

Collaborative Planning Model for Brownfield Regeneration

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브라운필드 재생을 위한 협력적 계획 모델 연구

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국문초록

대부분의 일반적인 계획 과정과 달리, 브라운필드 계획은 잠재된 오염문제로 인한 기술적, 법률적 전문지식을 필요로 한다. 성공적으로 통합적인 의사결정에 관여하기 위해서는 조정된 협력적 계획 모델이 중요하다. 본 연구는 기존의 협력적 계획 접근방식이 브라운 필드 재생에 있어 상반된 분야의 전문가들 및 지역 주민들이 함께 일하며 적절하게 균형 잡힌 협력을 이루어 내기 위한 어려움들을 극복하는 데에 어떻게 효과적으로 적용될 수 있는지 알아보는 것을 목표로 한다. 의사소통적 계획이론 관련 문헌분석을 통해 적절한 지표들을 찾아내어, 네 단계의 브라운 필드 계획과정(대상지 선별, 평가, 정화, 디자인)에 적용시켜 본 후, 중요한 부분들을 짚어내었다. 본 연구의 결과, 크게 세 가지 점에 초점을 맞춘, 브라운 필드 재생에 적합한 협력적 계획 모델의 필요성이 인식되었다(1. 사회, 문화, 디자인 분야와 과학, 기술 분야의 전문가 간의 균형 잡힌 대화의 촉진, 2. 일반주민들과의 잠재적 오염 위험과 관련한 커뮤니케이션을 위한 적절한 방법 개발, 3. 전문가 주도의 객관적 데이터와 주민 의견 중심의 주관적 데이터의 통합을 위한 의사결정지원 시스템의 마련).

주제어: 통합적인 의사결정, 의사소통적 계획이론, 브라운필드 선별, 평가, 정화, 디자인

ABSTRACT

Unlike most other planning processes, brownfield planning generally requires a high level of technical and legal expertise due to potential site contamination. To successfully engage in inclusionary decision making, an adaptive collaboration strategy for brownfield planning is therefore critical. This study examines how a communicative planning approach can be used to overcome the challenge of enabling experts from different fields to work alongside lay people from the local community to achieve a properly balanced collaboration in brownfield planning. After identifying appropriate indicators for collaboration through a literature review of established communicative planning theory, these indicators are applied to the brownfield planning process, highlighting critical points of collaboration such as site prioritization, assessment, remediation, and redevelopment throughout. The results suggest the critical need for an adaptive model focusing on three aspects: 1. Facilitation

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of a balanced dialogue between the experts with social, cultural, and design-based knowledge and the ones with scientific and engineering-based knowledge, 2. Preparation of an appropriate tool for risk communication with the lay people, 3. Development of decision support system for the integration of expert-oriented technical data and public opinion-oriented subjective data.

Key Words: Inclusionary Decision Making, Communicative Planning Theory, Brownfield Site Prioritization, Assessment, Remediation, and Redevelopment

1. Introduction

1. Research Background and The Purpose of Study

Brownfield sites are crying out for attention but in spite of their negative impacts on the surrounding area, such as increased crime, contamination risk and visual blight, the majority of brownfield sites are marginalized or neglected by governments or local residents due to a lack of monetary resources and their perceived economic infeasibility; these lots are neglected due to the indifference of people, effectively existing in a city vacuum.

Communicative planning provides a useful tool for attracting attention to these neglected brownfield sites. Through meetings involving government agencies, developers, planners and designers, and local community members, the diverse issues associated with brownfield sites, including their opportunities as well as their problems, can be shared and understood (Caser *et al.*, 2013). For example, the Gasworks Park in Seattle, Manhattan's High Line project, and the Detroit city plan have all proved very popular with city residents and visitors alike. These projects have all drawn attention to the problems of brownfield sites but also their potential through cooperative work with various communities.

In particular, brownfield sites need mutual understanding and learning to address the inherent problems of contamination risk assessment, remediation, and complex liability issues. The stigma of contamination can be lessened through a better understanding of the risk it poses to health through risk communication and identifying feasible remediation solutions, and the liability burden can be shared among stakeholders through communication.

