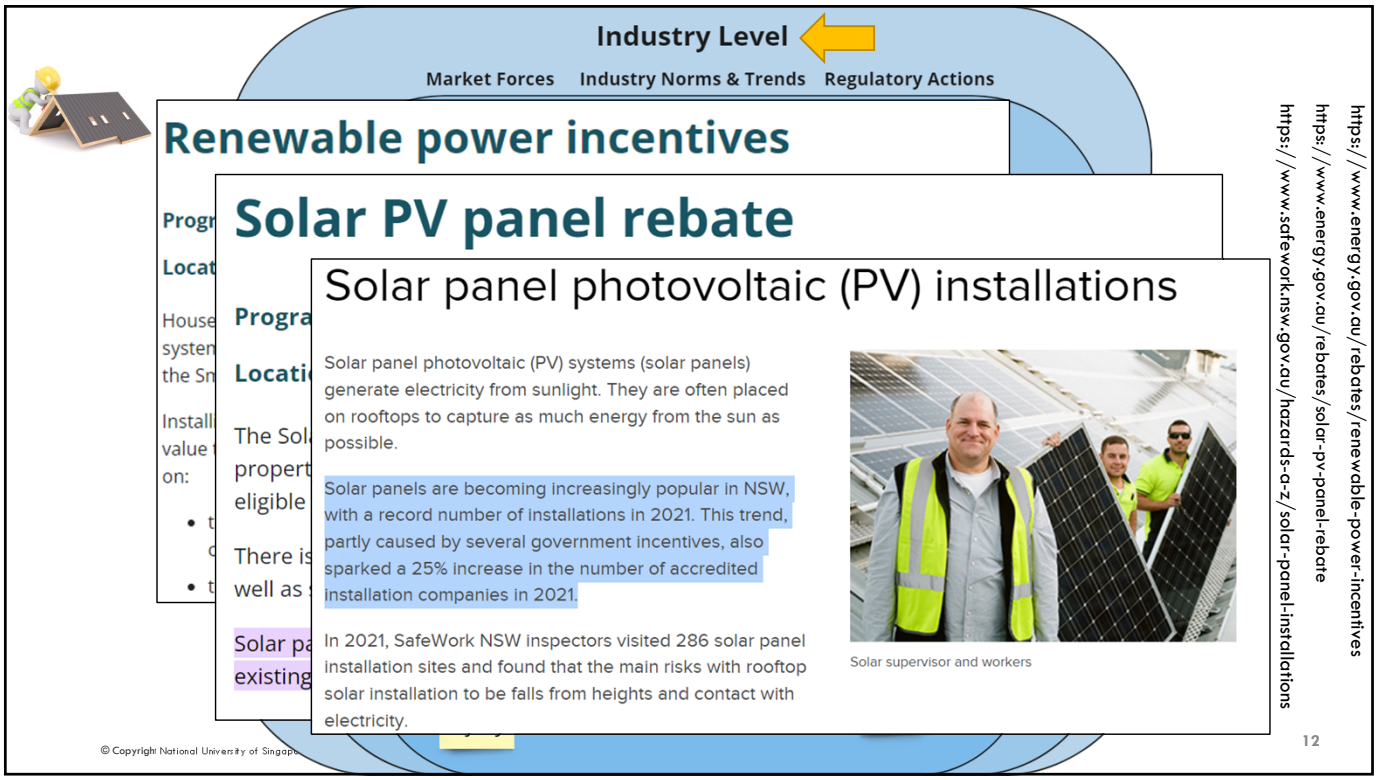
Industry Level
Market Forces
Industry Norms & Trends
Regulatory Actions
Renewable power incentives
Solar PV panel rebate
Solar panel photovoltaic (PV) installations
Solar panel photovoltaic (PV) systems (solar panels) generate electricity from sunlight. They are often placed on rooftops to capture as much energy from the sun as possible.
Solar panels are becoming increasingly popular in NSW, with a record number of installations in 2021. This trend, partly caused by several government incentives, also sparked a 25% increase in the number of accredited installation companies in 2021.
In 2021, SafeWork NSW inspectors visited 286 solar panel installation sites and found that the main risks with rooftop solar installation to be falls from heights and contact with electricity.
Solar supervisor and workers
https://www.energy.gov.au/rebates/renewable-power-incentives
https://www.energy.gov.au/rebates/solar-pv-panel-rebate
https://www.safework.nsw.gov.au/hazards-a-z/solar-panel-installations
12

