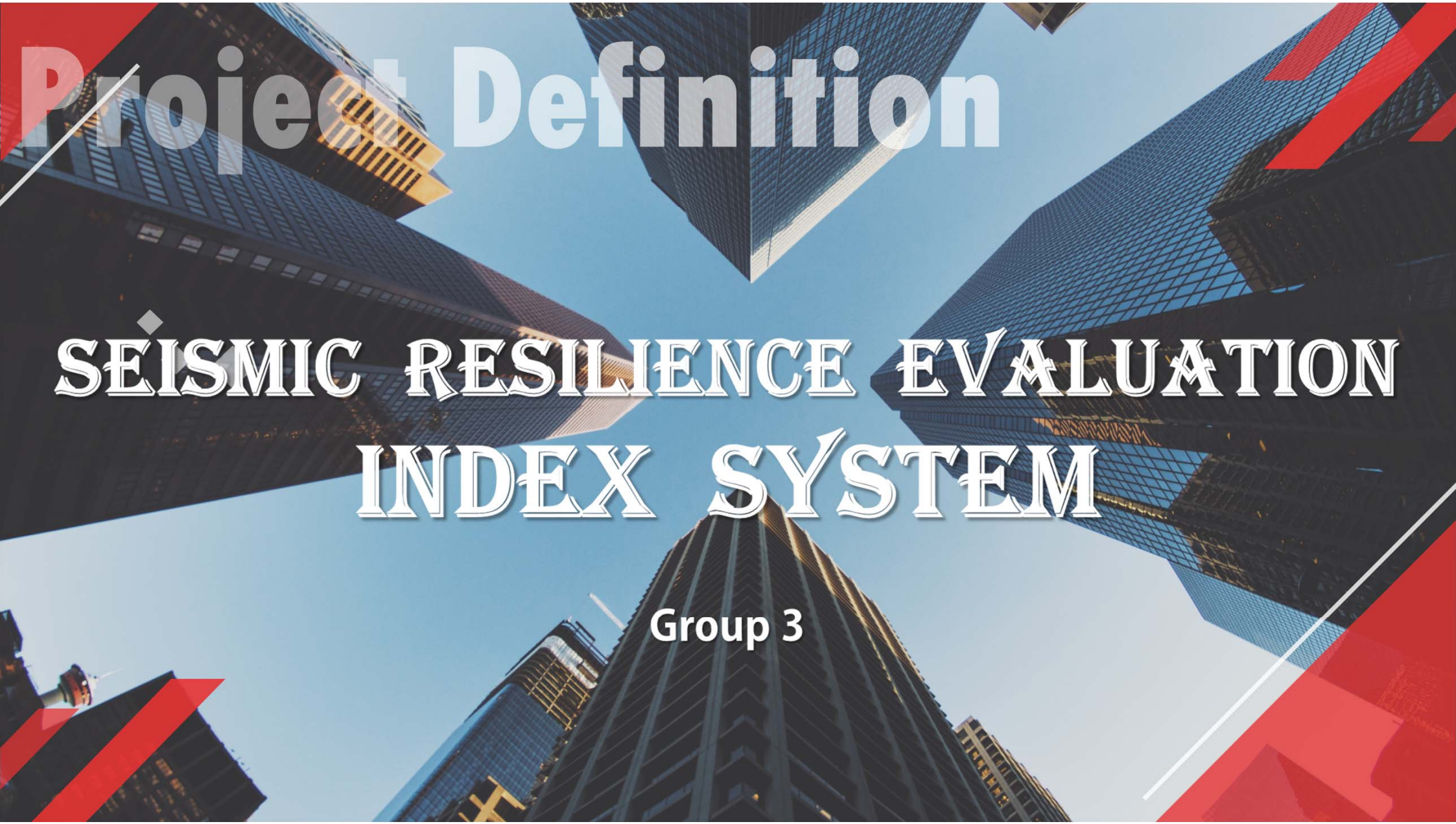

Project Definition
SEISMIC RESILIENCE EVALUATION
INDEX SYSTEM
Group 3

CONTENTS

Chapter

01

Team Introduction

Tsinghua Group + Doc. + Beijing Earthquake Agency

Team Introduction

Tsinghua Group
(Undergraduate)
Yikun Liu
JingQiu Liao
Weixuan Chen
Yinan Hu
Jian Tang