In order to achieve democratic planning decisions that correspond to contemporary conditions and take into account a wider range of interest groups, the communicative approach to planning

has been suggested as an alternative to traditional planning approaches consisting of a comprehensive plan put together by a few trained professionals. However, the simple application of existing communicative planning approaches to the brownfield planning process may not be effective, as these sites generally involve knotty issues such as contamination risks that require site assessment and remediation, and potential liabilities needing special legal knowledge. Unlike most other planning processes, trained professionals with highly technical and legal expertise such as chemistry, soil science, public health, and environmental liability, as well as planner and designers with social, political, and cultural expertise, will inevitably share major roles in the planning process. In addition, engaging lay people, particularly those living and working close to the site, is becoming even more important as brownfield programs and policies continue to move towards a bottom up approach. In this complex environment intensive collaboration skills become highly relevant, and several questions therefore arise: How can current communicative planning approaches achieve the specific objectives and requirements of brownfield reclamation planning? What are the critical challenges and conflicting objectives confronting brownfield planners? How can the existing communicative approaches be modified to address these issues?

To accomplish a well-balanced, inclusionary decision making process, the choice of an appropriate adaptive collaboration strategy for brownfield planning is critical. The purpose of this paper is to show how existing communicative planning approaches, specified and modified if necessary, can be used to address the challenge of helping participants with different areas of expertise to work alongside lay people from the local community to achieve properly balanced collaborations that ensure a successful outcome. An overview of the indicators supporting the adoption of a collaborative approach in the existing communicative planning literature and its preliminary application to the brownfield planning process, and a detailed

examination of the critical challenges and the aspects needing differentiation, are presented below.

2. Study Content and Method

This study focused on developing preliminary collaboration framework for brownfield redevelopment. Through the review of the major literatures regarding communicative planning theories, the important collaboration indicators were chosen and applied to four different stages of brownfield planning process. The brownfield planning model is limited to the most recent phase of brownfield program focusing on localized approach such as brownfield pilot and brownfield area-wide planning project in U.S. context where there have been active efforts for brownfield reuse more than three decades.

The first part of the study dealt with the review of communicative planning theories by two major scholars, Patsy Healey and Judith Innes in order to understand the pre-requisite conditions and indicators for successful collaboration. In the second part of the study, the collaborative objectives and expected outcome were discussed for each of four planning stages. In addition, the critical moments and aspects that needs further differentiation in order to accomplish successful collaboration.

3. Related Precedent Study

Extensive research has focused on developing a theoretical foundation and practical guidelines for participatory and communicative planning approach (Forester, 1999; Healey, 2006; Huxley and Yiftachel, 2000; Innes and Booher, 2010; McGuirk, 2001). Research about specific methods and tools, including GIS and scenario visualization, for participatory planning is a particularly active area (Geertman, 2002; McCall, 2003; Sadoway and Shekhar, 2014; Sen and Sen, 2014; Talen, 2000; Tress and Tress, 2003). In other hand, the management and planning of the abandoned lands, especially the so called brownfield sites, have been the subject of research by a number of scholars (Hollander, 2011; Hollander and Németh, 2011; Johnson *et al.*, 2014; Németh and Langhorst, 2014; Rieniets, 2009). However, few researchers have examined the use of participatory and communicative approaches in brownfield planning (Blokhuys *et al.*, 2012; Caser *et al.*, 2013; Pearsall *et al.*, 2014; Solitare, 2005). This study extends the precedent works by

examining how a communicative approach can be applied to brownfield planning, leading to a more effective regeneration process.

II. Literature Review

1. Communicative Planning Approach

Two major scholars, Patsy Healey at Newcastle University in the UK and Judith Innes at UC Berkley in the US, have led the effort to apply this new concept to the planning field. Both have espoused Habermas' communicative action theory, which emphasizes a "reasoning" process based on diverse interactions among active agents, contending that "planning is understood as an interactive and interpretive process involving communicative work among participants, during which issues, problems, strategies and policy ideas are given form and meaning" (Healey, 2006, p.91).