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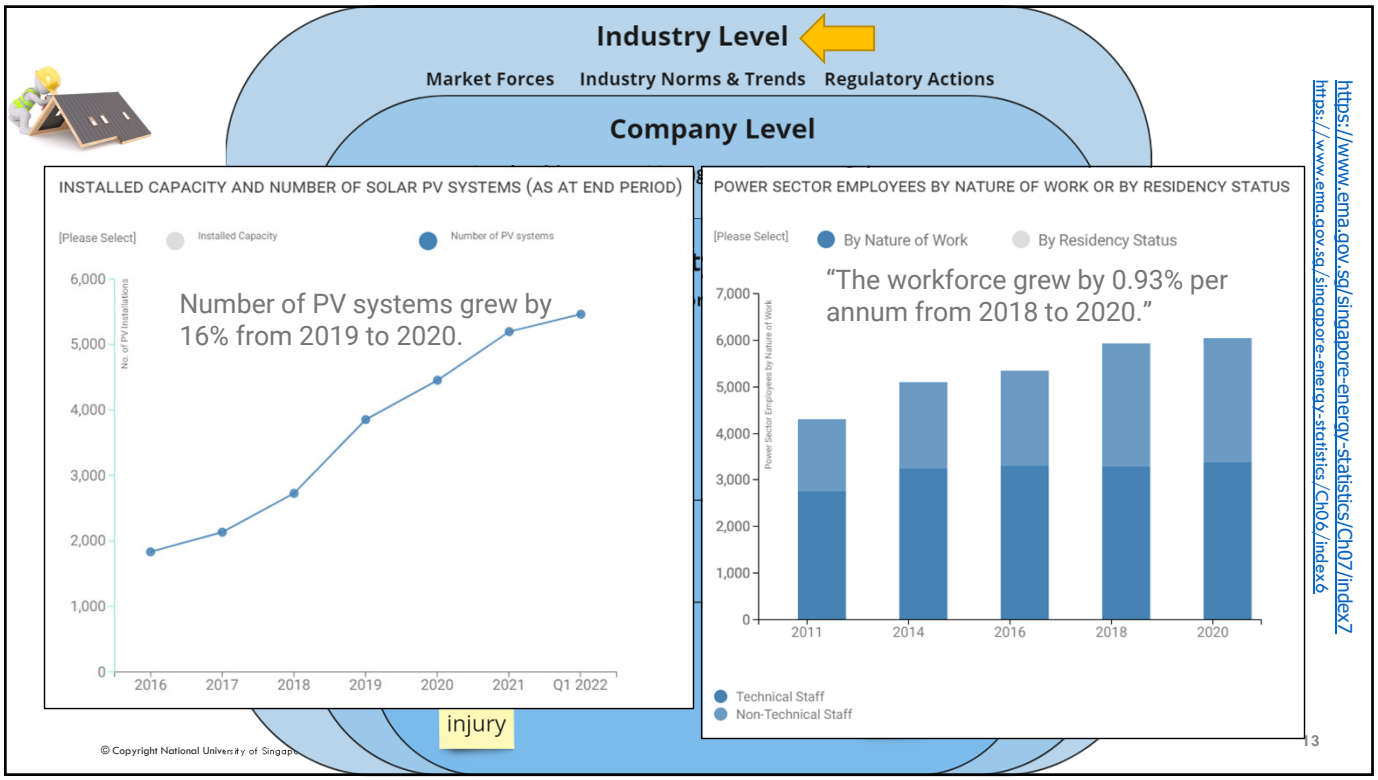

https://www.ema.gov.sg/singapore-energy-statistics/Ch07/index7
https://www.ema.gov.sg/singapore-energy-statistics/Ch06/index6

