

Resilient hospital design through agent-based modelling and expandable modular construction

Dr Kangkang Tang kangkang.tang@brunel.ac.uk

CEng MICE MIStructE

22/7/2021



Resource Efficient Future Cities
(REFC) Research Centre



Brunel
University
London

WHAT IS RESILIENCE?

- “Resilience is the capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance.”
- “It is the capacity to bounce back after a disturbance or interruption.”

- *Resilient Design Institute*

WHAT IS RESILIENCE?

- A hospital shall maintain operation during an extreme circumstance. Healthcare facilities shall remain operation for all patients.
- During SARS-CoV outbreak in 2003, over 20% of the confirmed cases were caused by nosocomial infections and most of them were frontline healthcare staffs [1].

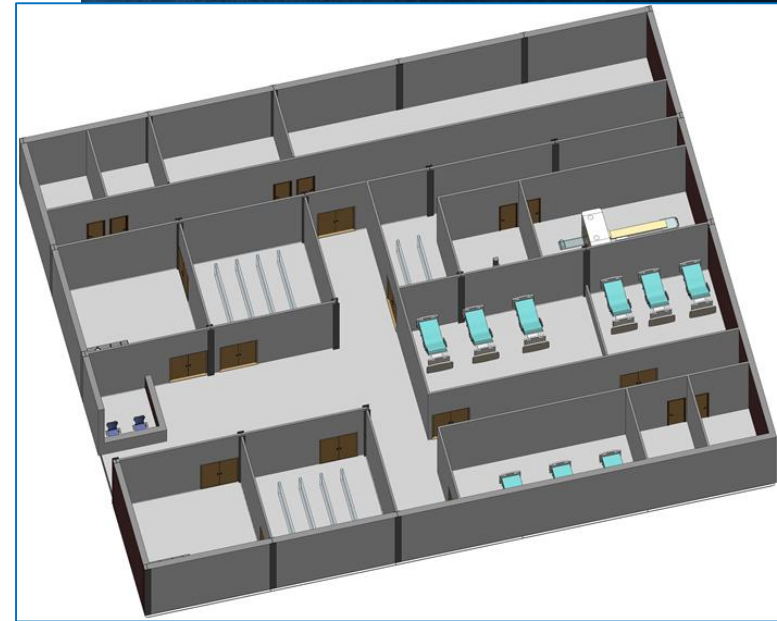
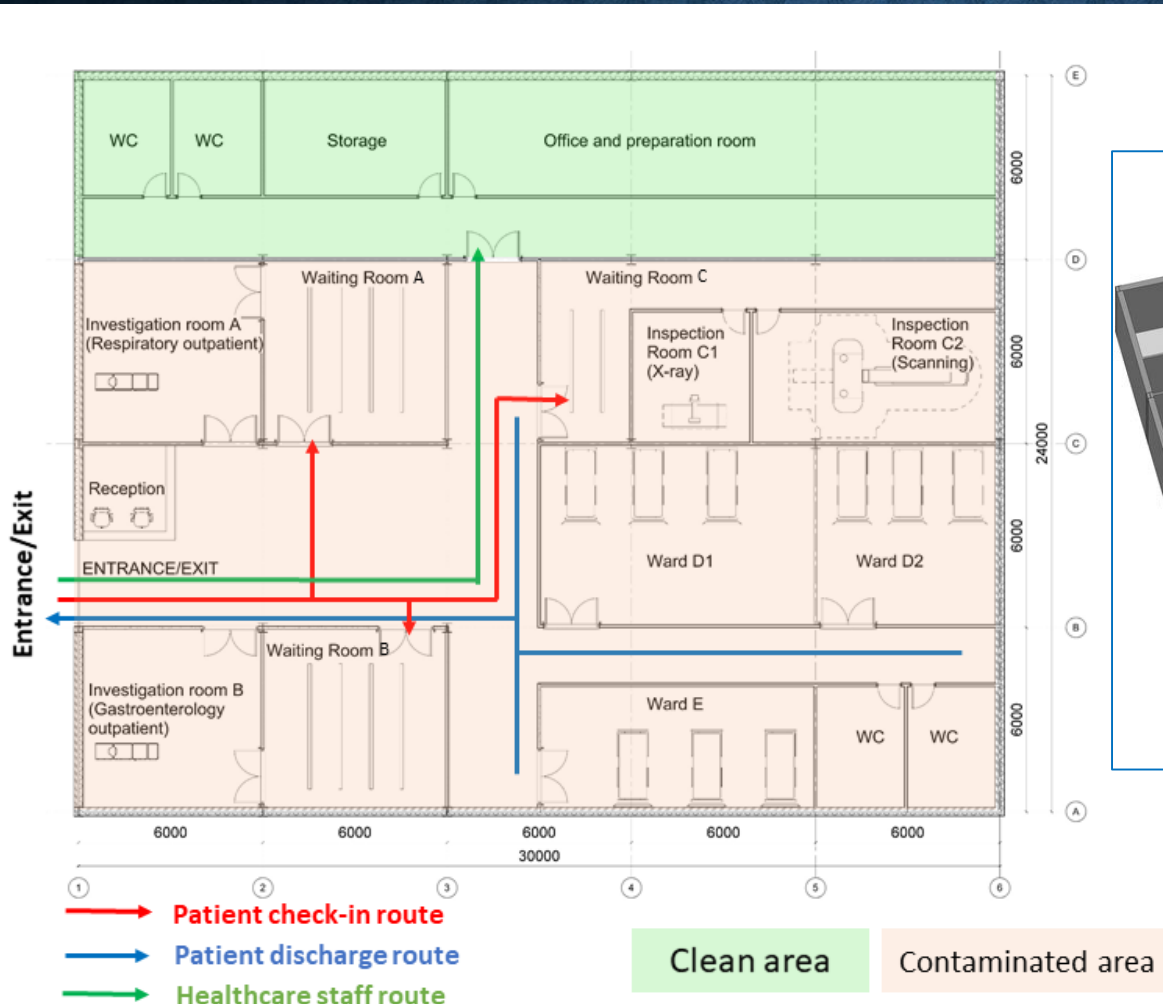
WHAT IS RESILIENCE?

