THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
DEPARTMENT OF CIVIL ENGINEERING

RISKS ASSOCIATED IN IMPLEMENTATION OF GREEN BUILDINGS

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PRESENTATION OUTLINE

- GREEN BUILDING DEFINITION
- ASSESSMENT ASPECT OF GREEN BUILDING
- DRIVERS FOR THE IMPLEMENTATION
- RISKS IN GREEN BUILDING
- SUMMARY AND CONCLUSION
- RECOMMENDATION

Why do we go green ????
(Green Building)

- **IMPROVE STANDARD OF LIVING**
- **BUT**
- **SAVE THE ENVIRONMENT (ZERO DAMAGE)**

DEFINITION OF GREEN BUILDING

- Green Building" is described as a building that is more energy and resources efficient, releases less pollution into the air, soil and water, and is healthier for occupants than standard buildings [Richardson & Lynes (2007)]
- A development that seeks to increase the sustainability and efficiency of buildings and development [Retzlaff (2009)]
- No standard definition exists (Kibert & Grosskopf, 2007)
- Focus on several issues, typically site selection and building orientation, energy consumption, materials selection, indoor environmental quality, water consumption, construction methodology, and life-cycle costing (Perzan, 2006; Zacharian, Kennedy, & Pressnail, 2002).

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DEFINITION OF GREEN BUILDING

Green Building	Sustainable Building	Restorative Building
• Reduces negative impacts on the environment • Continues to rely on stored stocks of natural capital • Some external costs remain	• Eliminates negative impacts on the environment • Relies only on current flows of natural capital • No external costs; all external costs are internalized	• Positive effect on the environment • Reinvests in restores natural capital • External or public benefit

Weak sustainability

Strong sustainability

(Hawken, Lovins & Lovins, 1999; Martinex-Alier, 2001, p.4019; Reed, Hubbard, and Batshalom , 2004; McDonald and Dale, 2004)

ASSESSMENT ASPECT OF GREEN BUILDING

- Green Building Councils from all over the world developed rating tool systems that can be used as a guideline to profile a building that is designed 'green' and designed non-green.

DRIVERS FOR THE IMPLEMENTATION

- *(i) the implementation of new government policies that will help to promote or perhaps mandate eco-friendly features*
  - the impact of Global Pressure which drives the government to put high incentive towards movement of sustainability
  - Government in Germany provide incentives to promote sustainable development, such as introduction of tax credit schemes and regulatory mechanisms as well as to assist the implementation of other economic instruments (e.g. favourable banking and insurance products, advantageous interest, and insurance rates) that support sustainable development in property and construction (Lutzkendorf & Lorenz, 2006)

DRIVERS FOR THE IMPLEMENTATION

- (i) the implementation of new government policies that will help to promote or perhaps mandate eco-friendly features (cont'd)
  - In United Kingdom, the government offers the industry lower taxes on sustainable properties to promote energy efficiency (Matters, 2009).
  - In Australia, it was stated in the article published by the Sustainable Property company that new buildings must comply with the country's 'Green Star' sustainable performance measures (Matters, 2009)

DRIVERS FOR THE IMPLEMENTATION

- *(ii) stakeholders perceive that Green Buildings will give higher profit in return and increasing awareness that green buildings tend to be more economical to operate*
- developers,
  - Developers which participate in the implementation of green building for the commercial and residential buildings are driven by the profit that they are able to make through selling properties with eco-labelling (Fuerst, 2009). Hence to the developers, are looking for a good return for what they have invested either in short and long term period. In other words, they are interested in expanding their business.
- owner-occupier & tenants
  - The owner-occupier and the tenant are interested in the low operating cost of the green building. The studies carried out by McGraw Hill Construction, (2006) and GVA Grimley, (2007) reported that the occupiers are willing to pay for the additional costs of green buildings through higher rents provided in return that they will achieve the four benefits i.e reduced operating costs, improved productivity, improved image for occupiers and owners and reduced operating and regulatory risks

DRIVERS FOR THE IMPLEMENTATION

- *(iii) the increase in level of awareness has been due to multiple researches on performance of green building*
  - The research carried out by (Heewagen, 2000; Heewagen & Wise, 1998) outlines the benefits of green buildings in promoting awareness to the key players of sustainable development. Another study by (Z. Yang & Yang, 2009) highlighted the mutual benefits of sustainable housing which contributes to the level of awareness. A study by (Seewald, 2009) suggested to the relevant authorities to use a software to measure benefits of green buildings and this is also a contribution to promote the level of awareness. A recent research by (Baird, 2010) which studies the occupants level of comfort has helped to emphasis the benefits of Green Building.