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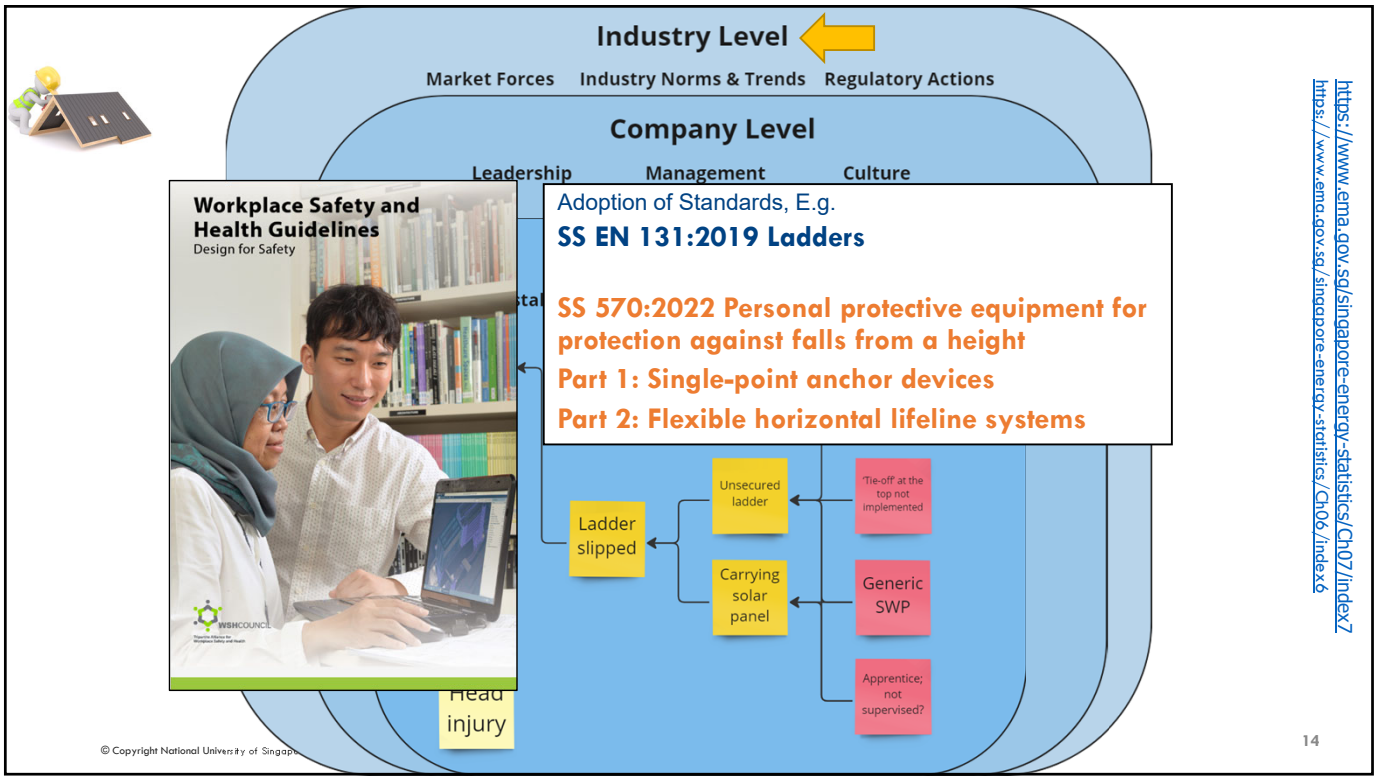

https://www.ema.gov.sg/singapore-energy-statistics/Ch07/index7
https://www.ema.gov.sg/singapore-energy-statistics/Ch06/index6

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International Level
Megatrends: Global trends, risks, and opportunities

National Level
Government Policies | Societal Expectations | Technological Advancements

Industry Level
Market Forces | Industry Norms & Trends | Regulatory Actions

Company Level
Leadership | Management | Culture

Activity Level
Worker installing solar panel on single storey residential house

- Ladder collapsed
- Worker fell
- Struck head on driveway
- Head injury
- Ladder slipped
  - Unsecured ladder
    - SWP not comms
    - 'Tie-off' at the top not implemented
  - Carrying solar panel
    - Generic SWP
    - Apprentice; not supervised?

