TOP – WP1 – Contextual Review

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Tsinghua/UCL meeting 4-5apr2016

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WP1: Contextual review

Review of UK & China's context for building design, construction & operation – issues such as:

- **Policy**
  - Regulations
  - Statutory requirements
  - Future policy
- **Standards**
  - Industry accreditation
  - Construction
  - Building performance
- **Targets**
  - Development
  - Skills & education
  - Workforce
  - Emissions
  - Performance
- **Building techniques**
  - Construction
  - Equipment
- **Climate**

Informs participatory workshops

WP2: Energy / Carbon / IEQ performance

Phase 1: Monitoring

Preliminary Monitoring of: energy & IEQ of buildings (residential, office, schools, hospitals)
- UK: 8 buildings
- China: 16 buildings

Detailed monitoring requirements

Detailed monitoring of: building systems, observational, energy IEQ (essential and in-depth), subjective evaluations of buildings (residential, office, schools, hospitals)

Phase 2: Integration

Integration of monitoring & modelling with development of:
- Integration data schema
- Calibration process
- Performance indicators

Integration process & protocols

*Standards & metrics*

WP4: Developing impact

Developing impact for relevant stakeholder groups e.g.:
- Building & system designers
- Construction industry
- Product manufacturers
- Policymakers
- Inspectors
- Industry bodies

WP3: Development of guidance

Using a participatory system dynamics approach to develop robust advice for policy and regulation development. The process will include workshops with stakeholders in China and the UK

