What motivates urban poor in Bangladesh to adapt with urban ecosystem services and disservices?

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The problem statement

- Ecosystem provided varieties of services and disservices (e.g. provisioning, regulating, supporting, cultural) (MA 2005)
- Scholarship on role of ecosystem services is very rich particularly in the areas of wetland & forest; mostly regional/ rural context.
- Moreover, focus of overwhelming majority of researches is macro level
- Yet if we are to address wellbeing gain from ecosystem services & disservices of a growing number of urban poor (generally & esp. in poor urbanizing world , we must rethink.

We must rethink?

- Urban poor are in extreme challenges for adapting to ecosystem services & disservices.
- Their challenges result from:
    - Too much generalization about the benefits of ecosystem services
    - Failure to capture the influence of climate variability on ecosystem services
    - Neglect about the need for adaptation to ecosystem disservices

New thinking?

- New knowledge needs to:
    - recognise the challenges posed by climate variability on ecosystem services & finally to the wellbeing of urban poor
    - acknowledge the need for adaptation to urban ecosystem disservices
    - promote sustainable governance of urban ecosystem services & disservices

The ‘central concern’ of this study

Primary research question

Why some poor families better adapt to urban ecosystem services and disservices than others?

Objectives

1. Identification of urban ecosystem components/functions that offer services & disservices,
2. Explore the utilities that urban poor derive from urban ecosystem components/functions
3. Examine the factors that cause adaptation to ecosystem services & disservices challenging for urban poor

Situating ‘the central concern’ in Bangladesh context

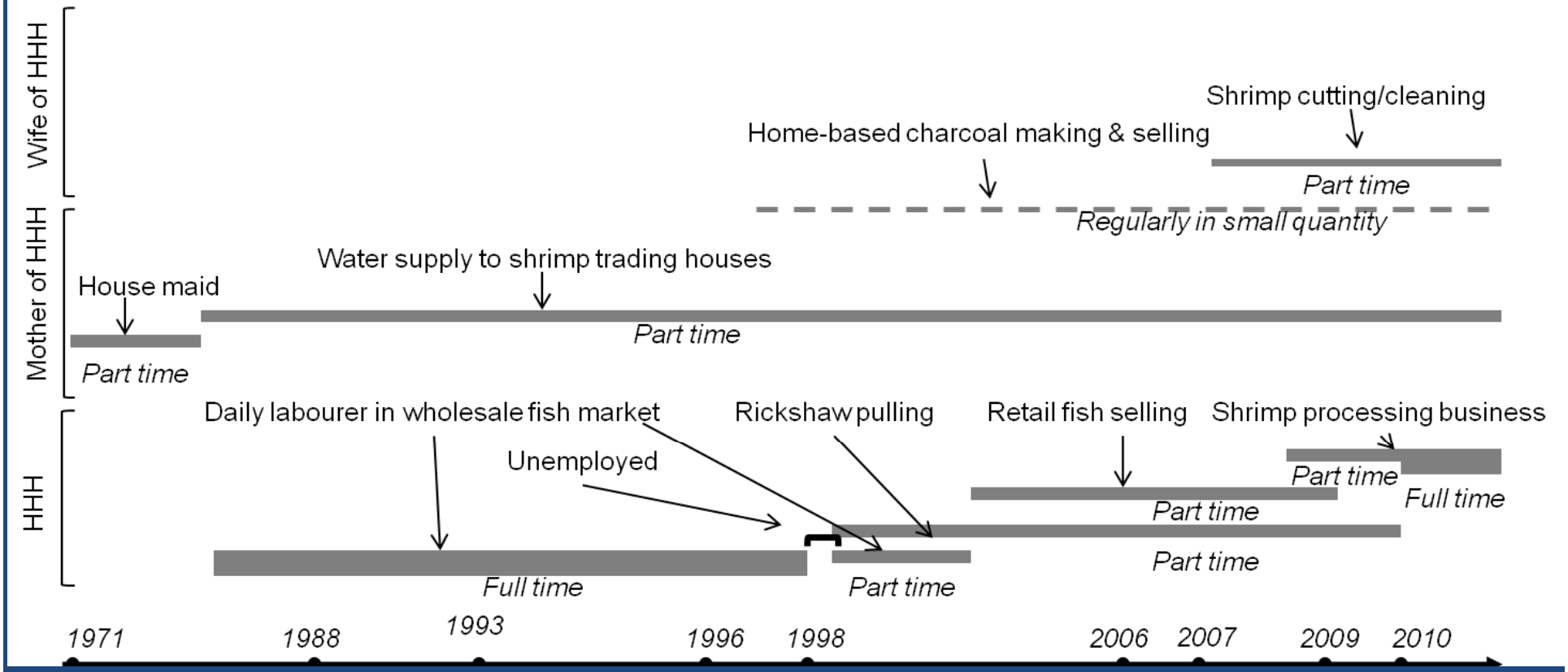
Let’s examine the household-level experience in a Khulna low-income settlement