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RISKS IN GREEN BUILDING

The risks will be discussed in three stages of project implementation as below

- Design Stage (stage 1)
- Construction Stage (stage 2)
- Maintenance and Operation Stage (stage 3)

RISKS IN GREEN BUILDING (Design Stage)

- Financial Risk (1/3)
  - associated with designing,
  - permitting,
  - certifying the project,
  - delay cost
  - lack of knowledge and experience resulting in wrong perceptions (high initial capital cost and the long payback time to recuperate the initial cost are risks in the growth of green building or in other word the fear to invest in high costs with uncertain return of the cost revenue.)

RISKS IN GREEN BUILDING (Design Stage)

- Standard of Care/Legal Risk (2/3)
  - *Not attaining the level of Green certification expected by owner, tenant, or other third party. Case:* ***Shaw Development, LLC v. Southern Builders, Inc., No. 19-C-07-011405 (Somerset Cty. Cir. Ct. Md. 2007)***
  - *Challenge of determining an appropriate standard of care as green building expertise continues to evolve*
  - *Evolving building codes with potential for application of a strict liability standard*.
  - *Untested contract language*

RISKS IN GREEN BUILDING (Design Stage)

- Regulatory Risk (3/3)
  - shift in government priorities (i.e maintaining green regulations, but removing tax incentives and subsidies)
  - the non-uniformity and instability of the tax and regulatory incentives can be considered as the risks towards accelerating the growth of green buildings

RISKS IN GREEN BUILDING (Construction Stage)

- Inexperience consultants and contractors (1/3)
  - lack of experience consultants and contractors with respect to green projects results in schedule delays of the project
  - lack of the skills to properly implement green oriented technology
  - possible unforeseen conditions of retrofitting existing buildings to become green are a common risk identified under the construction stage
  - It is significant to choose the sufficient experienced consultants and contractors with a good track record for implementing green buildings

RISKS IN GREEN BUILDING (Construction Stage)

- Financial Risk (2/3)
  - the cash flow during the construction stage process is critical in implementing green buildings
  - fluctuation of the price of green materials is also a risk in the implementation of green buildings
  - new materials in market would have high cost

RISKS IN GREEN BUILDING (Construction Stage)

- Availability of green materials risk (3/3)
  - availability of green materials in the market is a risk during the construction stage or sourcing materials become difficult
  - consultants are then faced with the challenge to audit the work of the contractor to ensure compliance

RISKS IN GREEN BUILDING (Maintenance and Operation Stage)

- Performance Risk
  - building performance risk is rated to be one of the highest risks in the growth of implementation of green buildings
  - a number of researches that had been carried out to show that Green Buildings are underperforming (some of the LEED rated buildings uses more energy than it was intended designed to be) Research findings by Newsham, Mancini, & Birt, (2009), Gabe (2008), Bordass, Cohen, Standeven, & Leaman (2001)