COVID-19

- In the UK, approximate one seventh to one fifth COVID-19 patients and majority of infected healthcare workers attracted the disease in hospitals [1, 2].

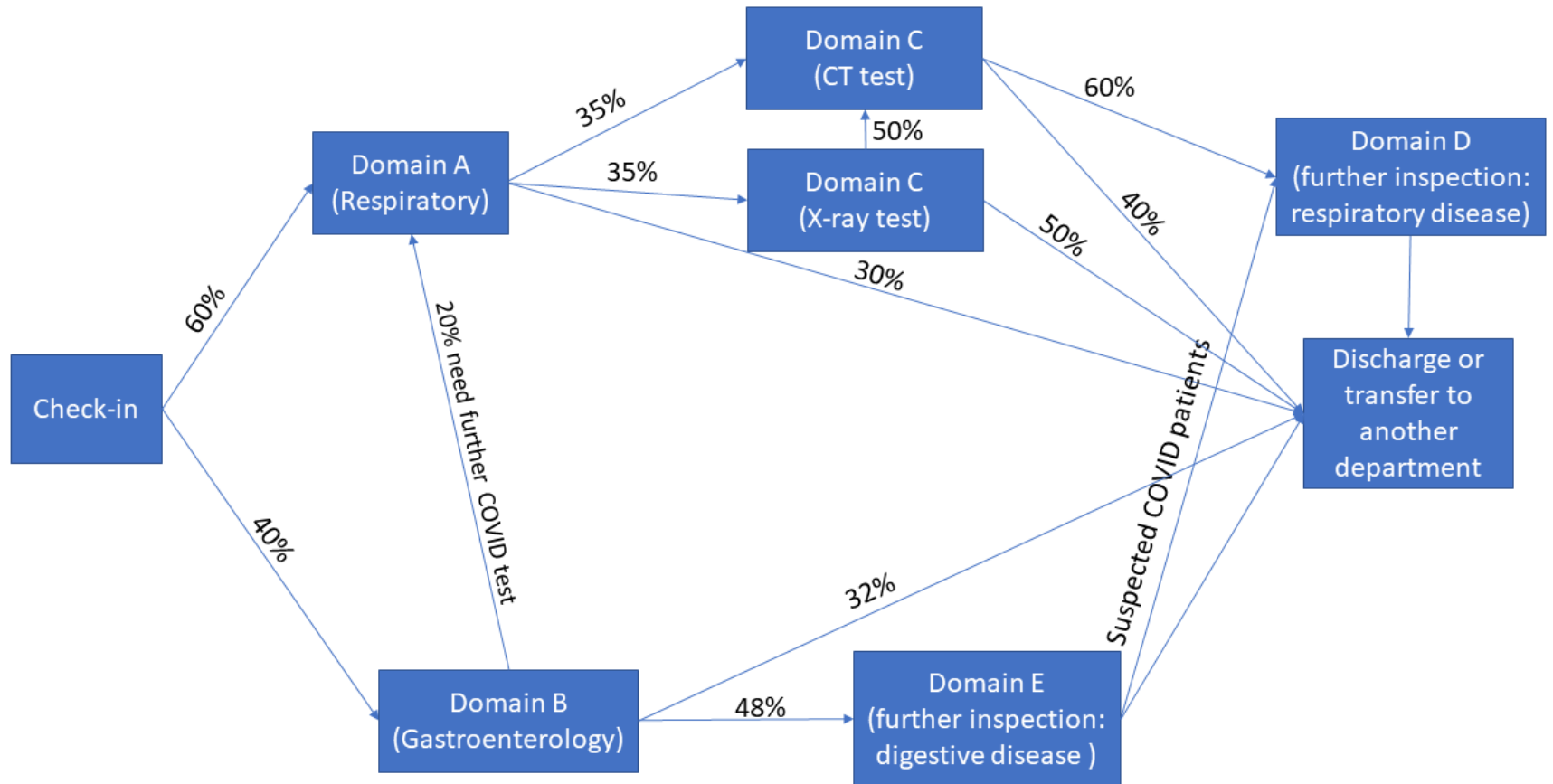
[1] D. Campbell, Caelainn, 40,600 people likely caught Covid while hospital inpatients in England, The Guardian, London, UK, 2021.
[2] S. Evans, E. Agnew, E. Vynnycky, J.V. Robotham, The impact of testing and infection prevention and control strategies on within-hospital transmission dynamics of COVID-19 in English hospitals, medRxiv (2020) 2020.05.12.20095562.