Knowledge transfer
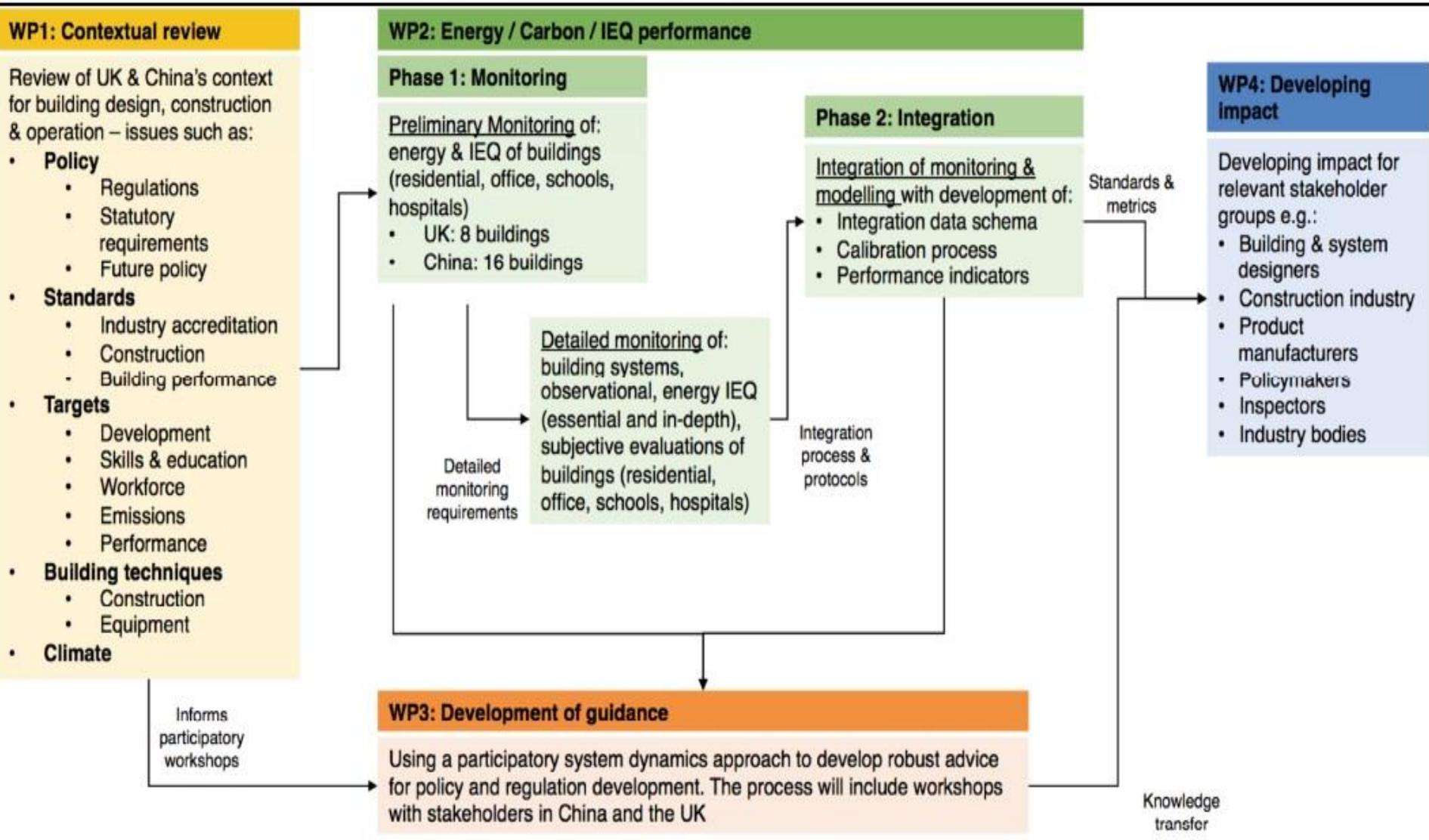
WP1 – Policy issues

- UK Building Regulations
  - 14 'approved documents', most relevant are
    - Part L – energy (revised 2010, 2013)
    - Part F – ventilation
    - Part D – toxic substances
    - Part E – sound insulation

- Local Authority Planning Rules
  - Eg 'Merton Rules', addressing
    - Acceptable types of building cladding
    - Minimum on-site renewables generation of power, heat, etc

- Greenhouse gas emissions
  - Legislation to reduce UK emissions by 80% by 2050 ref 1990

WP1 – Standards

- Formal Codes and Standards
  - Eurocodes – now required across the European Union
  - BSi – British Standards Institute
  - ISO standards - Global

- Client required
  - BREEAM – buildings
  - CEEQUAL – infrastructure

- Construction products
  - CEN standards – European Union
  - ISO standards - Global

WP1 – Targets and Procurement

- 2025 government/industry partnership document
  - See next slides
  - Leads to a combination of responses
  - Offsite, BIM, 'intelligent' components, use of advanced sensors, etc

- Procurement typesClient required
  - PFI/PPP, eg integrated design/build/manage/maintain
  - 'Traditional', eg design then build then manage/maintain

WP1 – Climate

- UK too small for regional variations, other than for
  - Wind
  - Rainfall

- Also note that both current and projected Climate Change impacts (eg heat island, wind and rain acute and chronic effects) are likely to have regional variation in the UK

WP1 – Climate

- UK too small for regional variations, other than for
    - Wind
    - Rainfall

Our vision for 2025

Working together, industry and Government have developed a clear and defined set of aspirations for UK construction.

It begins with a clear vision of where UK construction will be in 2025:

- **PEOPLE** An industry that is known for its talented and diverse workforce

- **SMART** An industry that is efficient and technologically advanced

- **SUSTAINABLE** An industry that leads the world in low-carbon and green construction exports

- **GROWTH** An industry that drives growth across the entire economy

- **LEADERSHIP** An industry with clear leadership from a Construction Leadership Council

This vision will provide the basis for the industry to exploit its strengths in the global market.

Lower costs

33%

reduction in the initial cost of construction and the whole life cost of built assets

Faster delivery

50%

reduction in the overall time, from inception to completion, for newbuild and refurbished assets

Lower emissions

50%

reduction in greenhouse gas emissions in the built environment

Improvement in exports

50%

reduction in the trade gap between total exports and total imports for construction products and materials

WP1 – Paper 1 - Qualitative

Relevant text from proposal document: *The call document stresses the importance of understanding how history and context matter for low carbon transition. Our proposed work will begin - via a review of the literature - by examining the contrasting context within which buildings have been designed and constructed and within which they are used and operated in both countries and internationally (Milestone 1.1 Report).*

Working title: *The Low Carbon Transition of Buildings in China and the UK: History and Context*

Target journal: Building Research and Information (BRI)

Target length: 8000 words

Lead author UCL: Clive / Ian? [supported closely by other authors as noted below]

Lead author Tsinghua: ?