Beijing Earthquake Agency
Fei Wang
Lifu Zheng

Doctor of Tsinghua Univ.
Fei Wang
Shengjie Pan

Chapter

02

Concepts & Framework

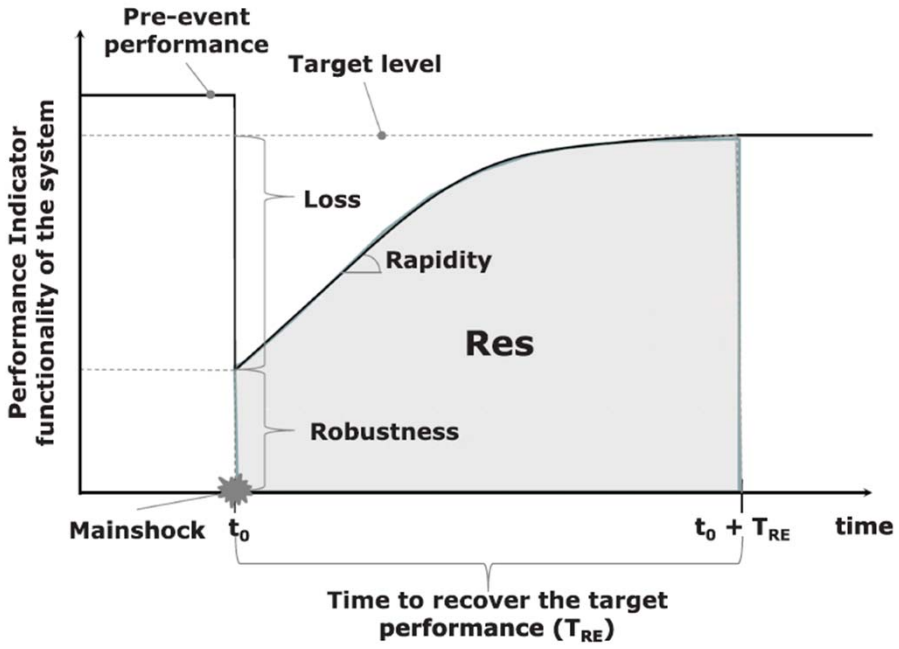
Urban resilience & Earthquake resilience & Index system

Why Earthquake Resilience

76 earthquakes with magnitude > 7.0 or above occurred in mainland China between 1900 and 2007, among which **6** earthquakes with a magnitude of 8.0 or above were recorded.

[参考文献] 郭晓宇. 城市中心区地震应急通道安全评价方法研究及应用[D]. 北京工业大学, 2014.

Urban Resilience & Earthquake Resilience



$$R(\vec{r}) = \int_{t_{OE}}^{t_{OE}+T_{LC}} Q_{TOT}(\vec{r}, t)/T_{LC} dt$$

Urban Resilience

"The ability of a city system and all its components to **maintain** or rapidly **recover** needed functions and adapt to changes. " ——Merrow

Earthquake Resilience

The ability of social units to mitigate disasters, absorb the impacts of disasters and take measures to recover in time, so as to reduce social disturbances and mitigate the effects of future earthquakes. ——Michel Bruneau et al

SPUR -- Seismic Hazard Mitigation Policy

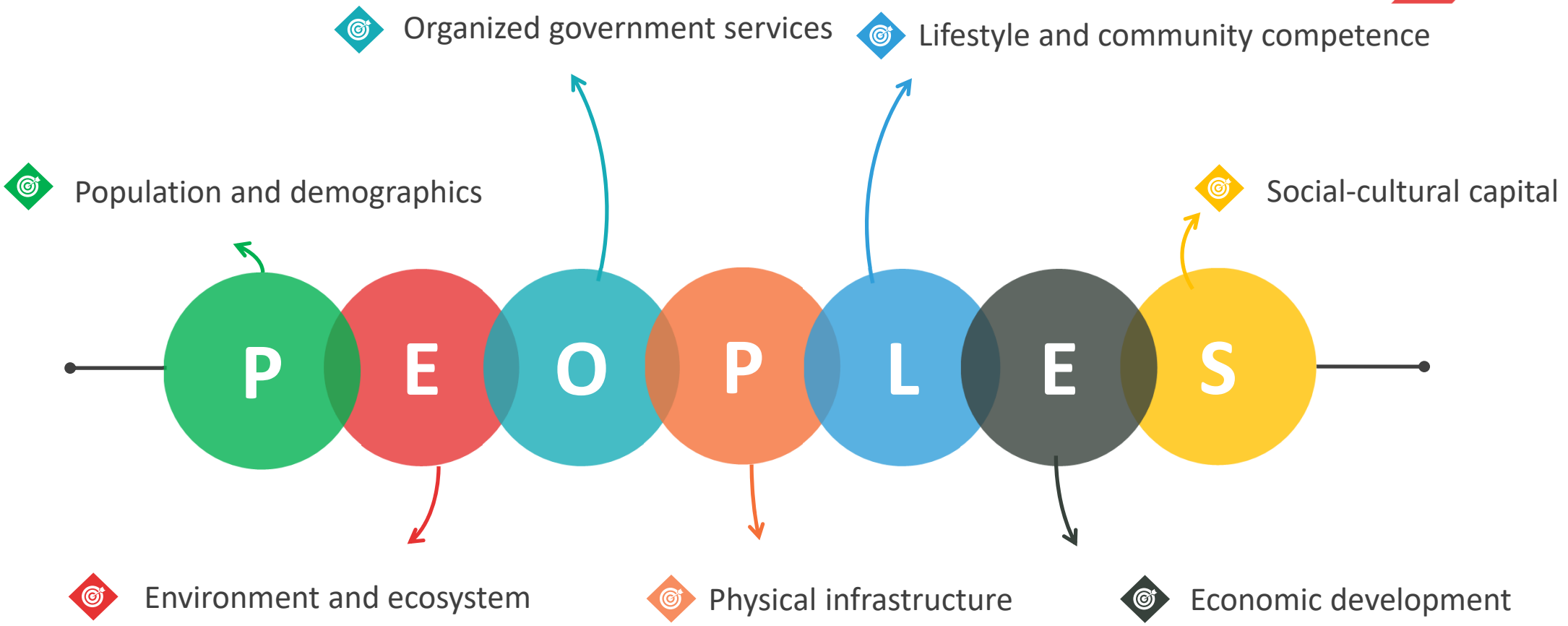
"Expected Earthquake"