Healey cautions that her study should be understood in the specific European context and particular conditions of Britain in the mid-1990s, when a central government advocating a narrow concept of economic opportunities dominated the country's policy regime at the national level at the expense of social justice and environmental care, weakening local collective initiatives to address problems (Healey, 2006). She explores the opportunities offered by communicative planning theory, with an emphasis on "more place-conscious evolution in public policy" through thinking about the "qualities of place, of cities, of valued landscapes, and of metropolitan urban system[s]" (Healey, 1999, p.111).

Innes works primarily in the U.S. context and her current emphasis is on collaborative policy making and action at the state and regional levels dealing with growth management, regional transportation planning, water planning and management, and voluntary civic regionalism. Her most recent work has been on the governance of large scale fragmented regions and in *Planning with Complexity* (2010), which she co-authored with practitioner David Booher, provides more grounded theory with case studies and specific strategies.

Healey and Innes share significant common ideas about the communicative approach in planning in terms of the philosophical background and objectives involved. Healey provides a strong theoretical background and stresses the human capacity to change or create social structure and treats planning as a

process and product evoking those process. Her voice is somewhat abstract, focusing on a theoretical treatment rather than proposing specific alternatives or strategies. In contrast, Innes's research shows more specificity in considering strategies for achieving the objectives of collaborative planning and is grounded in case studies.

1) Shared Theoretical Background: Inter-Subjective Reasoning Model

Healey's argument is that without falling prey to extreme post-modernist ideas such as nihilism or fundamentalism, Habermas maintains the "reasoning" idea of modernism, arguing that the "truth" can be found not solely through reasoning based on scientific rationalism, but in diverse ways including reasoning through mutual interaction. Rather than rejecting the idea of reasoning, narrowed and constrained by scientific rationalism, he expanded the conception of reasoning. According to Habermas, the public sphere is where an individual can freely share ideas, argue and discuss, reflect critically, and transform and adapt. Habermas "provides normative philosophy for the reconstitution of the public realm, built on a conception of intersubjective consciousness and the theory of communicative action" (Healy, 2006, p.44). He believed that the public sphere can be reconstituted through open, public debate (Healy, 2006).

This authentic public sphere idea based on the intersubjectivity reasoning model provides the theoretical foundation for communicative planning theory. The comfortable phrase "make sense together while living differently" has often been used by Healey to represent this idea. "There is a hope that, through dynamically critical communicative processes, the democratic project of 'making sense together while living differently' can develop as a progressive force" (Healey, 1992, p.160).

2) Theory for Action: DIAD Network Dynamics Theory

Based on their practical experiences and case studies, Innes and Booher (2010) developed a theory called DIAD (Diversity, Interdependence, and Authentic Dialogue) for exploring the conditions for truly collaborative processes. This theoretical framework is adopted as the basic foundation for exploring how the collaborative approach can be used in a brownfield planning context because it appears to incorporate all the ideas related to the communicative approach in planning discussed so far.

The theory lists four critical conditions for collaboration. The first is diversity of interests and includes all potential perspectives, especially affected agents who can be easily excluded by powerful agents. The second is interdependence of interests in that "each agent must depend on the other in [a] reciprocal way and each has something others want". Through collaboration, group members will get "more of what they value most without necessarily reducing the value that accrues to others" (Innes and Booher, 2010, p. 36). The third is face-to-face authentic dialogue based on Habermas' basic speech condition. In this process, all must participate in the conversation with equal access and equal opportunity, with no control exerted by the facilitator. Lastly, adaptation to a system can occur when "participants start to develop shared meaning", for instance the agreed definition of brownfield and its value as a community resource (Innes and Booher, 2010, p.38).