CASE STUDY INVESTIGATION 1

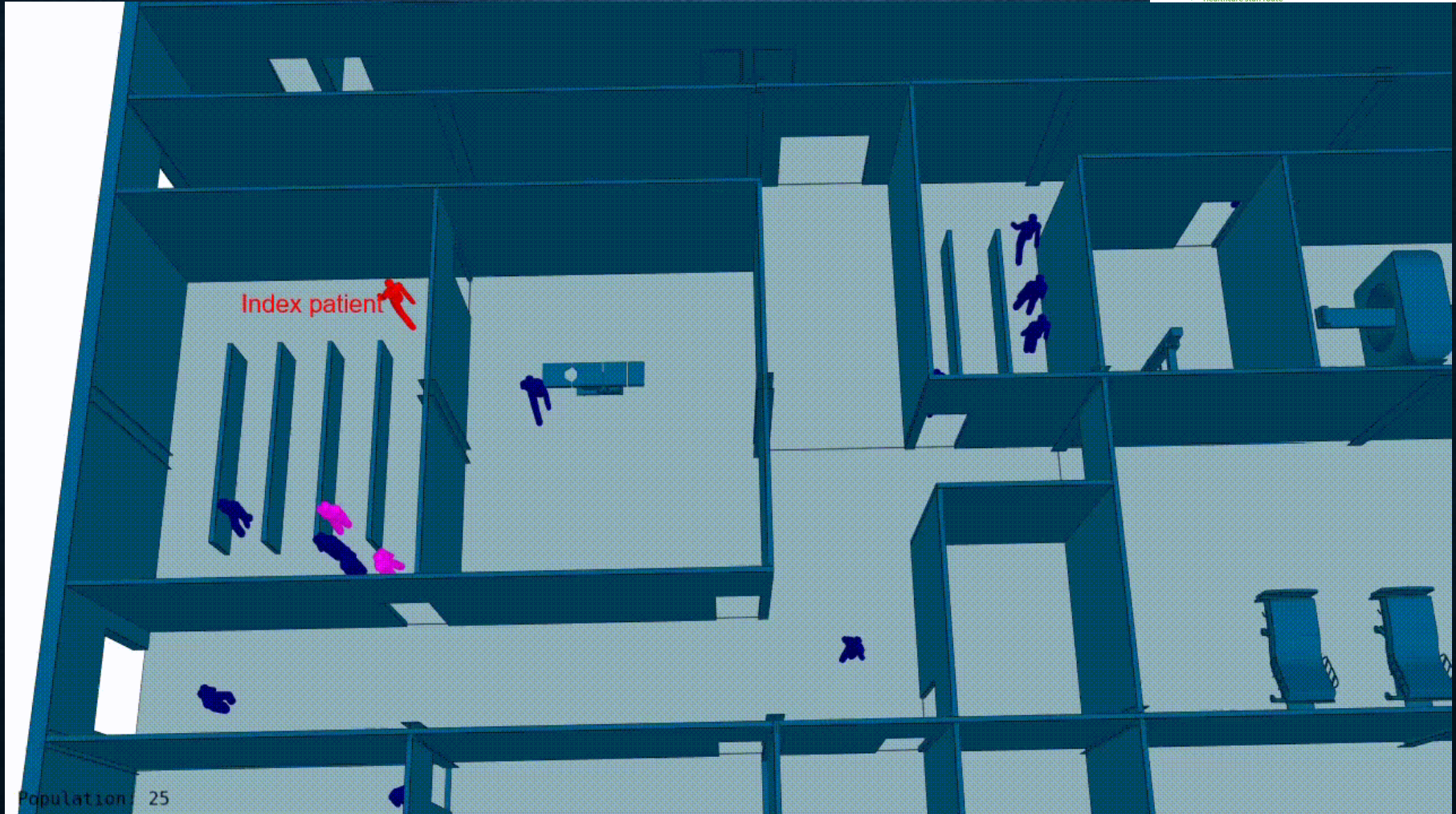
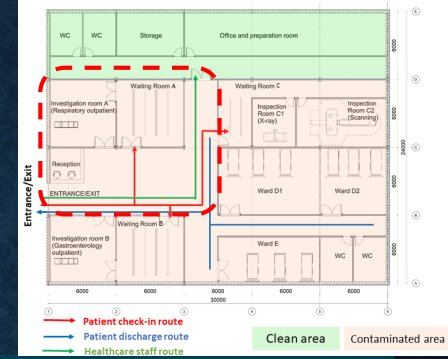


[1] K. Tang & B. Chen, Resilient hospital design through agent-based modelling and expandable modular construction, under review.