To clarify the level of damage that is acceptable and require only those improvements in performance needed to assure a quick recovery, or the level of resilience desired. They believe that most of the current criteria for new buildings are adequate, and the need for strengthening existing buildings is perhaps less extensive than generally perceived.

Not universal

But the plan is tailored to San Francisco bay area cities and cannot be used directly in other cities.

“PEOPLES” index system



Chapter

03 Our Selected Topic

What? Where? Why?

WHAT

index system

establish a comprehensive evaluation index system

community

set up a pilot community

promotion

explore the way of national promotion

WHERE

Fabric

all kinds of buildings

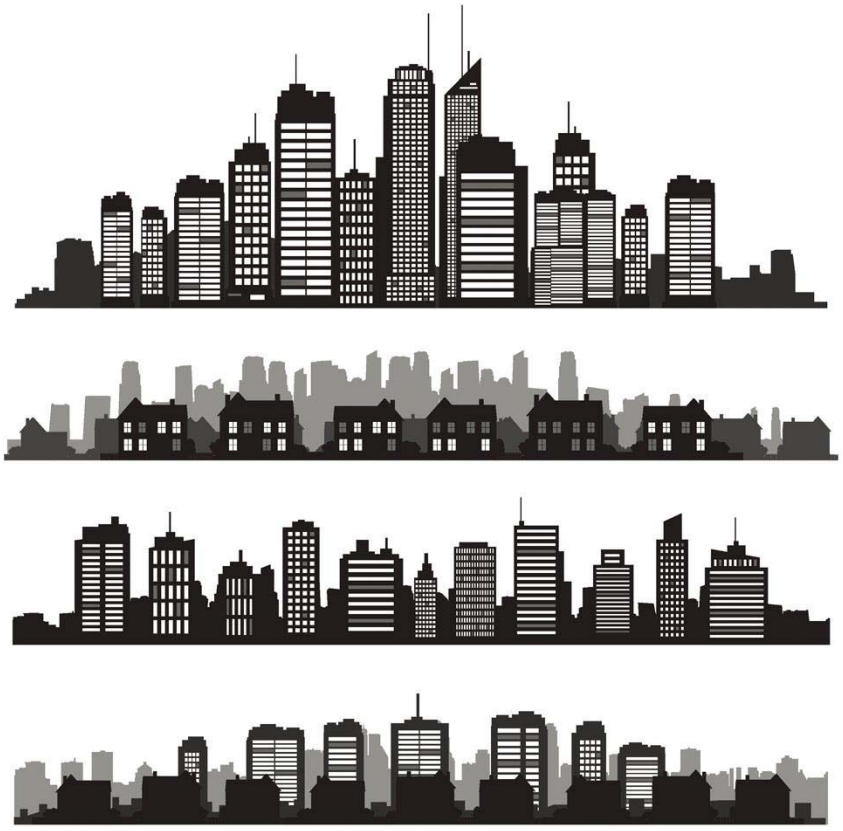
Function

everything that a mature community has.