2. Indicators for Successful Collaboration

To establish the prerequisites for an authentic collaboration to take place, we therefore developed (selected and re-categorized) thirteen indicators for the planning process under three categories, stage setting, process facilitation and quality control, by referring to the existing literature on communicative and participatory planning approaches (Dukes *et al.*, 2008; Healey, 2006; Innes and Booher, 2010) (Refer to Table 1).

1) Stage Setting: Create Atmosphere

For the planning process, the first priority must be to create a suitable atmosphere and environment for collaboration. Five indicators, namely an incentive structure, establishing specific needs, sharing information, inclusive decision making, and adaptiveness are involved in successfully inviting and retaining a variety of participants with diverse perspectives at the table and identifying the best alternative that will satisfy every member.

The incentive structure refers to preconditions of the project such as enforced laws, resource limitations, and political paralysis that lead participants to have strong feelings about problems with the existing conditions or that on-going plans are proceeding without their participation. This incentive structure should make stakeholders take action because they believe that they are more likely to accomplish their individual goals

by working together than by themselves(Innes and Booher, 2010). As with the initial ground rules for the incentive structure, group members must first establish their objectives together. They need to seek agreement about the need for shared expectations and to recognize their interdependence (Dukes *et al.*, 2008). We have added sharing information as another key indicator because every member could have different types of information at different levels. Healey provides some ideas about the diversity and kinds of information that may be relevant, arguing that “collaboration emphasizes the importance of paying attention to practical consciousness and local knowledge, as well as the systemized scientific and technical knowledge made available by [an] expert group” (Healey, 2006, pp 264). Also, all this information needs to be shared without concealment for their own interest(Dukes et.al, 2008). Fourth is inclusionary decision making. This refers to the fact that all or most of the relevant stakeholders, especially key stakeholders, should participate fully in the process. In several of the case study projects examined by Innes and Booher(2010), the staff devoted several months to identifying, persuading, and expanding the stakeholder group through getting external advice, conducting interviews, and preliminary core member meetings. Although conflicts between non-profit organizations and business sector participants were expected even before the first meeting, they found that those cases that recruited more diverse stakeholder groups produced better results in the long term. In addition to these four indicators, adaptiveness is important. “A complex adaptive system is one that involves diverse agents [who are] enabled to alter their

behavior as they get feedback from the environment and each other”(Innes and Booher, 2010, p. 96). For example, group members should be able to freely discuss adding stakeholders, introduce unanticipated issues, alter the task, change the ground rules, and contribute to the design process as the project proceeds. For higher achievement, group members must be able to learn from their experience and use that learning to improve the group’s functioning through three steps: evaluate, modify, and recommit(Dukes *et al.*, 2008).

2) Process Facilitation: Human and Material Resources

Another important requirement is the availability of sufficient human and material resources to ensure effective and smooth progress. The four indicators here are leaders and sponsors, credible expert group support, dedicated staffing, and a negotiated text and evolving agreement.

First of all, in addition to the external incentive structure, a group leader who has the ability and specific ideas to initiate collaboration is needed. The leader will play a role by engaging other leaders, designing and setting up the process, lining up sponsors and finding the resources to fund the effort. A good leader will encourage other leaders to join and initiate networks rather than seeking to control every aspect of the endeavor (Innes and Booher, 2010). Second, expert support is also an important indicator. Expert groups can provide invaluable advice on the economic, social, technical feasibility of planning ideas. They must be selected by the group based on their ability to provide credible and unbiased information(Dukes and Firehock, 2001). Third, dedicated, trusted staff support is another indicator. There is a great deal of support work required throughout any planning process, such as writing agendas, preparing meeting summaries, and selecting and inviting experts, and this is particularly true for brownfield planning. Staff must make sure that all participants are informed at every stage and they feel heard. Also, staff will help participants work through their concerns to prevent uncomfortable feelings arising during discussions(Innes and Booher, 2010). Lastly, a negotiated text and evolving agreement is necessary to focus attention on the issues under discussion. For example, a clear goal statement or preliminary conceptual plan drawing showing the negotiating process and evolution over time “provides confidence to participants that their ideas are being incorporated and clears away confusion about what has been decided”(Innes and Booher, 2010, p.95).

