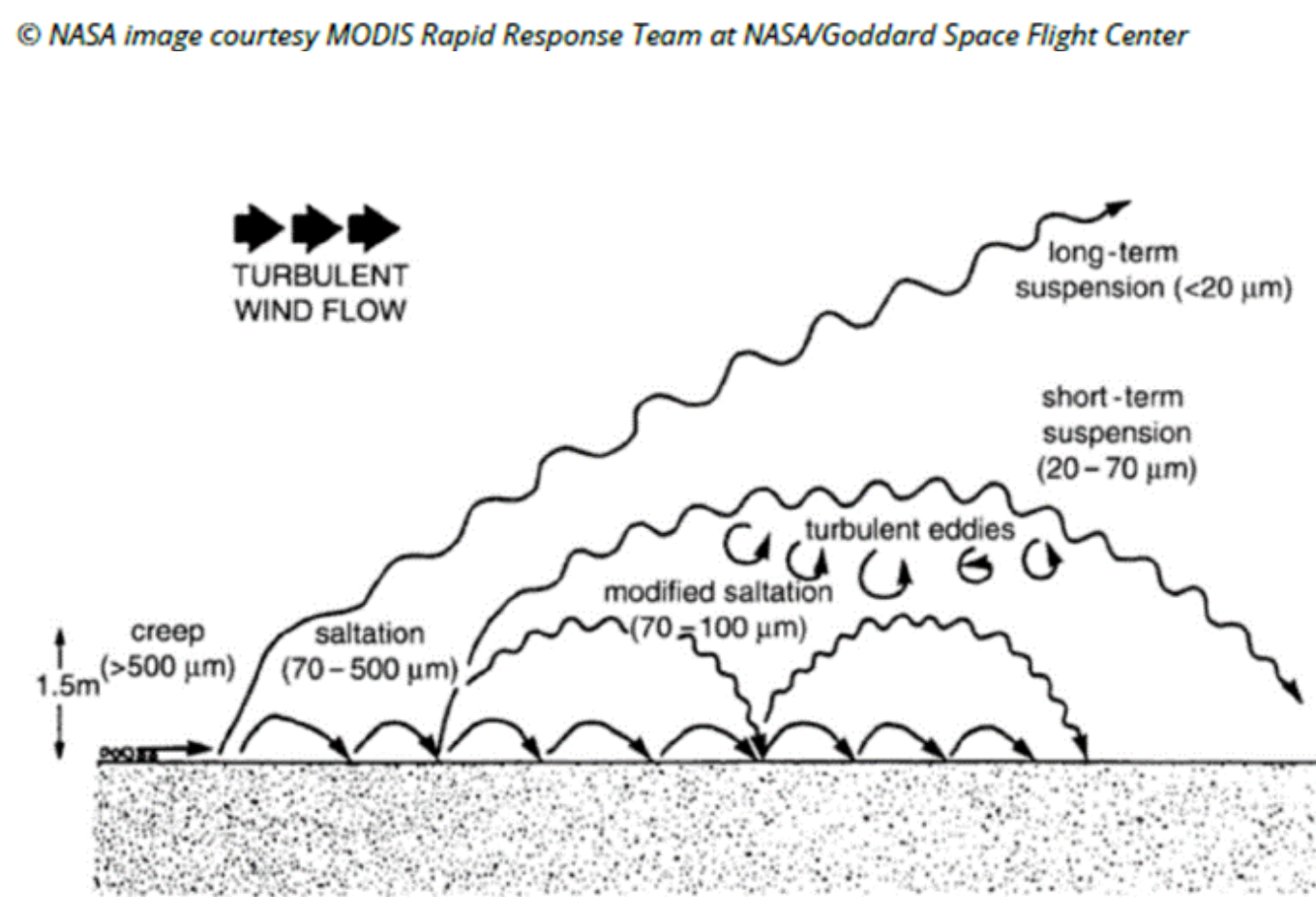