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International Level
Megatrends: Global trends, risks, and opportunities

Australian Government

AUSTRALIA'S LONG-TERM EMISSIONS REDUCTION PLAN

A whole-of-economy Plan to achiev
net zero emissions by 2050

- fell
- Struck head on driveway
- Head injury
- Ladder slipped

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Green jobs ≠ Safe and healthy jobs

Safety Science 151 (2022) 105745

Contents lists available at ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/safety

Review

The impact of climate change on workplace safety and health hazard in facilities management: An in-depth review

Tianxiang Lan [a], Yang Miang Goh [a,*], Olivia Jensen [b], Ashan Senel Asmore [c]

[a] Department of The Built Environment, College of Design and Engineering, National University of Singapore, Singapore
[b] Institute for the Public Understanding of Risk, National University of Singapore, Singapore
[c] Department of Building Economics, University of Moratuwa, Sri Lanka

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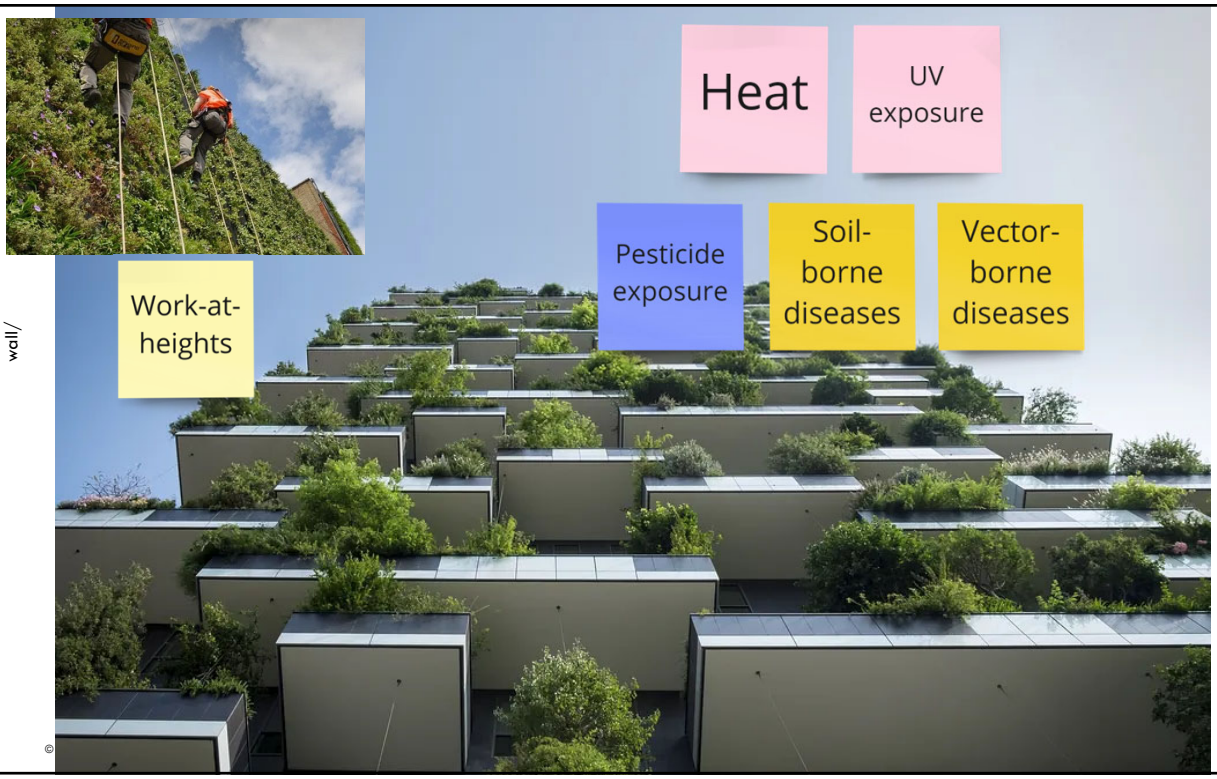