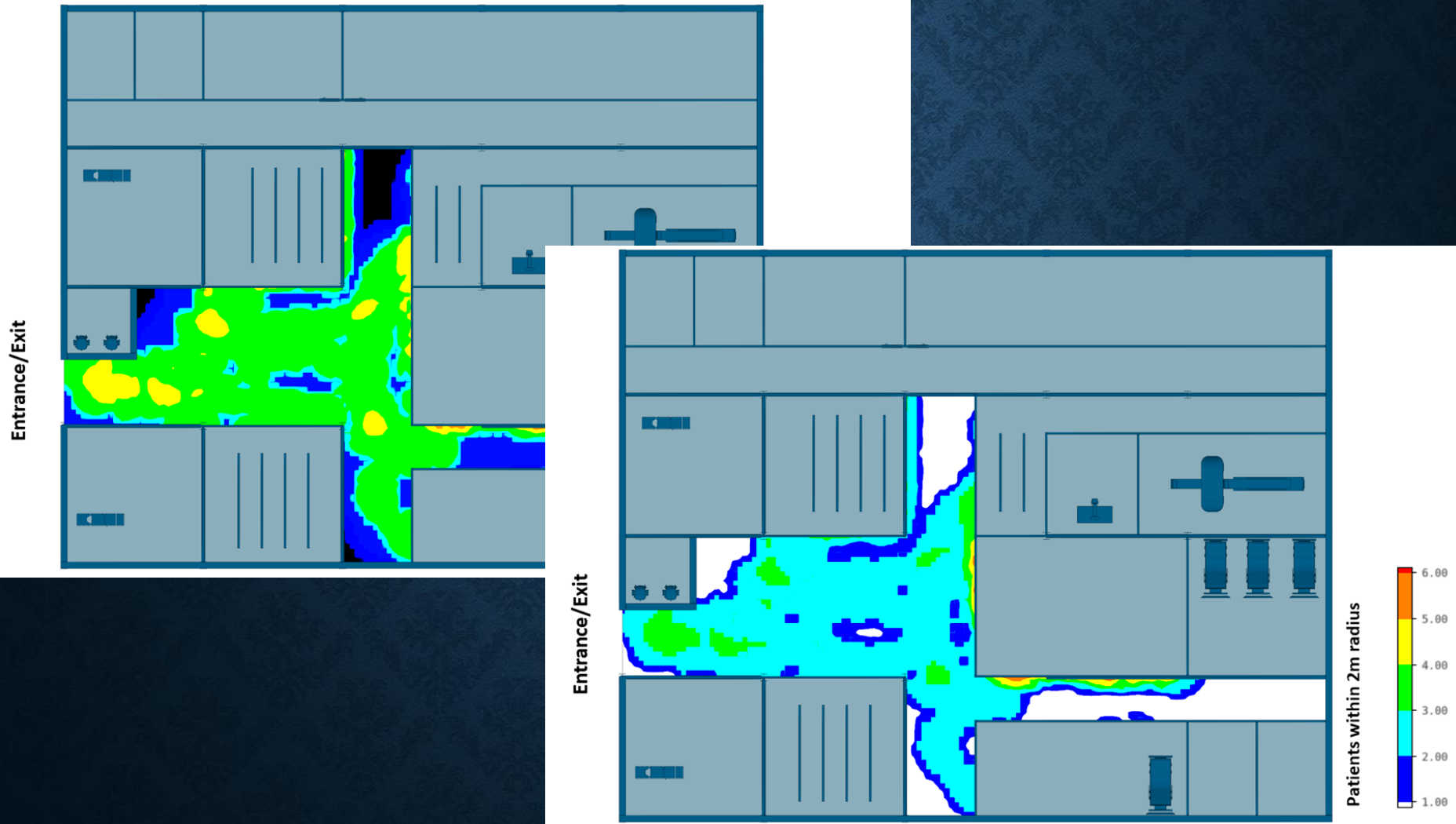
CASE STUDY INVESTIGATION 1