Meet the family:

Ashraf - a shrimp trader; ***Wife*** - a shrimp cutter/cleaner; ***Daughter*** - year 3 student;

Ashraf’s mom (not in picture) - supplies water to local shrimp trading houses

Life events of Ashraf's family

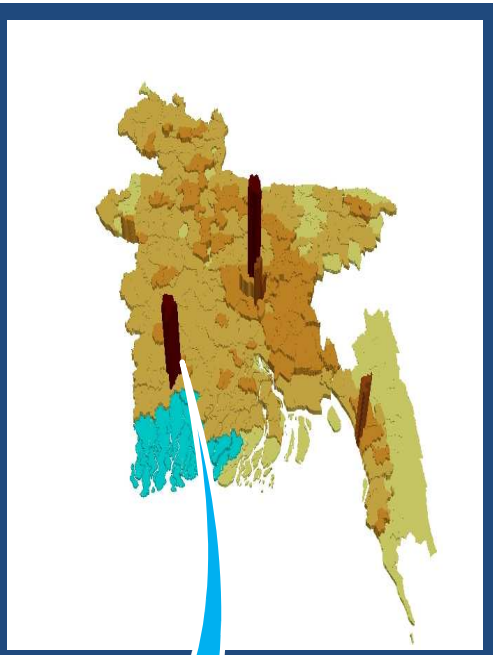


Wellbeing of poor families like Asharf is linked to ecosystem services & disservices.

But "… life has never been easy for us" (says Ashraf – the head of household) … "*the same is true for 75% of our neighbours doing similar things.*" Source: Roy et al (2012)

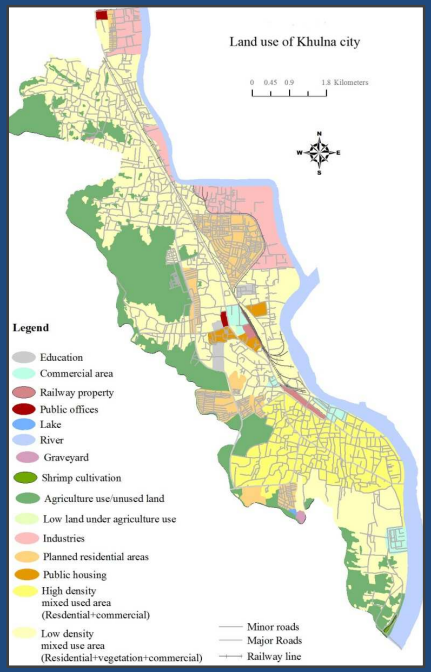
Wellbeing of hundreds of families like Ashraf's is linked to urban ecosystem services & disservices

Study Area & Methodology



Rupsha slum in Khulna metropolise:

- Located at the south-west coast (Bay of Bengal);
- About 0.2 million people live in slums/poor settlements
- Wellbeing largely depends on ecosystem service & disservice



Study Area & Methodology

- Rupsha is one of the densely populated slum in Khulna
- It *experience recurrent exposure* to coastal *flooding, tidal surge, waterlogging, cyclone, salinity intrusion, a* periodic drought and *susceptible to inundation of 0.15-0.5 m by the middle of this centaury for SLR*
- Internally displaced migrants arrive here especially after cyclones

- A total of 215 respondents were randomly selected for an interview; 3 FGD sessions were also conducted

Study Area & Methodology

- Various Socio-demographic, environmental, spatial, institutional data & information were collected
- The respondent have identified the green ecosystem component that they make use or try to avoid their negative impacts. These are discussed in result and discussion section
- Total 25 (15 ecosystem services & 10 disservices) ecosystem services & disservices were supplied to the respondents.
- They rated their adaptation challenges in a 5-point Likert Scale
- To reduce 25 ecosystem services & disservices into meaningful utilities, PCA is done. This offers ultimately three utilities which are discussed in result and discussion section.