1. Introduction [800 words]

Context and background

(i) General introduction [200 words: author – Mike/Tim?]

(ii) China [200 words: author - ?]

(iii) UK [200 words: author - Tim?]

(iv) Overview of TOP project [200 words: author - Mike]

2. Background - overview of the international context beyond UK and China [1000 words]
[Author – Clive/Ian?]

3. Brief overview of China and UK building stocks [800 words]
(i) China [400 words: author - ?]
(ii) UK [400 words: author – Clive/Ian]

4. Issues [3000 words]
Sub headings: Laws, Regulations, Standards, Targets, Building Techniques, Climate, Tenancy structures and sub-metering arrangements [etc.?]
(i) China [1500 words: author - ?]
(ii) UK [1500 words: author - Clive]

5. Risk management hierarchy [800 words]
Discussion of how the above factors form a hierarchy of risk and the implications of this [author- Tim]

6. Discussion - compare and contrast histories and contexts [1200 words]
Overall discussion plus implications for the TOP project
First draft author: Ian supported by Clive/Tim

6. Conclusions [400 words]
First draft author: Ian supported by Clive/Tim

WP1 – Paper 2 - Quantitative

Relevant text from proposal document: *We will then probe into the differences between China and UK in total building performance which takes both energy and IEQ into account, investigating the mechanisms of those differences in the building design and operation stages respectively (Milestone 1.2 Report)*
Working title: *The 'Total Performance' of Low Carbon Buildings in China and the UK*
Target journal: BRI / Energy and Buildings / Buildings and Environment
Target length: 7000 words
Lead author UCL: Jon [supported closely by other authors as noted below]
Lead author Tsinghua: ?

1. Introduction [800 words]
Context and background [perhaps referring to the WP1 quantitative paper?]
(i) General introduction [200 words: author - Mike]
(ii) China [200 words: author - ?]
(iii) UK [200 words: author - Tim?]
(iv) Overview of TOP project [200 words: author - Mike]

2. Top down data for <u>energy</u> performance gap [2300 words]
(i) A few topic specific paragraphs to key references, databases and common protocols (definition of the energy performance gap or breakdown of energy use especially electricity) [500 words: author - Sung Min/Tsinghua author]
(ii) China large database (48 'green' + 481 'conventional' offices as described in the original Tsinghua draft) [900 words: author - ?]
(iii) UK large database(s) (~500 'green' + 6,000 'conventional' schools) [900 words: author - Sung Min/Dejan/Daan]

3. Bottom up data for <u>energy and IEQ</u> performance gaps in 'low carbon' buildings [1800 words]
(i) A few topic specific paragraphs to key references and common methodological approaches [500 words: author - Esfand/Tsinghua author]
(ii) China - 31 'green' office buildings as reported in the Tsinghua draft [900 words: author - ?]
(iii) UK – 5-17 'low-carbon' schools [900 words: author - Esfand/Dejan/Joe]

4. Discussion [1200 words]
Overall discussion plus implications for the TOP project
First draft author: Jon supported by Tsinghua/Esfand/Sung Min

5. Conclusions [400 words]
First draft author: Jon supported by Tsinghua/Esfand/Sun Min

Thank you

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TOP WP1: Paper 1 (The *'qualitative'* paper)

Relevant text from proposal document: *The call document stresses the importance of understanding how history and context matter for low carbon transition. Our proposed work will begin - via a review of the literature - by examining the contrasting context within which buildings have been designed and constructed and within which they are used and operated in both countries and internationally (Milestone 1.1 Report).*

Working title: *The Low Carbon Transition of Buildings in China and the UK: History and Context*
Target journal: Building Research and Information (BRI)
Target length: 8000 words
Lead author UCL: Clive / Ian [supported closely by other authors as noted below]
Lead author Tsinghua:?