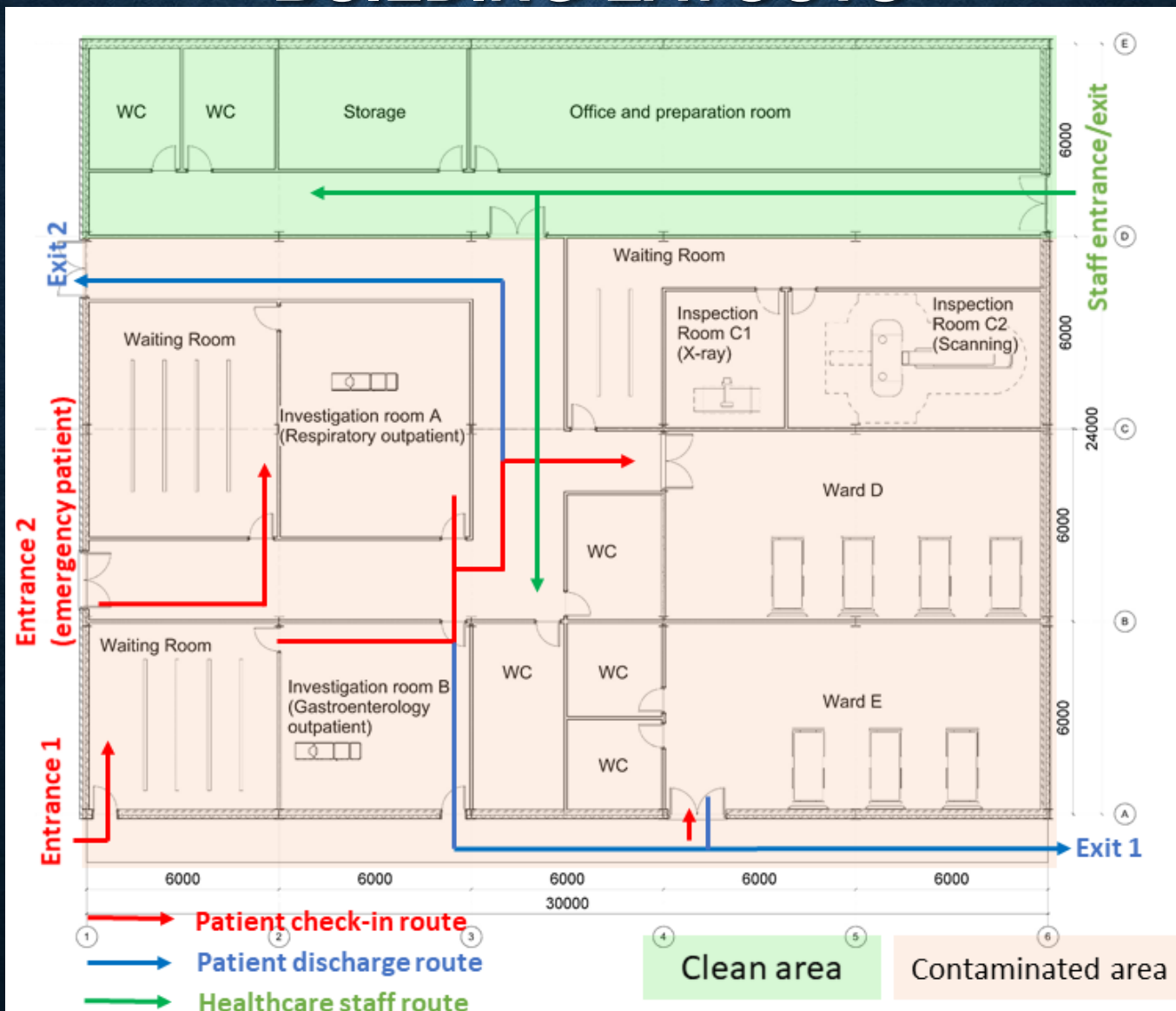
CASE STUDY INVESTIGATION 1



CASE STUDY INVESTIGATION 1