Result and discussion

- Multiple responses shows that among the green urban ecosystem components, 28% HH benefited or impacted by green park. In the same way 22% and 21% HH benefited or impacted by Green urban streetscape and urban forest. Only 13% of the HH benefited or impacted by community/family garden.

- Multiple responses shows that among the blue urban ecosystem components, 29% HH benefited or impacted by impounding (pond/ditch) of water around their place of living. However 25% and 24% HH benefited or impacted by rainwater or canal water.

Result and discussion

Green Ecosystem Component[a]		Responses		Percent of Cases
		N	Percent	
	Urban Forest	60	21.3%	38.0%
	Green Park	79	28.0%	50.0%
	Community/Family Garden	39	13.8%	24.7%
	Urban Street scape	62	22.0%	39.2%
	Playground	42	14.9%	26.6%
Total		282	100.0%	178.5%

a. Multiple response question.

Result and discussion

Blue Ecosystem Component[a]		Responses		Percent of Cases
		N	Percent	
	Rain water	61	24.7%	42.4%
	Pond/Ditch	71	28.7%	49.3%
	Natural Drainage	21	8.5%	14.6%
	Canal	60	24.3%	41.7%
	River	34	13.8%	23.6%
Total		247	100.0%	171.5%

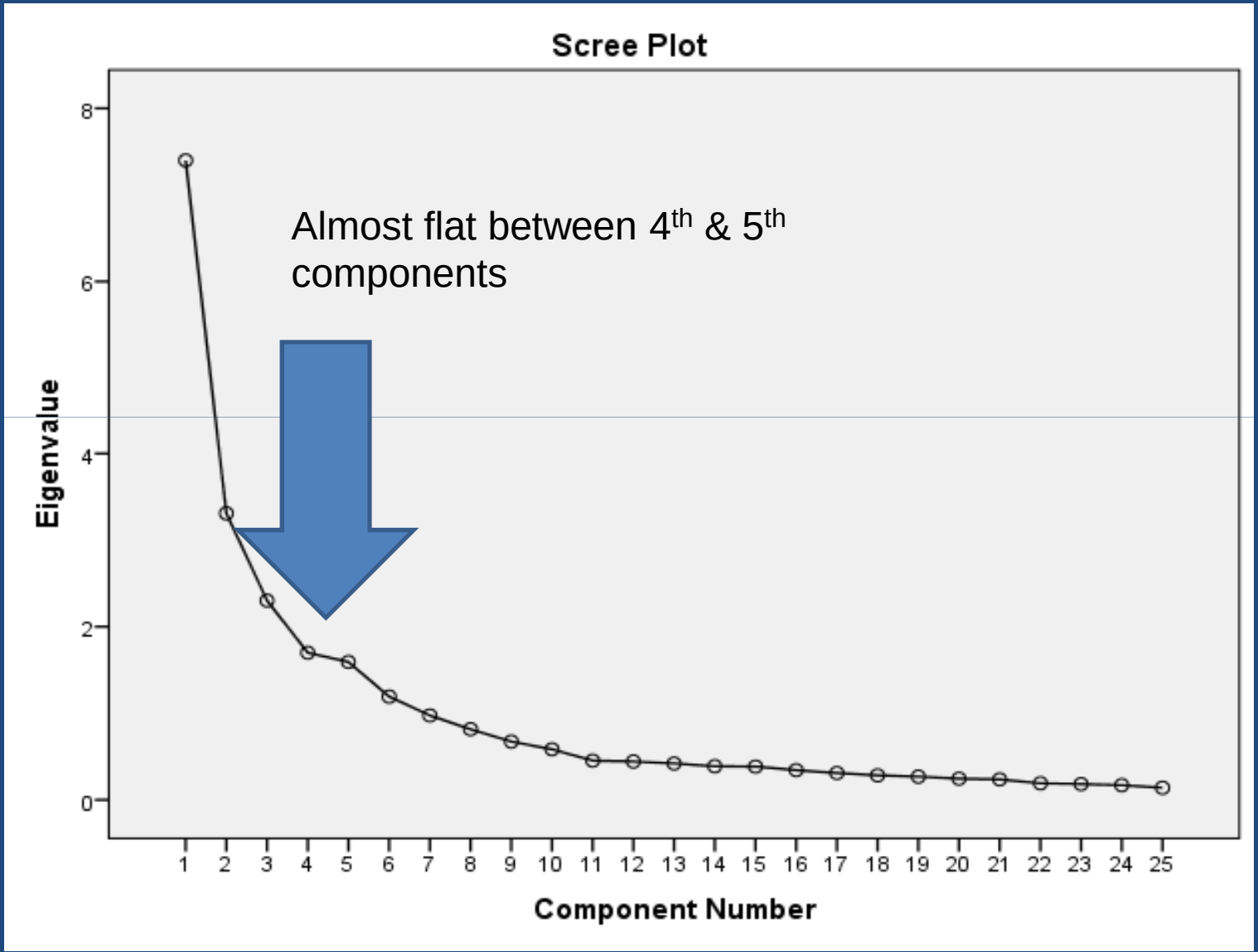
a. Multiple response question

Result and discussion

The PCA:

- To reduce 25 ecosystem services & disservices into meaningful utilities, PCA is done. This offers ultimately three utilities.
- These are:
  - 1st component- Livelihood;
  - 2nd component- Comfort;
  - 3rd component- Security; and
  - 4th components- Recreation
- Four Index are developed (adaptation challenge index for four utilities) which are presented below

Result and discussion



Result and discussion

The PCA:

1st component : Livelihood	**9 variables**	**Explain 21.11% variance**
2nd component: Comfort	6 variables	15.49% variance
3rd component: Security	5 variables	14.47% variance
4th component: Recreation	4 variables	7.78% variance
	24*	59% variance

Result and discussion

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
UC Comfort Index	215	1.17	4.33	2.6698	.62672
UC Livelihood Index	215	1.44	3.89	2.6558	.49077
UC Security Index	215	1.00	4.80	3.0670	1.13499
UC Recreation Index	215	1.00	4.25	2.4640	.69430
UC Ecosystem Service Index	215	1.53	3.67	2.6602	.40318
UC Ecosystem Disservice Index	215	1.20	4.20	2.8056	.56126
Valid N (listwise)	215				

Result and discussion

ANOVA:

- Bivariate Correlation identifies no significant correlation among Four Utility Index