1. Introduction [800 words]
Context and background of the main issue
Why are buildings being built and how? Buildings are being built to do things (not to save energy);
General introduction [200 words: author – Mike/Tim]
> Importance of energy performance in meeting both global GHG mitigation targets and of reducing the intensity of demand associated with development in fast growing urban environments and improving existing buildings.
> The need to consider the wider implications of high energy performance buildings on indoor environmental quality.

Main issue being address:

There is wide acknowledgment that to develop buildings that provide safe and comfortable indoor environments and achieve a high-level of energy performance, a socio-technical approach that accounts for a range of development, institutional, operational and socio-cultural facets is needed. Such an approach needs to draw from a wider complex and dynamic system of interacting factors that act on the delivery and operation of high performance buildings.

The issue is: what are the critical components of the system that need to be understood in order to deliver these conditions within buildings and what past and current conditions can help to inform this delivery.

China [200 words: author - ?]

UK [200 words: author - Tim]

Main drivers in the UK of the low carbon buildings transition

Description of the challenge being faced by the UK, i.e. That the majority of buildings are built, meaning the total performance needs to improve among a heterogeneous stock.

Description of the UK's prospective of developing new and high performance buildings

Overview of TOP project [200 words: author - Mike]

Description of the themes of the project (and brief mention of the partnership approach of UK-China to study local context)

What is the TOP project bringing to the party? What is it trying to solve, i.e. where do the key issues lie?

2. Background - overview of the (UK, China, international) context [1000 words]

[Author – Clive/Ian] with detail from China [400 words: author - ?]

Scope out the wider drivers that have been affecting the development of the built environment, of which a 'thin facet' are those of energy and IEQ performance.

Sustainability: UN Conference on Environment and Development in 1992: Agenda 21, developed/developing countries. Kyoto protocol and later agreements COP21. Climate change. Industrialization. Globalization, Knowledge sharing, Mobility of work force/Skills

Brief overview of low carbon buildings initiatives

Worldwide building trends: ASHRAE standards

3. Brief overview of China and UK building stocks [800 words]

(i) China [400 words: author - ?]

(ii) UK [400 words: author – Clive/Ian]

Historical building perspective, Geophysical details (brief)

(very briefly UK Context: Climate change act, CCC targets, EU context(EPBD), regulation ADF/ADL. State of existing stock, Building types and ranges. Performance gap. IAQ issues

State of existing stock, Building types and ranges. Performance gap. IAQ issues

4. Issues [3000 words]

Sub headings: Laws, Regulations, Standards, Targets, Building Techniques, Climate, Tenancy structures and sub-metering arrangements [etc.?]

[Each of the themes should contain the relevant factors/drivers within China/UK and how the impact the development, delivery and operation and maintenance of high performance buildings]

(i) China [1500 words: author - ?]

(ii) UK [1500 words: author - Clive]

Themes: place the following within the issues: Climate change act, CCC targets, EU context(EPBD), regulation ADF/ADL.

Relate the influence of each of the issues on:

Performance: / gap / IEQ issues/ Wellbeing context.

Evaluation: measurement/surveys/stakeholder discussions WP1-WP3: need for holistic approach to dig into results

5. Risk management hierarchy [800 words]

Discussion of how the above factors form a hierarchy of risk and the implications of this [author- Tim]

What are the critical areas/methods to identify these

Pinch points: designers-contractors-users

6. Discussion – learning from histories and contexts for the transition to a low carbon building stock [1200 words]

Overall discussion plus implications for the TOP project

First draft author: Ian supported by Clive/Tim

Key issues from above: Compliance/Energy use/Wellbeing/IEQ / interaction and communication

New technology/ occupants passive/active

Offer future policy options/ guidance for stakeholders/building professional in framing future projects to achieve multiple goals?