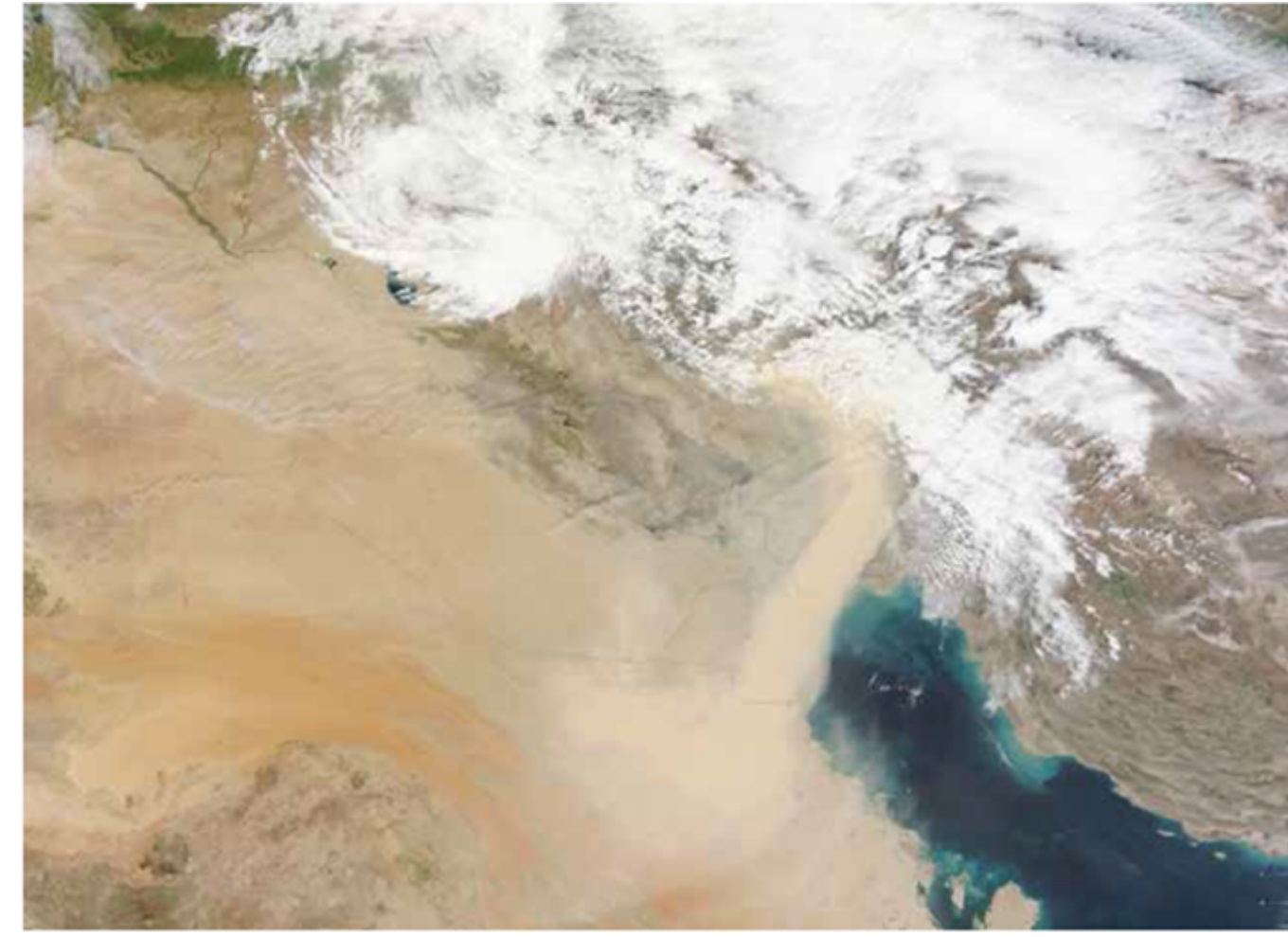