- Four separate ANOVA is done instead of MANOVA
- Non-significant Levene's test imply homogeneity of variance for all four index
- F values and significance levels indicate all four models are valid although Adjusted R^2 for adaptation challenge to
    - Livelihood: .23;
    - Comfort: .31;
    - Security: 29;
    - Recreation: 21

Result and discussion

ANOVA:

- Adaptation challenges to livelihood related ecosystem services & disservices significantly differs due to 8 factors:
  - Whether there is fear of eviction;
  - Whether maintain connection with local polity
  - Whether relative lives in the same locality/slum
  - Whether exposed to water related disaster in the past
  - Whether Adopted with city's work culture
  - Whether the respondent is male
  - Age of the respondent and duration of living also influence HH's level of adaptation challenges in securing sustainable livelihood

Result and discussion

ANOVA:

- Adaptation challenges to comfort related ecosystem services & disservices significantly differs due to 4 factors:
  - Whether there is fear of eviction;
  - Whether the HH is owner or tenant
  - Whether HH has access to institutional credit
  - Whether the HH needs to adapt seasonally

Result and discussion

ANOVA:

- Adaptation challenges to security related ecosystem services & disservices significantly differs due to 6 factors:
  - Whether there is fear of eviction;
  - Whether maintain connection with local polity
  - Whether the HH is owner or tenant
  - Whether the HH needs to adapt seasonally
  - Whether the HH is a male
  - Whether HH get assistance from GOs & NGOs

Result and discussion

ANOVA:

- Adaptation challenges to Recreation related ecosystem services & disservices significantly differs due to 3 factors:
  - Whether there is fear of eviction;
  - Whether HH has access to institutional credit
  - Whether the HH is self employed or do other jobs/works

Result and discussion

ANOVA: Determinants of Adaptation Challenge

	Livelihood Index (B;SE;Sig)	Comfort Index (B:SE:Sig)	Security Index (B;SE;Sig)	Recreation Index (B;SE;Sig)
Fear of eviction	X (.164; .079; .039)	X(-.258; .096; .008)	X(.287; .176; .104	X(.677; .113; .000)
Connection with local polity	X (.144; .072; .048)		X(.414; .160; .010)	
Presence of any relative here	X (-.140; .069; .043)			
Past exposure to water related disasters	X (-.173; .074; .021)			
Adopted with city's work culture	X (.153; .073; .037)			

