Revisiting Urban Brownfield Regeneration and Beyond within the Lens of Green Infrastructure-based Design and Management

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Introduction

The typical showcase of urban transformation practice can be experienced mostly in the core or close proximity of downtowns as either replacing a series of existing vacant or deserted lots along with exacerbated natural system or retrofitting built-up areas and housing affordability. In this way, regardless of their size but their linkage with nearby land uses and down to the urban core, brownfields necessitate urban regeneration practice whereas charging the city with discriminatory land use policies as well as a multitude of social and ecological problems. Urban brownfields consisting of natural assets -including river, wetlands, delta etc.-, post-industrial facilities and districts, dysfunctional settlement patterns and slums, and leftover areas make up of depressed, yet significant regions of urban fabric. Having traces of very natural and cultural threads of urban communities, these specific places as a basic 'urban regenerator' are capable of revising physical and social aspects of downtowns or urban core areas.

The basic argument raised in the paper engages urban brownfield(s) within fast growing metropolitan cities across the globe into urban regeneration policy through hands-on experience of green infrastructure concept. Based on this fact, this paper aims at;
- introducing green infrastructure-based design and management approach that claims to mitigate present and likely effects of social and ecological problems particularly on both urban fabric and the brownfield itself while recognizing the importance of urban (brownfield) regeneration policy,
- studying the theme in the case of a strategically significant and centrally located brownfield of İzmir coastal metropolitan city that embraces post-industrial sites, slums and abandoned lots along with delta and hydrological system. This brownfield and its urban-wide ecological, social and historical traces have nowadays been a central concern of urban regeneration in İzmir.

Methods

To achieve a sustainable urban brownfield regeneration project, the paper builds upon green infrastructure-based design and management concept in which the complex of Meles Delta and its hydrological pattern has been envisioned as a spin of green infrastructure (i.e. urban brownfield generator) intertwining post-industrial sites, abandoned lands, slums as well as new residential districts and coastal landscape into a whole entity (Fig. 1). The case study area is considered an exemplar for any urban brownfield in fast-growing metropolitan cities.