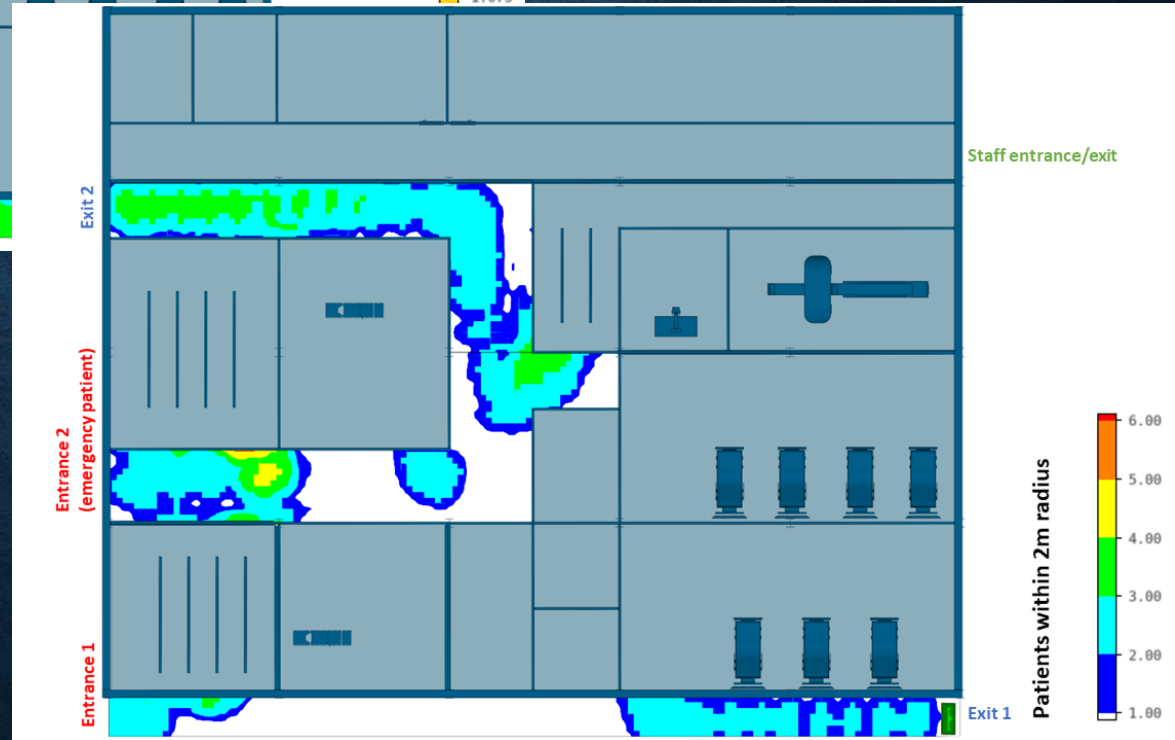
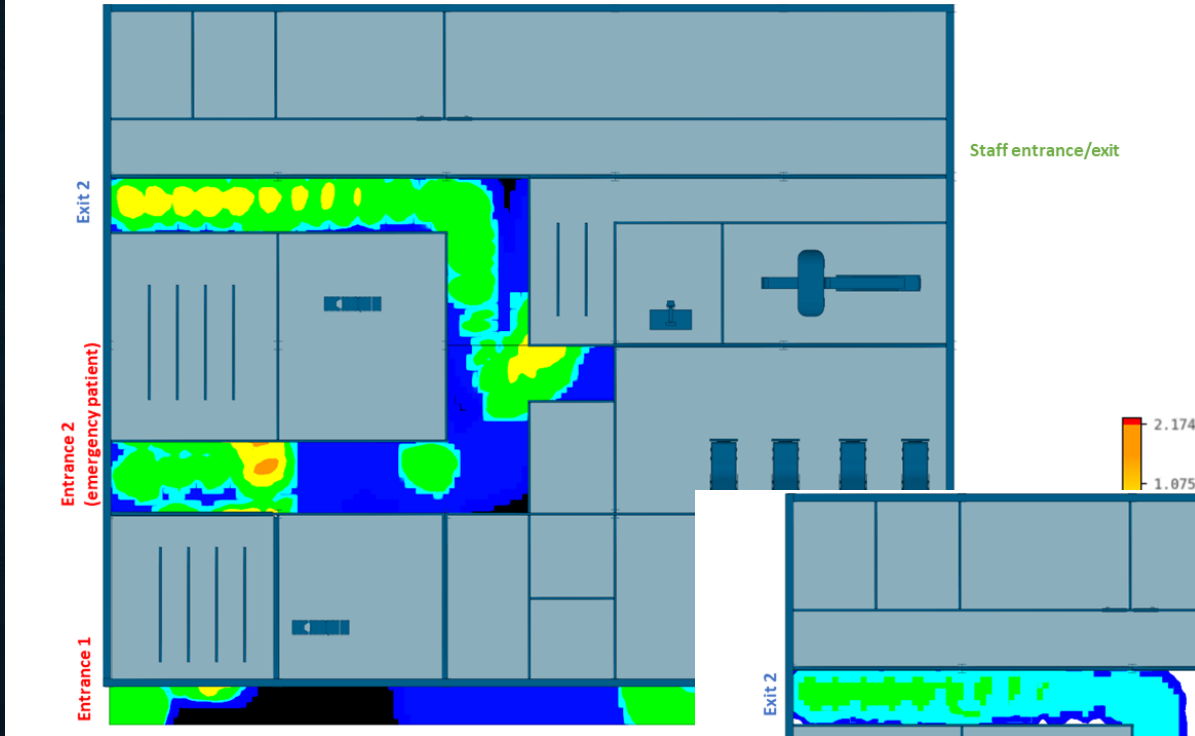