Table 1. Indicators for successful collaboration

Objectives	Categories	Indicators
Stage setting	Create environment and atmosphere	<ul style="list-style-type: none"> • Incentive structure • Establishing the needs • Sharing information • Inclusionary decision making • Adaptiveness
Process facilitation	Human and material resources	<ul style="list-style-type: none"> • Leaders and sponsors • Expert support • Dedicate staff • Negotiating text and evolving agreement
Quality control	Authentic dialogue	<ul style="list-style-type: none"> • Diverse stakeholders • Understanding and agonism • Accuracy • Comprehensibility • Sincerity • Legitimacy

Source: Dukes *et al.*, 2008; Healey, 2006; Innes and Booher, 2010

3) Quality Control: Authentic Dialogue

The third category involves authentic dialogue. This condition can be achieved when diverse stakeholder groups reach mutual agreement, often as a result of having resolved some tensions and conflicts, which will eventually stimulate creativity. In addition, the speech condition requires accuracy through the involvement of an expert group and a triangulation procedure, comprehensibility requires a facilitator, sincerity is based on face-to-face meetings and informal dialogue, and lastly, legitimacy is achieved through the participation of public agencies and constituencies(Innes and Booher, 2010).

III. Collaboration Indicators Applied to Four Brownfield Planning Stages

A typical brownfield planning process can be divided into four stages: site prioritization, assessment, remediation, and redevelopment(ICMA, 2001). Thirteen collaboration indicators are applied to the each stage of brownfield planning(Refer to Table 1). To develop a more specific understanding, this study modeled brownfield pilot programs and brownfield area-wide planning programs based on a bottom up approach that were funded by government programs designed to foster city and district scale redevelopment in U.S. context(U.S. EPA, 2010).

1. Site Prioritization Stage

Site prioritization phase benefits most from communicative planning approach in terms of extensive information needs, the diversity of stakeholder groups' visions and objectives, the discussion of large scale planning areas, and decisions regarding the selection of project boundaries and target areas. The main collaboration goals for this stage are to involve diverse stakeholder groups, understand their interests, and satisfy these interests as much as possible through consensus building for the future plan. The expected outcome is a comprehensive city and district-wide conceptual plan that focuses particularly on brownfield sites and the selection of specific target areas.

This stage is not critically different from those in most other planning processes. Based on the indicators listed earlier, government funding programs such as those dedicated to brownfield pilot and area-wide projects can provide a useful external incentive structure. Information can be gathered by

all the members through joint-fact finding exercises, which will generally be an effective way to gather scattered information related to the existing infrastructure, amenity distribution, and community needs from diverse sources. Large scale meetings need to be organized and managed by a designated leader and dedicated staff who can work full time on the project. Large stakeholder groups, including land owners, local people, private developers and city managers, as well as expert groups such as planners and government officers, are identified and invited to participate in the inclusionary decision making process. Small group meetings can be added for face-to-face and informal dialogue. For technical requirements, future city-wide alternative plans with target areas reflecting the diverse interests of stakeholders can be developed as options to be voted on by the group as a whole.

2. Site Assessment Stage: Balanced Dialogue Need among Different Expertises and Resource Need for Risk Communication with Lay People

Site assessment is the defining and categorizing phase where individual site are evaluated based on their risk level and categorized in terms of their clean-up requirements. Based on the indicators described earlier, the main collaboration goal for this stage is mutual learning and developing a better understanding about contamination risks and acceptable levels. Under ideal collaboration conditions, information about contamination risks, the potential effect on public health, and existing and potential assessment criteria is shared through stakeholder meetings and education programs. Also, by discussing on an acceptable limit for contamination, clean-up levels and future land use plans can be discussed in the light of the requirements for federal regulation. The expected outcome for this stage is for the stakeholders to arrive at an agreed-upon risk level or range. Unlike the prioritization stage, the site assessment stage will gain only limited benefits from the existing collaborative approach. Due to particular brownfield conditions such as the potential risk of soil and groundwater pollution, this stage likely to depend more on experts' judgments, such as the input from site engineers and supporting scientists.