Impacts of Sand and Dust Storms on the Livability of Urban Public Spaces: Evidence from Ahwaz, Iran

Introduction

- Developing countries owing to their population growth outstrip the infrastructural capacities, are more vulnerable in terms of climate change impacts.
- The Mena region and the Middle East, have been experiencing direct and indirect impacts of climate change such as drought, heatwaves, and air pollution due to its arid context. Especially, sand dust storms, which have severely impacted arid Iranian cities and the city of Ahwaz, is one of the most polluted cities globally in this regard.
- Dust storms often occur at ground level, but lighter particles could be floated kilometers away from their source. As the particle's speed drops to almost zero on the ground level, the density and accumulation are much higher at 2 to 3 meters altitude, where human life is going on.
- Dust storm impacts on cities can be seen as direct and indirect, long-term or short-term, and they could be categorised in environmental, health and hygiene, and socio-economic impacts, and influence at least 11 out of 17 main sustainable development goals.

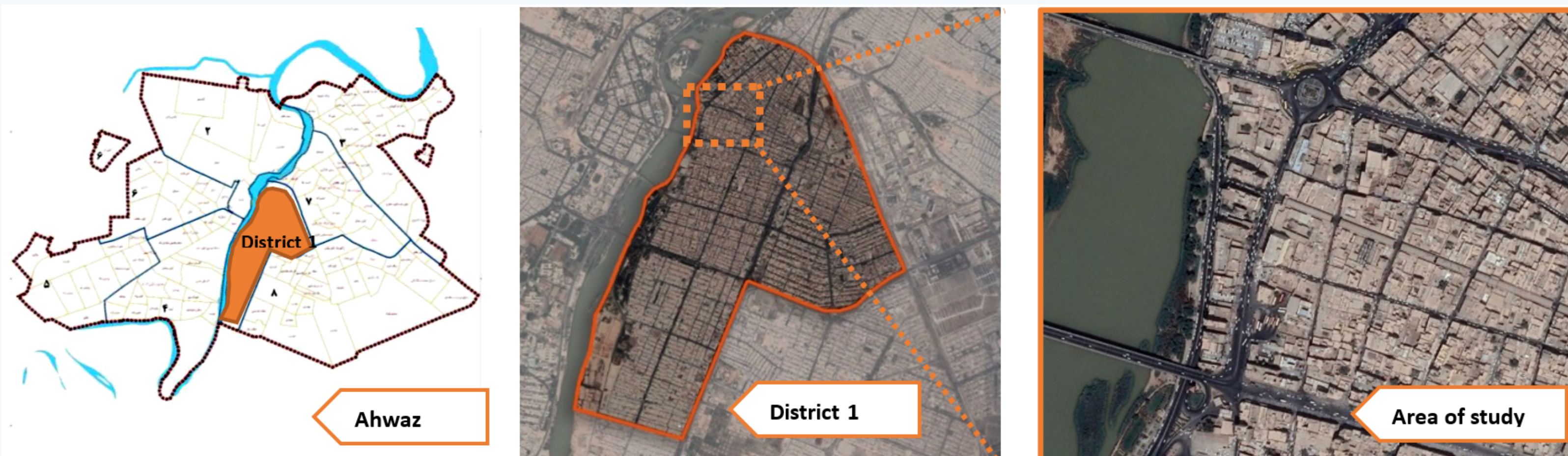


Literature

- Urban public spaces are extremely adaptable under stable variations, but they might not have enough capacity to face severe climate change impacts and can be one of the most vulnerable parts of a city.
- In contrast to indoor spaces, open spaces are significantly limited in their ability to control climate-induced conditions. Depending on the context, climate change scenarios may even lead to some trends of public space privatization. This homogenization pattern will diminish essential experiences of diversity and inclusion. It is essential to provide equal opportunities and spatial justice for all walks of life to access public space and its adaptive chances in the climate change era.
- Livability refers to the core concept of quality of life and the general wellbeing of residents in any human living environment based on the context. Livability offers opportunities for diverse local communities to thrive as well as create better places to work, live, and grow.
- A livable urban environment is a place where the built environment supports the residents' basic needs while promoting the quality of life.
- Despite the significant impacts of climate change and global warming on urban livability, this field of research has yet to be studied.
- Evaluating urban livability seems crucial to adopt appropriate adaptation and mitigation measures in the face of climate change challenges for livable cities and urban environments.