Future

world first class university

WHY



Assessment of various cities

Ensuring urban functions when earthquakes come

real-world urban sustainability

Chapter

04 Prospective Output

A **3-dimension multilevel evaluation index system** together with **derivatives** that fit different functional communities

Seismic resilience index system

Dimensions	Level 1 index	Level 2 index	Level 3 index
Engineering	Building structure	Robustness	• age of the buildings • earthquake loads • ……
		Recovery rapidity	• …… • ……
		……	
	Water	Robustness	
		Recovery rapidity	
		……	
	Power		
	Transportation		
	Communication		
	……		
Society	Population	……	……
	Health condition	……	……
	……		
Administration	Emergency response plan	……	……
	Rescue worker capability	……	……
	……	……	……

Three dimensions

Engineering: seismic risk, building structure, lifelines

Society: population density, health condition……

Administration: emergency response plan, rescue worker capability……

Multilevel index system

Primary level for quantification

Upper levels for classification

Index: comprehensive and independent

Specify the ranges and borders of the indexes

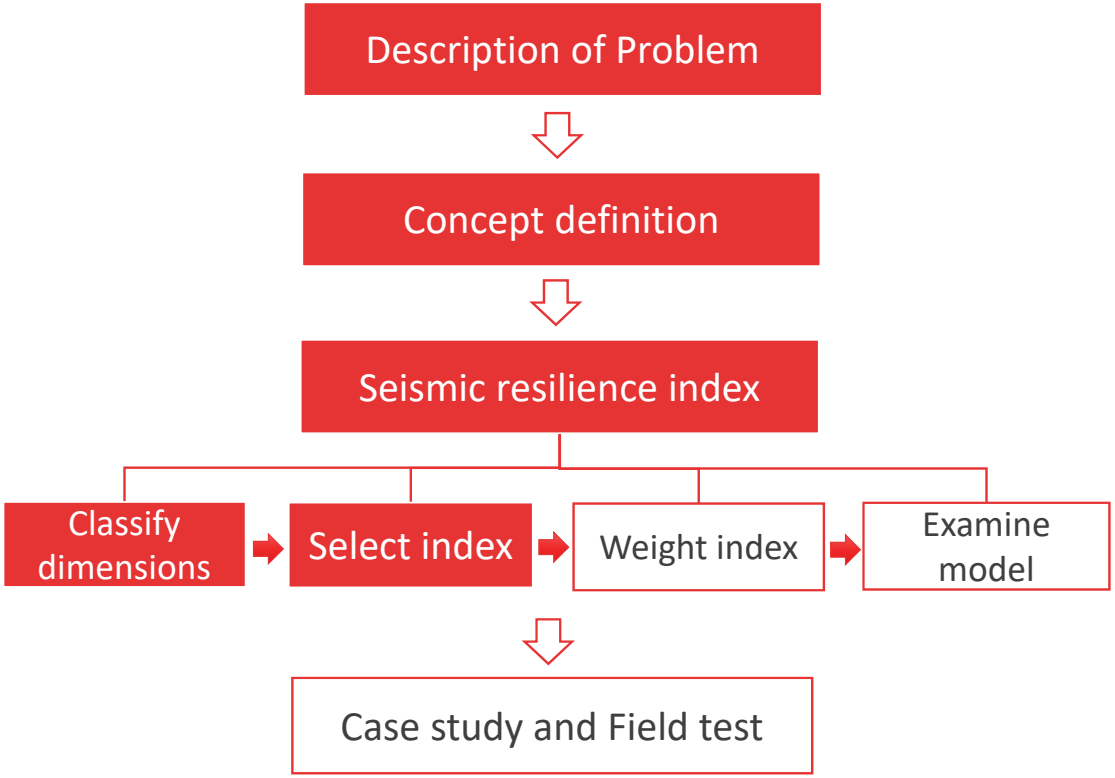
Derivatives

Functional Communities

As emphasized by our Beijing earthquake agency partner, different functional communities have different priorities in terms of earthquake defense and recovery. For example, the control center should have better robustness to maintain necessary control function; hospitals should have more effective emergency response to save casualties; schools should be better at protecting the vulnerable than general residential communities. It is one of our goals to alter the prototype into suitable evaluation systems for these functional communities, probably through index and weight revisions.

Working Process

To design an evaluation framework for urban seismic resilience, we have to complete the following steps.



Schedule

Time	Task	Description
Week 3	The 1st meeting	Meet Dr. Wang and make a plan
Week 4	The 1st presentation	
Week 5-6	Literature review	Review previous work on resilience index over 3 dimensions: engineering, society and system
Week6-7	Finish the first draft of the index list	
Week 8	The 2nd meeting	Discuss and complete the index list.
Week 9	Expert review	Over 50 experts will help us to further select indices and complete our model.
Week 10	Finish reports	
Week 11	Prepare for the final presentation	

Resources

Tsinghua ,Dep. of Construction Management

We have doctoral fellow students to consult, literature to refer, a campus to do fieldwork, some previous research experience on this topic, and brilliant minds to explore.

Beijing Earthquake Agency

On the other hand, Beijing Earthquake Agency is working on the same project and is willing to support us. They can provide us documents on urban planning and give us instructions. They can also contact more experts and arrange the expert review.


Thank You!
Question & Answer