CASE STUDY INVESTIGATION 2 – ALTERING THE BUILDING LAYOUTS

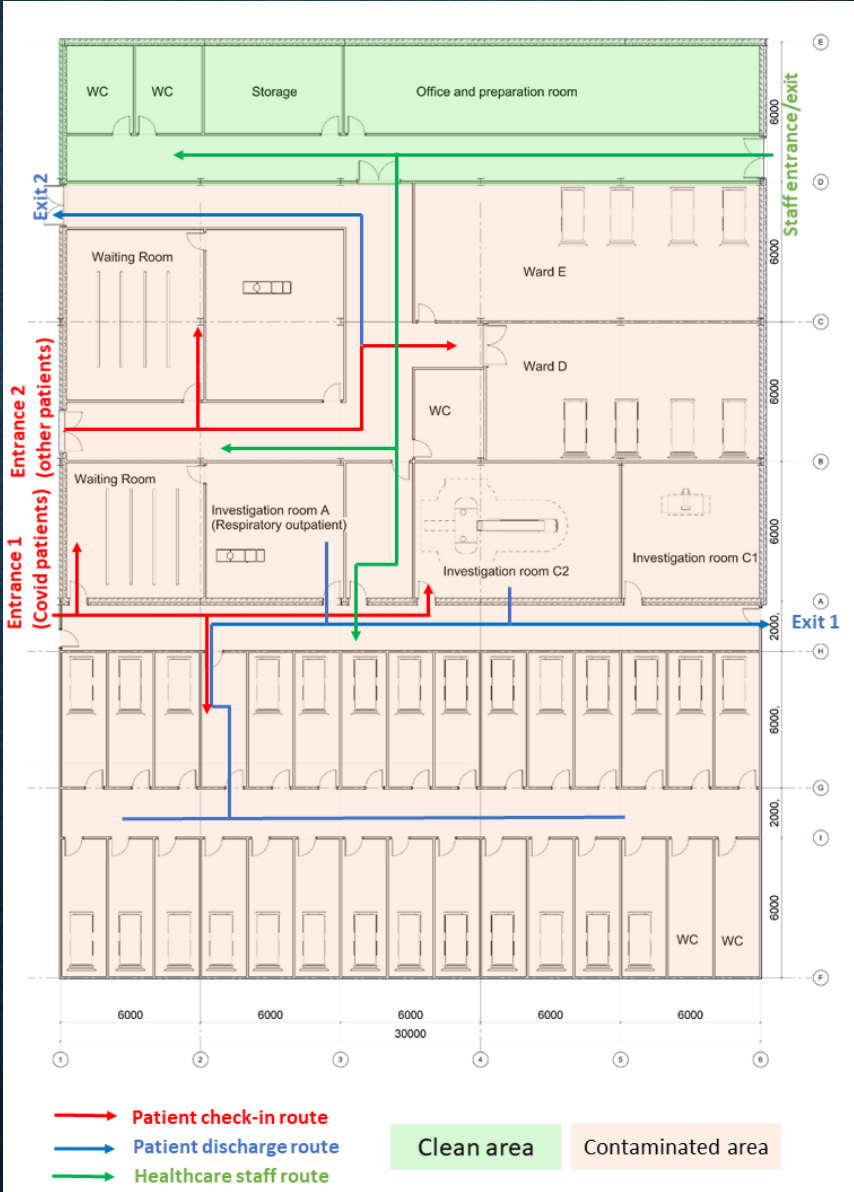


[1] K. Tang & B. Chen, Resilient hospital design through agent-based modelling and expandable modular construction, under review.

Case study investigation 2 – altering the building layouts



DEVELOP A MORE RESILIENT HOSPITAL BUILDING



[1] K. Tang & B. Chen, Resilient hospital design through agent-based modelling and expandable modular construction, under review.

DEVELOP A MORE RESILIENT HOSPITAL BUILDING

- Anticipate future challenges.
- Embrace flexible hospital building layouts and ‘design redundancies’.
- Ensure maximum adaptability.



Brunel
University
London

THANKS!

kangkang.tang@brunel.ac.uk