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Fatal FFH Accident in the US

- ~3:45 p.m. on May 15, 2008
- Mill worker, Employee #1, at a seed storage, cleaning, and distribution facility
- Climbed a 7.6m fixed ladder onto a shade roof and then to a catwalk
- ~9m to 12m high; there from 30 minutes to one hour
- Air temperature was 37.8 Degree Celsius with very low humidity
- Employee #1 started to feel dizzy and his coworker told him to sit down
- Employee #1 went to the other end of the catwalk and sat down in the shade
- Shortly thereafter, he was seen hunched over at the top of the ladder
- Later found at the bottom of the ladder
- Apparently fallen from the catwalk or from the ladder

https://www.osha.gov/ords/imis/accidentsearch.accident_detail?id=201072444

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https://www.channelnewsasia.com/singapore/hot-weather-high-temperature-singapore-climate-change-health-2722321

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By James LeeFormerIP at en.wikipedia - https://www.flickr.com/photos/jronaldlee/4579611880/Transferred from en.wikipedia by ronhjones, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=18954704

Intensity and frequency of extreme weather can render risk controls infeasible

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KPMG

Opportunity to improve WAH safety and health and WSH

CEOs increasingly understand that businesses embracing ESG are best able to secure talent, strengthen employee value proposition (EVP), attract loyal customers and raise capital. ESG has gone from a nice-to-have to integral to long-term financial success.

ESG – Environment, Social, Governance

https://home.kpmg/xx/en/home/insights/2022/08/kpmg-2022-ceo-outlook/esg-and-diversity-trends.html

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https://www.sgx.com/regulation/sustainability-reporting

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List of Core ESG Metrics

Occupational Health & Safety	Fatalities	Number of cases	GRI 403-9, WEF core metrics, MOM (Singapore), SASB 320	Number of fatalities as a result of work-related injury during reporting period across the organisation. Scope of report should include both employees and workers who are not employees but whose work and/or workplace is controlled by the organisation.
	High-consequence injuries	Number of cases	GRI 403-9, WEF core metrics, MOM (Singapore)	Number of high-consequence work-related injuries (injury that results in a fatality from which the worker cannot recover fully to pre-injury health status within 6 months) excluding fatalities during reporting period. Scope of report should include both employees and workers who are not employees but whose work and/or workplace is controlled by the organisation.
	Recordable injuries	Number of cases	GRI 403-9, WEF core metrics, MOM (Singapore), SASB 320	Number of recordable work-related injuries during reporting period. Scope of report should include both employees and workers who are not employees but whose work and/or workplace is controlled by the organisation.
	Recordable work-related ill health cases	Number of cases	GRI 403-10, WEF expanded metrics, MOM (Singapore)	Number of recordable work-related illnesses or health conditions arising from exposure to hazards at work during reporting period. Scope of report should include both employees and workers who are not employees but whose work and/or workplace is controlled by the organisation.

Potential opportunity to improve WAH safety and health

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Emerging Trends Influencing WAH

Sustainability
- Climate change risks
- Adaptation risks
- ESG opportunities

Technology
- Tech opportunities
- Fallible Tech
- Cybersecurity risks

Talent and Competency
- Structural changes
- Labour shortages
- Tech for training

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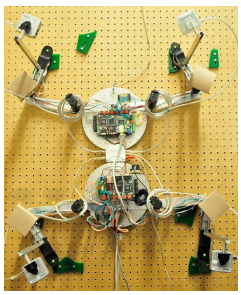
https://www.pexels.com/photo/selective-focus-photograph-of-white-quadcopter-drone-during-blue-hour-319968/

https://www.grenoble-drone.com/inspections-de-toitures-par-drone-a-grenoble/



https://commons.wikimedia.org/wiki/File:Capuchin_Free_Climbing_Robot.jpg

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https://www.commercialdroneprofessional.com/video-drone-drops-from-the-sky-during-window-inspection-check/

"It is thought that the drone fell due to high rise buildings in the area preventing it from picking up communication signals."