Study Area

- The city of Ahwaz, the centre of Khuzestan province, located in the southwest of Iran, was chosen as the study area. The strategic importance of this province and city is due to its geopolitical location and its diverse subcultures, as one of the most critical and vulnerable cities, which can represent the climatic circumstances of southwest of Iran.
- The most vibrant and active urban public spaces are located in the city centre (District 1), where the great Bazar of Imam Khomeini can also be found and resembles the heart of the city. This area encompasses a variety of urban open and public spaces, namely the Karun River and its waterside and bridges as one of the liveliest and thriving urban spaces.



? What are the impacts of sand and dust storms on the liveability of urban public spaces?



Approach

Interviews

- In-depth interviews to explore the perspective of the residents
- Selective sampling to interview those who have the most engagement and relation with the urban public spaces, also university professors (12 interviewees)

Analysis

- qualitative content analysis was used to interpret the interviews
- Meaning units were extracted and classified into codes, then codes were grouped in categories, and finally themes were extracted from them

Framework

- Urban livability indicators and indexes were extracted from Zhan, D., et al (2018) research titled: 'Assessment and determinants of satisfaction with urban livability in China'
- Indicators were contextualized

Results

- Themes were extracted based on the categories to be adopted into the urban livability assessment framework in order to contextualize the results based on specific dust storm impacts