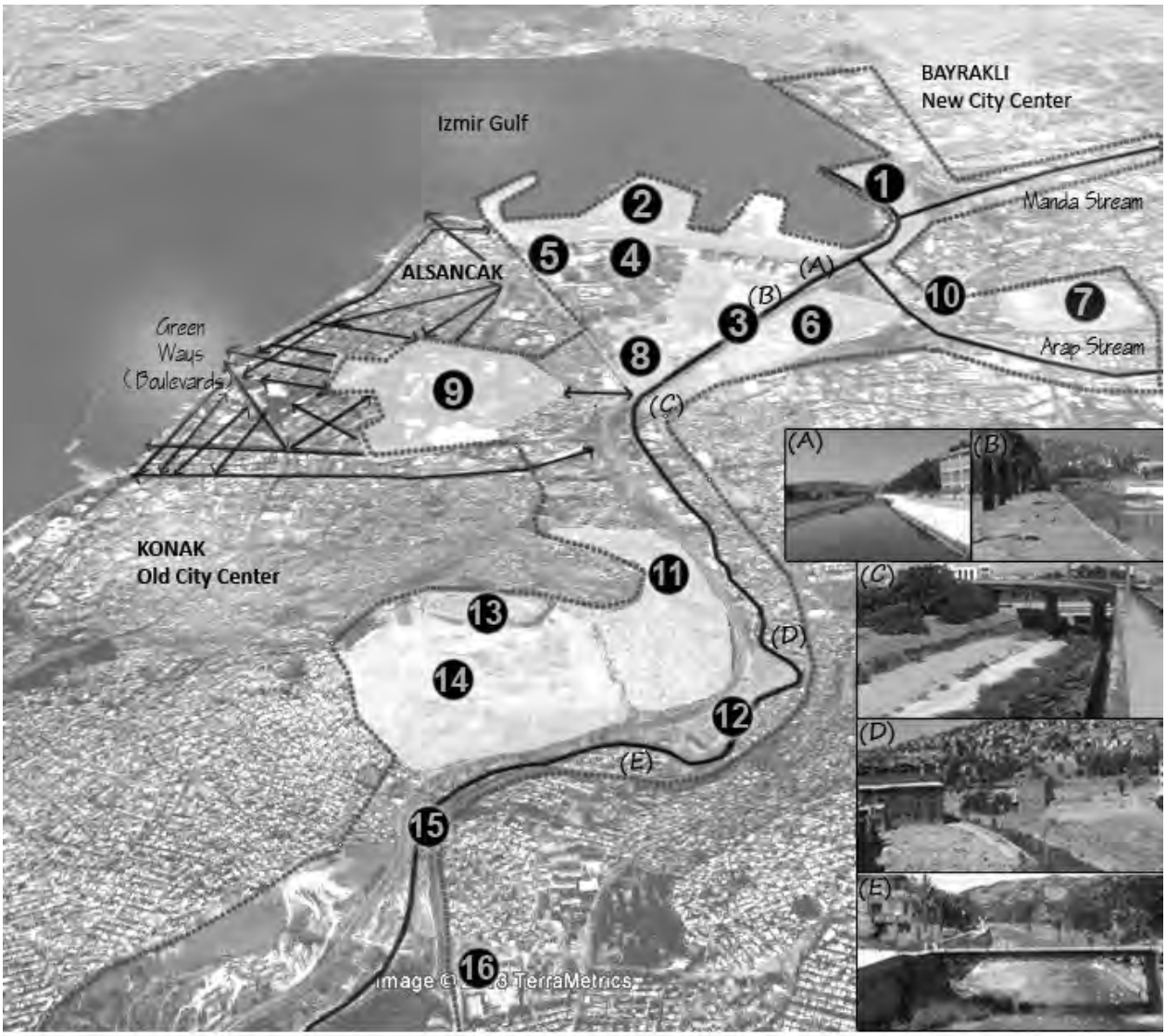

Figure 1. The case study area

The 'gap analysis' has been applied through measuring differences between actual situation or reality of urban brownfield and its environs and green infrastructure-based design and management requirements supported by green infrastructure-based, idealized projects or thoughts of the authors, as depicted in Fig. 3 and 4.

Gap analysis is a simple technique when predicting the size of the gap between current state and desired future. To assess the possible risks it is generally used by private firms at the beginning of any project. Conducting the gap analysis usually follows three-step processes:

- Identify your future state, where do you want to reach?

- Analyze your existing situation, where are you now? (reality)
- Identify the gap between the two and think about how you will bridge the gap (gap bridging strategy)

In this study, this simple tool is used since the expectations on the brownfield (Fig. 1) is numerous and uncertain. To discover the assumed gap, five basic dimensions were distinguished as follows; social and cultural assets, governance, ecological concerns, engineering and technical aspects, land use and urban design. Then, thematic explanations were produced in Tables for each dimension indicating;

- Reality (existing situation)
- Challenges (reaction to problems of the brownfield, partial solutions developed by respected organizations)
- Design and management requirements (future state of the brownfield and the urban tissue based on green infrastructure concept) (Fig. 2).