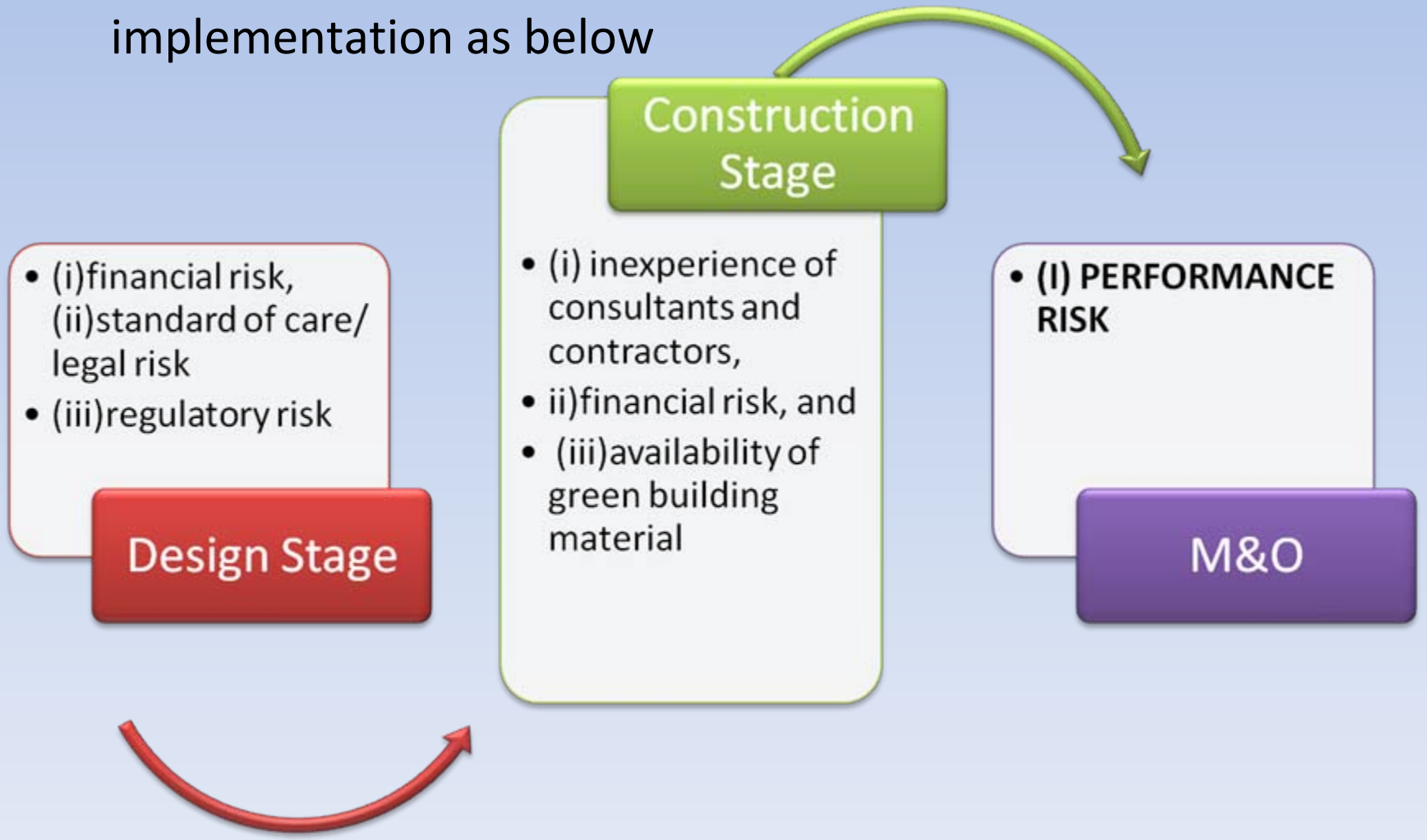
- Performance Risk (cont'd)
  - common reasons of this inefficient energy building performance is mainly due to the actions of the occupants and facility managers in the building
  - malfunction of technologies and systems in the buildings has also been identified to be the reasons of inefficient energy building performance
  - the benchmark or estimated energy is inappropriate for buildings that are high energy usage i.e research building that consists of laboratory

RISKS IN GREEN BUILDING (Maintenance and Operation Stage)

- Performance Risk (cont'd)
  - Green Buildings have the potential to have moisture accumulation and mold growth problem due to the increased natural ventilation in the building
  - with these problems that persist in Green Building, it may impede the growth of Green Building
  - can be mitigated through proper design and construction (suggestion)