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https://techcrunch.com/2022/04/12/aethon-robots-hospitals-hijacks/

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Emerging Trends Influencing WAH

Sustainability
- Climate change risks
- Adaptation risks
- ESG opportunities

Talent and Competency
- Structural changes
- Labour shortages

Technology
- Tech opportunities
- Fallible Tech
- Cybersecurity risks

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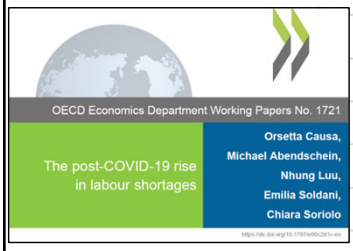
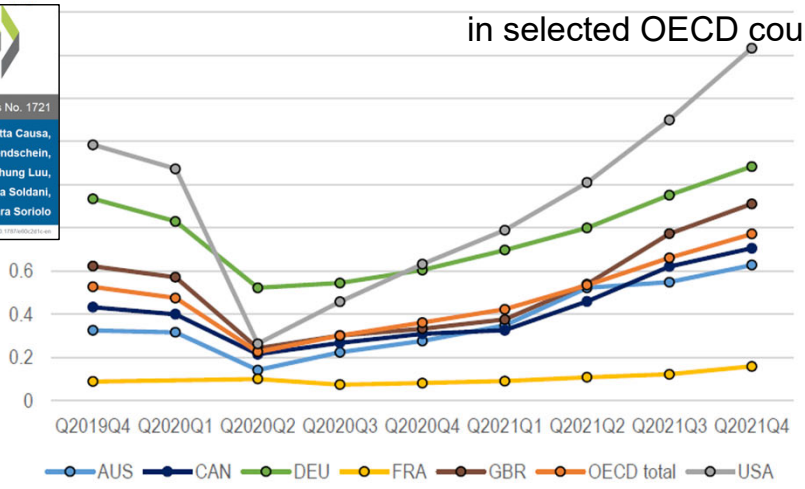
Figure 2 Labour markets have been tightening

Ratio between the number of vacancies and that of unemployed in selected OECD countries





Note: Ratio between the number of vacancies and that of unemployed in selected OECD countries. See Annex for country profiles.
Source: Vacancies: Australian Bureau of Statistics (AUS), Statistics Canada (CAN), DARES (FRA), Office for National Statistics (GBR), Central Bureau of Statistics (ISR), US Bureau of Labor Statistics (USA), and Eurostat (OECD-EU). Unemployment; OECD Short-Term Labour Market Statistics database.

Organisation for Economic Co-operation and Development (OECD)

https://www.oecd.org/publications/the-post-covid-19-rise-in-labour-shortages-e60c2d1c-en.htm

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Singapore

Job vacancies at record high as labour market rebounds: MOM

Resident employment in the first quarter of 2022 exceeded pre-pandemic levels.

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https://www.channelnewsasia.com/singapore/labour-market-report-q1-2022-manpower-mom-2752506

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Labour Shortage

Changing Competency Needs
- Sustainability
- Tech
- Safety etc.

Talent and Competency Challenges

Apprentice Electrician

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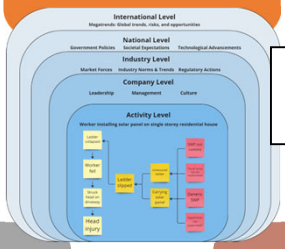
Emerging Trends Influencing WAH

Volatile
Uncertainty
Complex
Ambiguous

Sustainability
- Climate change risks
- Adaptation risks
- ESG opportunities



- Focus on circle of influence
- Multi-level risk assessments

Talent and Competency
- Structural changes
- Labour shortages

Technology
- Tech opportunities
- Fallible Tech
- Cybersecurity risks

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Charles Perrow's Normal Accident (1984)

Perrow argues that multiple and unexpected failures are built into society's complex and tightly coupled systems.