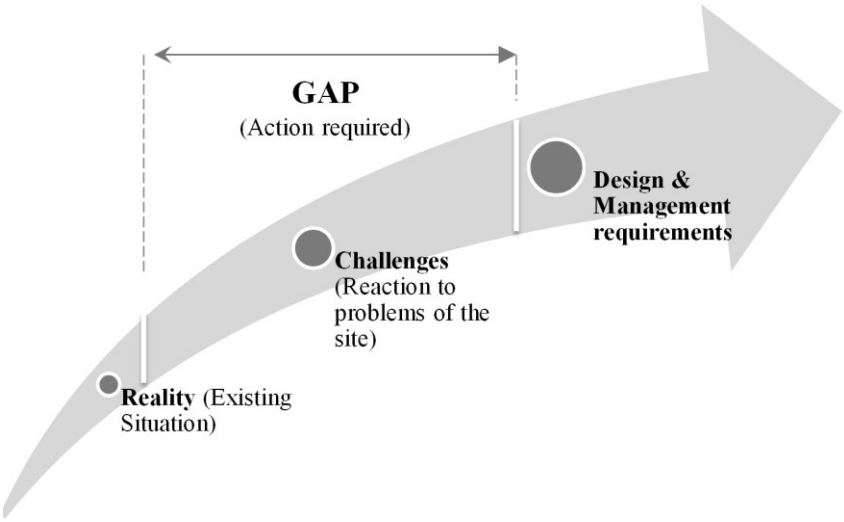

Figure 2. Gap Analysis Framework

Gap Analysis Dimensions

Each dimension has been elaborated according to its reality, challenges and the requirements in Tables (1 - 5). These all determine the boundary of urban brownfield including its immediate environment up to the downtown (Fig. 1), and the graphical expression of design and management requirements (interventions) for some particular regions (Fig. 3, 4).

Table 1. Social and cultural assets

REALITY	CHALLENGES	DESIGN AND MANAGEMENT REQUIREMENTS
The case study area, once significant for urban history and social attachment, occupied by brownfields and slums.	Metropolitan municipality sets the schedule of urban renewal of the brownfield, but in lack of holistic vision.	Green infrastructure concept is able to intertwine riverfronts, slums and post-industrial quarters into a vast region.
Community life of post-industrial sites and slums, and natural structure are introvert and isolated from the city itself.	Metropolitan government is preparing urban renewal projects in order to enrich socio-cultural assets of the region.	Social structure and neighborhoods of the region should be renovated to provide a magnet for social life.
Introvert type of development generates its own character areas, different from nearby uses.	Any project or endeavor related to the linking socially the brownfield with the city center is not available yet.	Providing social interaction with the center through well-conceived pedestrian and bicycle tracks.

Demolishing of historical references and their vicinity accounts for cutting off social binding with the city.	Connection of each project site under urban renewal act is troublesome.	Physical and social access between historic references would facilitate a historical sequence throughout the city.

Table 2. Governance

REALITY	CHALLENGES	DESIGN AND MANAGEMENT REQUIREMENTS
Central and local governments and related bodies independently set their own agendas and projects for the city	Metropolitan government endeavors to run urban renewal projects with related public bodies in a participatory way.	An autonomous, public-private partnership should be authorized to implement green infrastructure program.
Public and private initiatives exploit their own lands as per regulations of urban development plans.	Metropolitan government has recently expropriated some private lands for urban renewal projects.	The aforementioned partnership designates land uses with regard to the right of property.
Urban planning and management interventions are contingent upon jurisdictions of related public bodies.	Although metropolitan government aspires cross institutional policy, any tangible progress has not been recorded.	The code relating to green infrastructure planning and management should be issued for the case study area.
Property rights and subsequently land speculations generate inappropriate climate of investment.	Regular investment policy is insufficient to hold future scenarios of the city in an integrative manner.	Public-private partnership should spur green infrastructure policy to further develop the climate of investment.
Rehabilitation and design of riverfronts and streams are splitted up to existing jurisdictions of public bodies.	Metropolitan government initiates some joint works for waterways in partnership with related public bodies.	Legal framework featuring green infrastructure policy should be passed into law to manage waterways wholly.

Table 3. Ecological structure

REALITY	CHALLENGES	DESIGN AND MANAGEMENT REQUIREMENTS
Delta and its associated water ecosystem manipulated by man-made interventions is poor in natural resources, biodiversity.	Natural system has been conceived as a basic engineering matter only.	Defining the natural system as a spin of green infrastructure provides ecological services for urban community.
Urban development plans have long partly or fully destroyed traces of some lakes, wetlands and streams.	Natural structure within the urban brownfield has been deteriorated due to ad hoc planning and decision making.	Recuperation of hydrologic pattern of lakes, streams and the delta to create a comprehensive green infrastructure.
There is not any explicit ecological connection particularly between İzmir Bay, streams and the downtown itself.	İzmir Bay and its coastal landscapes have not been evaluated within the regional hydrological pattern.	Greenways to bind the Bay with the hydrological system should be extended through the brownfield.
Ecologically sound land use and habitat management are lacking in administrative policies.	Urban planning policy and property rights have resulted in fragmented urban tissue.	Green infrastructure should associate different land uses to form a substantial urban ecological system.