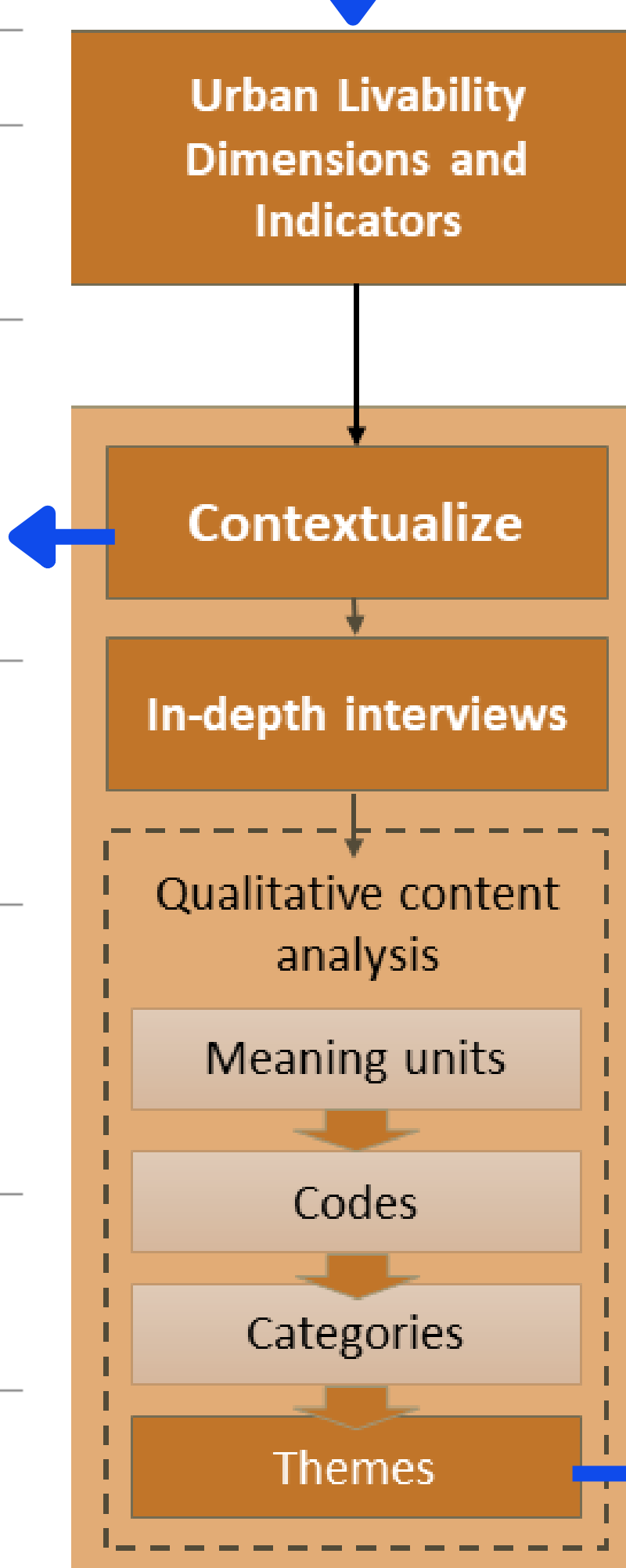
Discussion

- This research sheds light on the impacts of sand and dust storms, as a climate-change-induced phenomenon, on the livability of urban public spaces.
- Recognition of the challenges, and identifying the impacts is the initial step for further investigations.
- Mitigation and adaptation measures should be adopted at different levels of local, national and international to combat the occurrence of this hazard and to minimize its impacts to build more resilient cities.

Based on the interviews content analysis, the impacts of sands and dust storms on the livability of urban public spaces of Ahwaz could be tracked in the following themes:

- Suspension of the daily urban life
- Disaster and lack of preparation
- Health, hygiene, and cognitive effects
- Fading and disconnection of citizens' sense of belonging to the city
- Emptying of urban and collective spaces of citizens
- Mandatory presence of the businesses despite the absence of citizens and lack of trades
- Lack of effective and targeted measures

Dimensions of urban livability	Assessment indicators
A Urban Security	A1 Social security A2 Transport security A3 Emergency shelters A4 Disaster response capacity
B Convenience of public facilities	B1 Shopping facilities B2 Education facilities B3 Healthcare facilities B4 Dining facilities B5 Recreational facilities B6 Cultural facilities B7 Aged facilities
C Natural Environment	C1 Favorable climate C2 Access to water area C3 Access to urban parks C4 Urban green coverage rate C5 Cleanliness of the city
D Sociocultural environment	D1 High quality citizens D2 Social inclusion D3 Urban identity D4 Protection of historical culture D5 Sense of belonging
E Convenient transportation	E1 Urban road conditions E2 Access to public transit E3 Availability of parking lots E4 Traffic congestion
F Environmental health	F1 Water pollution F2 Solid waste pollution F3 Air pollution F4 Noise pollution



Relevant indicators	Codes	Themes
C1 C5 F3	Suspending dust particles in urban environment for several days Disruption in daily life routines Residents leaving the house for only necessary activities	Suspension of the daily urban life
C1 C5 F3 D1 A1	Dust particles as an omnipresent element of urban daily life Decrease in the efficiency of life and work Taking refuge in houses	Disaster and lack of preparation
A4 A4	The occurrence of something like a disaster Unawareness and unpreparedness Impact on health and hygiene Spreading diseases and side effects Wellbeing problems	Health, hygiene, and cognitive effects
C1 F3 C1 F3	Transfer of other pollutants and chemicals by dust particles Dusty weather Impact on vision	Fading and disconnection of citizens' sense of belonging to the city
D1 D5 D5 D3 D1 D3 C5	Increase in mandatory migrations People's dissatisfaction with their living environment Diminish of senses of belonging to the city Pessimistic perspective Despair of people Adverse impacts on the appearance of the city Emptying the urban spaces Absence of people in the city	Emptying of urban and collective spaces of citizens
A3	Turning to indoor spaces Lack of welcoming of the urban public spaces Adverse technical effect on buildings	Mandatory presence of the businesses despite the absence of citizens and lack of trades
B1 B1 A4 D2 A4 D1 A4	The presence of business owners in the shop due to financial problems The grand Bazaar being quite with no trades going on Mandatory work of some jobs namely utility workers Lack of problem-solving actions and initiatives Negligence of officials and policy-makers Reluctancy of business owners to cooperate effectively Uncertainty of decisions and temporary actions	Lack of effective and targeted measures