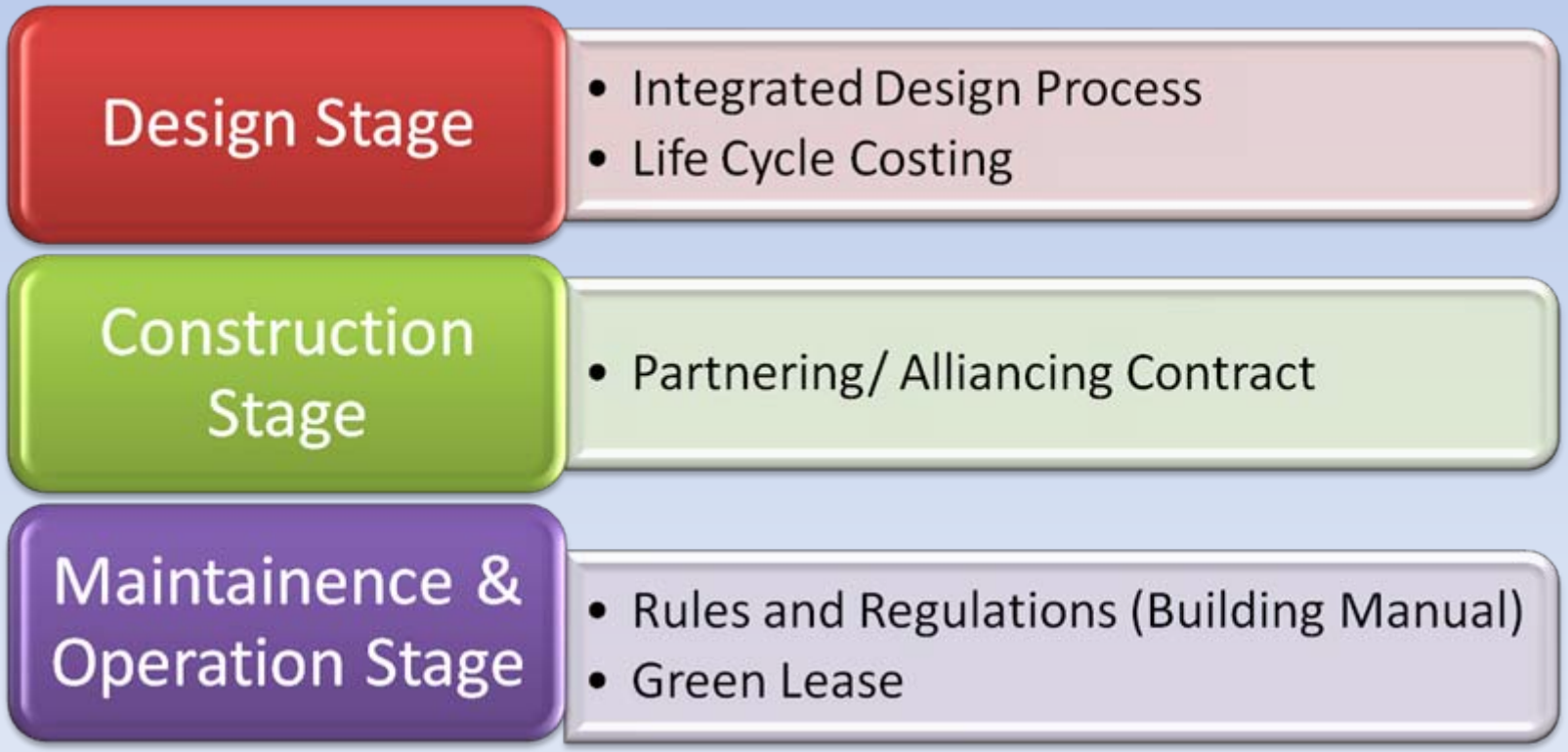
SUMMARY & CONCLUSION

- The risks were listed under three stages of a project implementation as below



RECOMMENDATION

- The "decision makers" must consider seriously the significant risks as abovementioned at all stages of project implementation in order to accelerate the implementation of green buildings. Below are recommendations to the solutions to mitigate risks associated implementation of green buildings. How effective are these recommendations are yet to be investigated.



- **QA SESSION**