Table 4. Engineering and technical aspects

REALITY	CHALLENGES	DESIGN AND MANAGEMENT REQUIREMENTS
Major part of existing Meles Delta has been reserved for ‘urban greening’ only	Natural structure of the delta was partly transformed into urban recreation park.	Extending current wetland on the delta to improve the capacity of engineering works (i.e. bioremediation measures).
Seasonal streams act as ‘collector’ diverting the rain water down to the Bay and ‘flooding storage area’.	Channeling the stream pattern to mitigate soil and water erosion and to dispose of pollution sources.	Through some niches (or small pools) on either side of stream banks to enlarge the water surface for habitat enhancement and flood protection.
Planning and transportation policies have resulted in adverse effect on urban ecosystem.	Related public bodies are in lack of referring reclamation program for naturally significant parts.	Once naturally significant lands should be recuperated and extended to improve the coverage of green network.
Discharge of slums’ and industrial waste into the streams and down the Bay.	Stream rehabilitation work is manually managed at some intervals.	Biological treatment and landscape reclamation work to mitigate multiple effects of contaminants.
Od leather factories have been relocated, but the site (Yeşildere) is still underused.	Following the removal of the factories, rehabilitation of the region to turn into a socially recognizable recreational asset.	Implementing the sanitary program to cleanse off water and soil contaminants and to take measures against erosion.
Dismantling landslides-prone parts of slum district (Ballıkuyu, Kadifekale) under the urban revitalization program	Demolishing the slum in Kadifekale, an afforestation program is scheduled to benefit a recreational use.	Landscape reclamation work is needed to stabilize the earth against any likely landslide and resulting erosion effects.

Table 5. Land use and urban design

REALITY	CHALLENGES	DESIGN AND MANAGEMENT REQUIREMENTS
Designation of land uses is determined independently by property ownership and planning decisions.	Statutory planning practice is unable to deliver problem-based and innovative approaches.	Green infrastructure discourse frames the linkage between the brownfield and downtown, and drive land use and urban design policies.
Current and prospective land uses are unable to cater a synergy for a comprehensive urban regeneration task.	Statutory planning process fails to address a corporate and participatory development scheme for urban futures.	Green infrastructure-based scenario introduces expropriation program and readjustment of legal jurisdictions.
The urban brownfield as an ecological entity has almost been neglected in municipal planning and design projects.	Future conceptions of reports, plans and projects for the city have failed to correspond well with each other.	These all documents should be merged with green infrastructure framework to accomplish road map for the city.
Spatial, socio-economic and ecological effects of urban renewal projects regarding the brownfield are not clear.	The metropolitan government is in preparation of revealing a historic axis nearby Meles River.	Green infrastructure program should be interacted with urban renewal projects to increase the feasibility of them all.
Meles River and other natural entities are in isolation from the downtown.	There is a lack of any urban design approach supporting the brownfield, historic axis and the downtown linkage.	Green infrastructure design approaches the historic axis to identify the thorough brownfield with the urban center.
The case study area retains its brownfield properties as an inner city district.	Qualifying riverfronts and post-industrial sites as an investment entity.	Stream pattern and associated lands together should be conceptualized as community areas and natural reserves.
Natural system has been too often treated in isolation from urban land uses.	Riverfronts are approached as technical and engineering matter and more recently as recreational reserves.	Widening the stream corridors helps shape water bodies in engagement with the surrounding public space system.