Result and discussion

ANOVA: Determinants of Adaptation Challenge

	Livelihood Index (B;SE;Sig)	Comfort Index (B:SE:Sig)	Security Index (B;SE;Sig)	Recreation Index (B;SE;Sig)
Tenure of Housing		X(.450; .117; .000)	X(-.547; .214; .011)	
Sex of respondent	X(-.152; .066; .022			
Access to institutional credit		X (-.378; .134; .005)		X (.306; .158; .055)
If adaptation is seasonal?		X(.233; .095; .015)	X(-.638; .173; .000)	
Sex of Household head			X(.444; .230; .055)	

Result and discussion

ANOVA: Determinants of Adaptation Challenge

	Livelihood Index (B;SE;Sig)	Comfort Index (B:SE:Sig)	Security Index (B;SE;Sig)	Recreation Index (B;SE;Sig)
If get assistance from GOs/NGOs?			X(.376; .186; .045)	
Occupation of HH				X (-.235; .110; .034)
Age of respondents	X(.005; .003; .097)			
Duration of living	X(-.007; .004; .093)			

Result and discussion

Binomial Logit Model: Determinants of Gainers & Losers of Ecosystem service & Disservice

- Based on mid value of two index of adaptation challenges to Ecosystem Services & Disservices the gainer & losers are identified.
- This offer the opportunity to use Binomial Logistic Regression model to identify the factors that determine whether a HH would gain or loss from ecosystem services & disservices.
- Two separate models are developed.
- It has predicted the gainer 73% correctly and the loser 68% correctly.

Result and discussion

Binomial Logit Model: Determinants of Gainers & Losers of Ecosystem service & Disservice

- Ecosystem Services Model:

Pseudo (Nagelkerke) R Square:.43
But, Hosmer and Lemeshow Test shows model validity is poor (Chi-square = 6.784; Sig.=.56)

Result and discussion

Binomial Logit Model: Determinants of Gainers & Losers of Ecosystem service & Disservice

- Ecosystem Disservices Model:

Pseudo (Nagelkerke) R Square:.36
But, Hosmer and Lemeshow Test shows model validity is poor (Chi-square = 6.094; Sig.=.64)

Result and discussion

Binomial Logit Model: Determinants of Gainers & Losers of Ecosystem service & Disservice

- Whether a HH would be gainer or loser from ecosystem services significantly differs due to 7 factors:
  - Whether there is fear of eviction;
  - Whether maintain connection with local polity
  - Whether Adopted with city's work culture
  - Whether the respondent is educated or not
  - Whether the HH is owner or tenant
  - Whether the HH is self employed or do other jobs/works
  - Whether the HH is member of social group

Result and discussion

Binomial Logit Model: Determinants of Gainers & Losers of Ecosystem service & Disservice

- Whether a HH would be gainer or loser from ecosystem disservices significantly differs due to 7 factors:
  - Whether exposed to water related disaster in the past;
  - Whether the HH is owner or tenant
  - Whether the HH is member of social group

Result and discussion

Binomial Logit Model: Determinants of Gainers & Losers of Ecosystem service & Disservice

	Eco S Service (B; ExpB; SE; Sig)	Eco S Disservice B; ExpB; SE; Sig)
Fear of eviction	X (-1.144; .318; .450; .011)	
Connection with local polity	X(-.969; .380; .426; .023)	
Past exposure to water related disasters		X (-1.655; .191; .419; .000)
Adopted with city's work culture	X (-1.681; .186; .407; .000)	
Education	X (-.920; 398; .558; .099)	

Binomial Logit Model: Determinants of Gainers & Losers of Ecosystem service & Disservice

	Eco S Service (B; ExpB; SE; Sig)	Eco S Disservice B; ExpB; SE; Sig)
Tenure of housing	X(-1.136; .321; .553; .040)	X(.843; 2.323; .516; .102)
Occupation of HH	X (1.123; 3.074, .454; .013)	
Member of social group	X (-.621; .537; .379; .101)	X(1.169; 3.219; .363; .001)

Concluding Remarks

The policy implication of the findings is,

- this would help designing separate sets of intervention for enhancing urban poor's access to both green and blue urban ecosystem services for better livelihood, security and comfort particularly in the changing context of climate.

- Therefore, this finding would give synergies to ongoing efforts of building resilient city in an urbanizing world

Thank you very much

For any query:

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