"Normal" accidents are unavoidable and cannot be designed around.

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High Reliability Organisations

- Preoccupation with failure – Proactive risk monitoring
- Reluctance to simplify – Avoid oversimplifying complex situations
- Sensitivity to operation – Attention to ops details and frontline workers
- Commitment to resilience – Build redundancy and preparedness
- Deference to expertise – Recognise expertise & cross-functional collaboration

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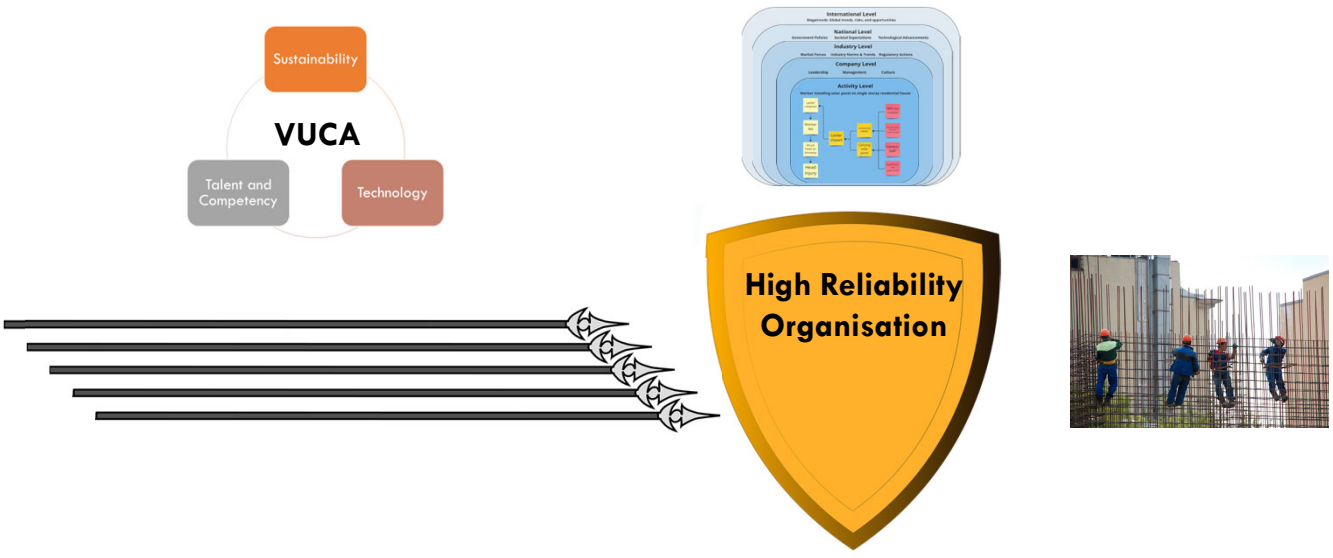

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THANK YOU!

Assoc. Prof. Goh Yang Miang
Safety and Resilience Research Unit (SaRRU)
Department of The Built Environment
College of Design and Engineering

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Useful Publications and URLs

- Rasmussen, J. (1997). Risk management in a dynamic society: A modelling problem. *Safety Science*, *27*(2–3), 183–213. Scopus. https://doi.org/10.1016/S0925-7535(97)00052-0
- https://www.weforum.org/reports/global-risks-report-2023/
- https://www.sitra.fi/en/news/megatrends-2023-these-are-the-trends-we-cannot-ignore/
- https://www.oecd.org/publications/the-post-covid-19-rise-in-labour-shortages-e60c2d1c-en.htm
- Weick, K. E., & Sutcliffe, K. M. (2001). *Managing the unexpected: Assuring high performance in an age of complexity.* Jossey-Bass

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