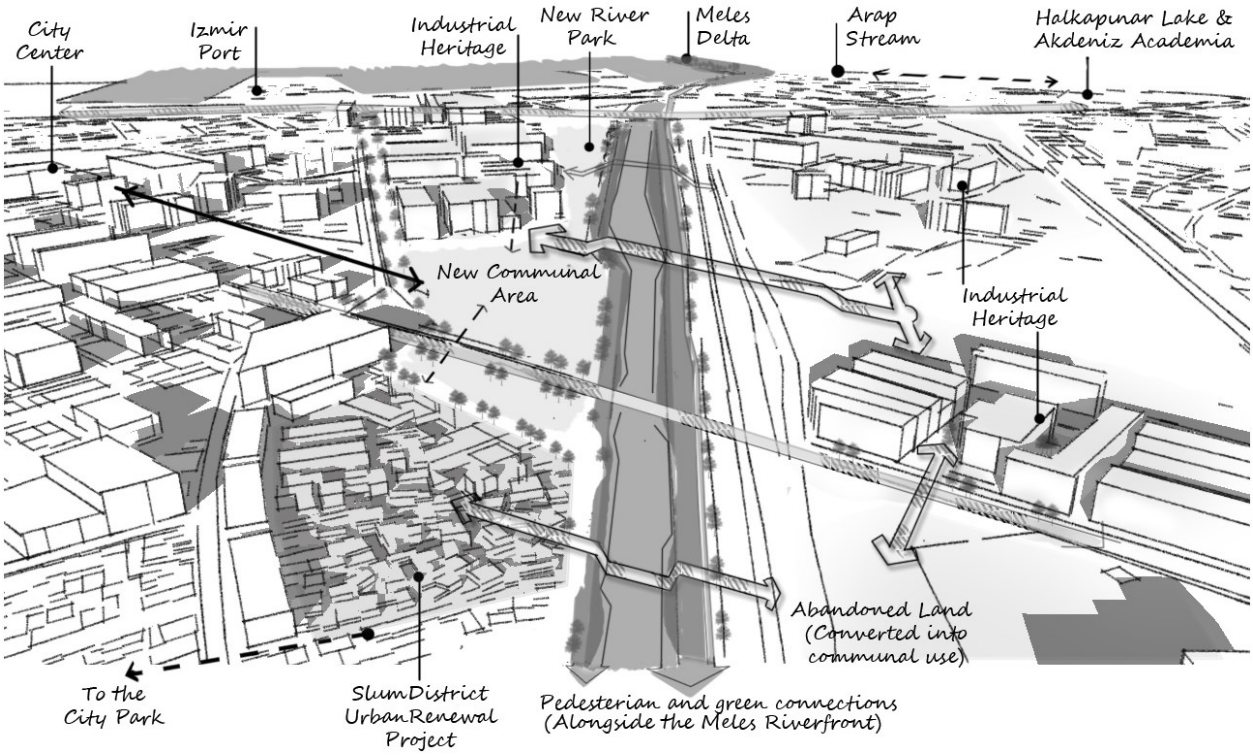

Figure 3. Design and management intervention identifies the Meles Riverfront as a spin connecting different land uses while emphasizing physical alteration and linkages for an urban-wide green infrastructure scheme.