Consider how systems approach SD can provide integrated understanding, i.e. understand the process from pre-design to end use/evacuation and suggest options/methods to achieve goals

Need for the TOP project

7. Conclusions [400 words]

First draft author: Ian supported by Clive/Tim

Relevant text from proposal document: *We will then probe into the differences between China and UK in total building performance which takes both energy and IEQ into account, investigating the mechanisms of those differences in the building design and operation stages respectively (Milestone 1.2 Report)*
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1. Introduction [800 words]
Context and background [perhaps referring to the WP1 qualitative paper?]

General introduction [200 words: author - Mike]

Define what we mean by low carbon
Define what we mean by IEQ
Energy use, indoor environment, and wellbeing.
    Relate this to WP3 – the wider building performance and wellbeing
Explain why we should care about low carbon and IEQ, briefly describe how poorly performing buildings may impact on occupant performance, health, and wellbeing.

(ii) China [200 words: author - ?]

Range of climates that require different building approaches
Nature of development – rapid, new construction
Regulatory and contextual framework for construction
       How are 'green' or low energy buildings defined
Increase in the number of green buildings under construction– try to obtain construction rates for 'energy efficient' buildings as percentage of new stock.

(iii) UK [200 words: author - Tim?]

Smaller range of climates that require different building approaches
Nature of development – retrofit, expensive
Regulatory and contextual framework for construction
       How does the UK define energy-efficient buildings?
Increase in the number of green buildings under construction– try to obtain construction rates for 'energy efficient' buildings as percentage of new stock.

(iv) Overview of TOP project [200 words: author - Mike]

Reference qualitative paper
Objective of the TOP project: Examine the differences in total building performance between China and the UK
Objective of the paper: to perform an initial investigation, with available datasets, of the total performance of UK and Chinese buildings

Aims:

To examine the top-down energy performance between two large sets of conventional and green buildings in China and the UK

To examine the difference between energy and IEQ performance in smaller sets of low carbon buildings in the UK and China

2. Top down data for <u>energy</u> performance gap [2300 words]

A few topic specific paragraphs to key references, databases and common protocols (definition of the energy performance gap or breakdown of energy use especially electricity) [500 words: author - Sung Min/Tsinghua author]

China large database (48 'green' + 481 'conventional' offices as described in the original Tsinghua draft) [900 words: author - ?]

UK large database(s) (~500 'green' + 6,000 'conventional' schools) [900 words: author - Sung Min/Dejan/Daan]

Refer to spreadsheet for common building performance parameters

Incorporate simple analysis, which establish the questions TOP will be answering

Compare like-for-like between China and the UK only when feasible

Should aim to have the same analyses carried out using the same protocol and software for all datasets. Suggestions welcome.

3. Bottom up data for <u>energy and IEQ</u> performance gaps in 'low carbon' buildings [2300 words]
A few topic specific paragraphs to key references and common methodological approaches [500 words: author - Esfand/Tsinghua author]

China: 31 'green' office buildings as reported in the Tsinghua draft [900 words: author - ?]

UK: 5-17 'low-carbon' schools [900 words: author - Esfand/Dejan/Joe]
Refer to spreadsheet for common parameters
Compare energy performance against conventional buildings in same climate/context
Where possible, examine performance gap and potential drivers behind gap.
Analysis should be simple, and set platform for more in-depth analysis in following papers.

Should aim to have the same analyses carried out using the same protocol and software for all datasets. Suggestions welcome.

4. Discussion [1200 words]
Overall discussion plus implications for the TOP project:

Summary of results
Discussion of observed differences within their various contexts
Buildings are unlikely to be directly comparable due to context/climate. Instead, focus on differences in metadata
Discussion of what drivers may be responsible for differences
Describe what the implications are for occupants/policy
Briefly describe what may be learnt from each country, set platform for TOP project, including limitations of data/methods.

First draft author: Jon supported by Tsinghua/Esfand/Sung Min

5. Conclusions [400 words]
First draft author: Jon supported by Tsinghua/Esfand/Sun Min