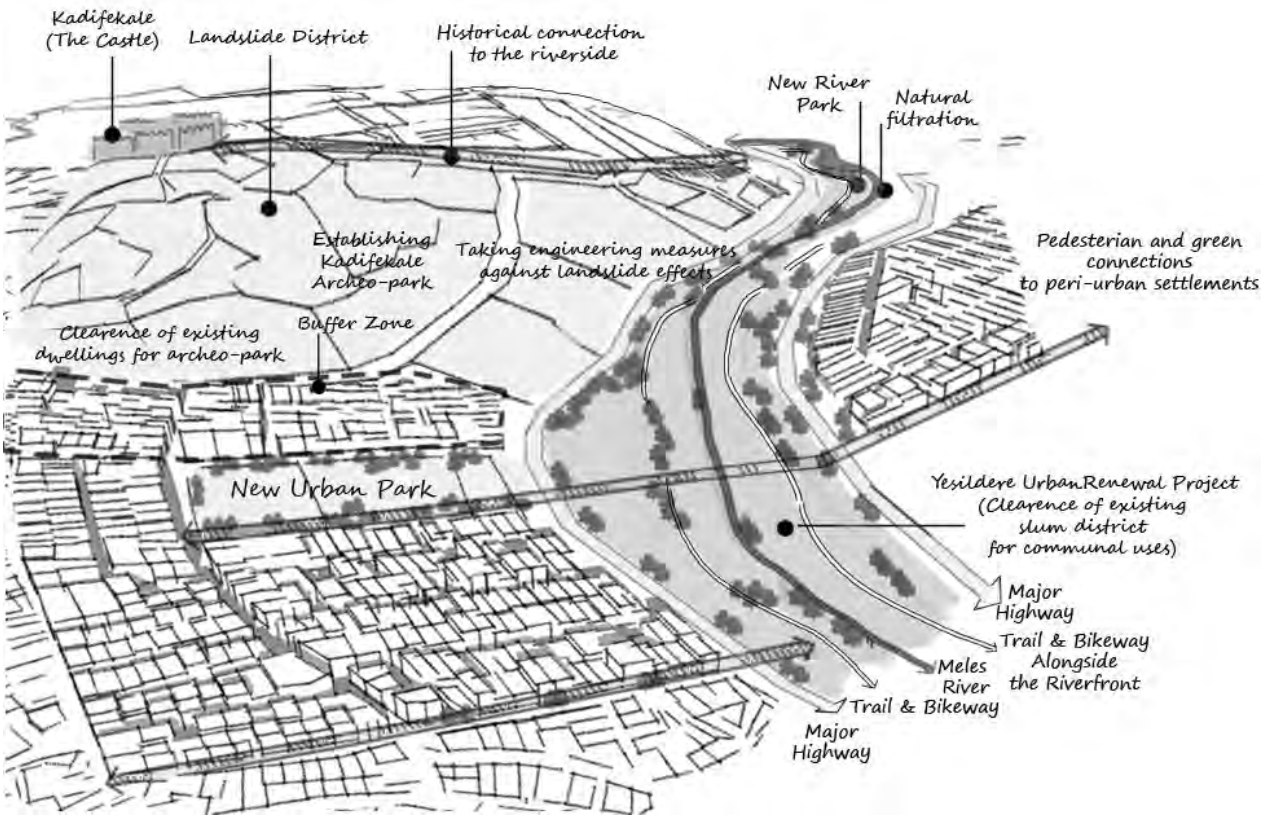

Figure 4. Design and management intervention deals with various social and ecological challenges such as landslide effect, urban renewal and slum upgrading programs, earth and water contamination besides pedestrian and green connections (to historical references).

Implementation of Gap Analysis and Results

The gap was measured in a two-step process (Heeks, 2003), and investigated reality and challenges of the brownfield posed by respected institutions. This does not give much concerted effort to reverse the current negative situation. Secondly, the nature of challenges and design and management requirements was scrutinized to access the idealized situation based on green infrastructure framework.

To measure the assumed gap between these parameters as per each dimension, 'gap rating' system (1=no change, 2= some degree of change, 3=radical change) as indicated in the tables above was applied, and then attributed weight to each item within each 5 dimensions according to their relative importance (1= less important, 2= important, 3= the most important). Each rating score was determined by the authors' consensus. Finally, overall rating scheme that is equal to weight of each item multiplying with its gap rating (overall rating= gap rating x weight) was calculated. Results of each category were collected to represent the gap between 'reality-design' and 'challenge-design' peers. The dimensions indicating the lowest score are the most likely causes of 'plan and project failure' underway (Fig. 5).

Gap analysis illustrated that careful risk assessment can be made according to overall rating scores. In terms of reality-design peer, there will be a risk for 'partial failure' in social and cultural assets, governance and more specifically ecological structure. In other words, any green

infrastructure-based design and management framework applied in the urban brownfield may well consider peculiarities of tarnished ecological structure, uncoordinated governance efforts, and fragility of special social and cultural assets such as ethnic groups and industrial heritage sites. On the other hand, challenge-design scores are more encouraging. Social and cultural assets and governance dimensions have some improvements via interventions throughout the brownfield. However, ecological structure is still the weakest dimension and needs to be seriously improved.

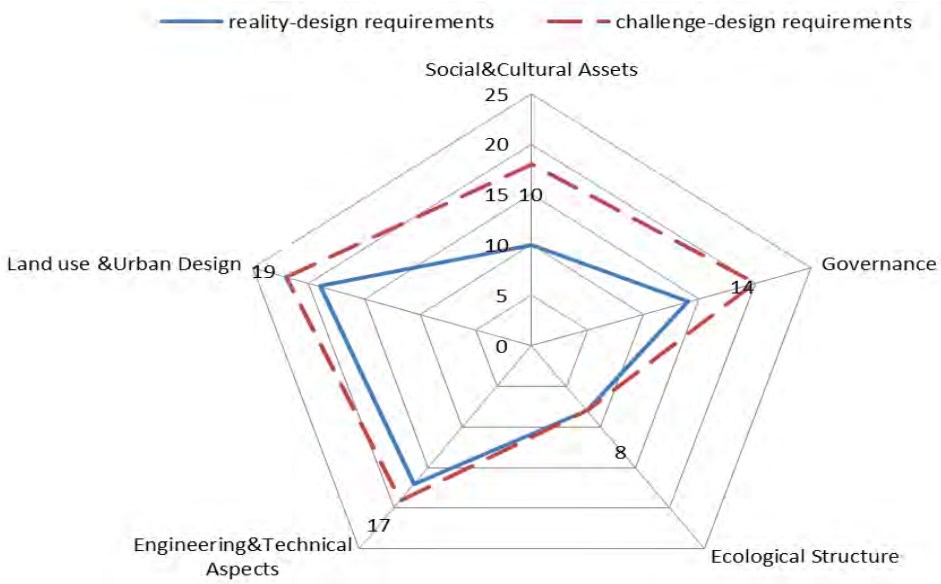

Figure 5. Overall representation of reality-design and challenge-design scores by dimensions

Discussion and Conclusion

This work inquires urban brownfield regeneration and green infrastructure engagement through some scholarly works on the case study area such as Erdik and Kaplan (2009), Kılıçaslan (2004), Özeren (2012), Velibeyoğlu and İnce (2012) and on European case studies such as RESCUE (2004) and Siebielec (2012). The gap analysis has thus been assigned a critical role of measuring the urban brownfield position in relation to green infrastructure based design and management requirements. The analysis indicated the complexity of urban brownfield regeneration along the hydrological system. It also reveals that socio-cultural assets, governance and ecological structure should be substantially managed within green infrastructure program (Fig. 5). Traditional planning schemes and land speculations are yet unable to make inroads into these complicated gaps. Nonetheless, the management of this controversial brownfield very complicated in nature is basically reserved to independent, but not well-administrated public bodies. This type of management practice is distant from deploying sound and holistic measures against present urban development challenges, and generates depressed urban patches such as the brownfield.

There is a clear ‘mind gap’ between engineers and designers in ways to understand technical solutions just like the difference between officials and politics. Eventually, delta and river systems have been introduced as a basic engineering matter omitting its ecological and social linkage with İzmir Bay, coastal strip and nearby communities. When introducing new design and

management approach like green infrastructure 'skill gap' should be considered between requirements of design conceptions and reality of availability and expertise of the staff. Furthermore, it is reasonable to expect 'communications gap' that can be attributed to miscommunications between the parties involved.

Nonetheless, gaps are not necessarily high. It must require some kind of gaps as both risks and benefits. For example, larger reality-design gaps may bring greater risks of failure besides greater organizational benefits. If these gaps could be managed as both desirable and feasible changes to current reality, it would bring greater chance of success in the solution of complex problems through green infrastructure system. In other words, the strategies or items of design and management requirements concerning each dimension be incorporated into the exemplary green infrastructure-based design and management framework

In recognition of the fact above, green infrastructure based design and management exploring all aspects of the brownfield with a focus of urban sustainability should be recognized. According to RESCUE Working Group (2004), the sustainable regeneration of urban brownfield sites requires both the identification of suitable use options and their implementation in an environmentally, economically, socially and institutionally sound way. To be sustainable, brownfield projects have to refer both to the regional context of the sites and the restrictions and potentials that have their origins in the site and its specific local or neighborhood context. However, it is highly notable, as Siebielec (ed.) (2012) articulated that there are no specific national or regional regulations for brownfield management and regeneration in countries of Central Europe. Lack of information in spatial format on number and area of brownfields is one of major bottlenecks for development of effective transformation programs and real knowledge on the potential of inner city development.

To sum up, this paper accounts the indispensable role of green infrastructure practice on urban brownfield regeneration. However, further research is needed on how green infrastructure-based model could be justified in urban planning/design and management.

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