Critical moments for collaborations can be triggered by the lack of a collaboration model capable of combining all the very different disciplines involved and facilitate risk communication with the lay people involved. The roots of this problem

lie in the deep gap between experts trained in natural science and social, political and cultural science specialists. Often, the experts responsible for providing the expertise in brownfield planning are not equally open to engaging in dialogue. The major issues regarding brownfields are likely to be regarded as highly technical problems dealing with pollution that must be solved by a group of expert scientists and engineers. For example, the site assessment process can easily be dominated by a single expert group, resulting in the multiple other potential values of the brownfield being underestimated at the outset. Cultural and social aspects such as historical assets, spatial quality and community involvement are often pushed lower down the priority list. Several scholars have pointed out the need for balance in dealing with brownfields by reinforcing these aspects. "I suggest... that the degraded environment are cultural artifacts as much as they are problems for science, and that we must address these problems with the full range of the arts and humanities, as well as the sciences, if we are

to be effective"(Comp, 2007, p.63). Therefore, maintaining a balanced discussion through devising a collaboration model that effectively combines two different types of expertise and fosters dialogue with expert groups with social and cultural knowledge represents a critical challenge for the application of existing communicative planning approaches to brownfields.

Another critical point comes during the discussion of risk with lay people. There is often some difficulty involved in delivering potential risk information to lay people in an appropriate way. Without suitable education, guidelines or instruments, for example comprehensive language and visual resources that support risk communication, non-experts can easily be intimidated by potential contamination and thus become isolated from the decision making process, simply accepting the results presented by the experts. Moreover, if the acceptance level of contamination among stakeholders cannot be properly communicated, it will not be possible to reach a valid agreement.

Table 2. Collaboration indicators applied to brownfield planning process

Objectives	Indicators	Planning phase			
		Site prioritization	Site assessment	Site remediation	Redevelopment
State setting (create atmosphere)	Establishing incentive structure	Government fund			
	Establishing the needs(common goal)	Consensus city revitalization plan	Full understanding of site and Consensus assessment	Consensus remediation plan	Consensus redevelopment plan
	Sharing information	Joint-fact finding(e.g. community needs, infrastructure needs)	Joint-assessment(e.g. contamination risk, ecological and social potentials)	Joint-evaluation(e.g. economic, technical, social feasibilities of remediation options)	Joint-plan development (e.g. expected economic, community benefits)
	Inclusionary decision making	Decision support meeting including stakeholders group, multiple expert groups and local people			
	Adaptiveness	Group expansion and open discussion			
Process facilitation (human and material resources)	Leaders and sponsors	Advisory committee(e.g. government officers, neighborhood leaders, private developers)			
	Credible expert group	Officers, planners	Scientist, engineer, planners, designers	Scientist, engineers, planners, designers	Planners, designers
	Dedicated staffing	Staff organizing meeting			
	A negotiated text and evolving agreement	Documents(e.g. analysis, assessment) and plans(e.g. city-wide, district, site-level plan)			
Quality control (authentic dialogue)	Accuracy	Cross-check among participants	Site assessment criteria triangulation among multiple experts group	Remediation options evaluation criteria triangulation among multiple experts group	Cross-check among participants
	Comprehensibility	Facilitator	Facilitator and educator		Facilitator
	Sincerity	Small face-to-face meeting			
	Legitimacy	Federal and city government supervision			

Source: Dukes *et al.*, 2008; Healey, 2006; Innes and Booher, 2010

3. Site Remediation Stage: Decision Support System Need for the Integration of Objective and Subjective Data

In this stage, the economic, technical and social feasibility studies related to remediation must all be conducted by experts, with factors such as cost, duration, effect, and the remediation alternatives or scenarios being prepared and discussed (Linkov *et al.*, 2005). Feasibility studies of these technologies for specific site applications are a necessary part of the decision-making process. The applicability of particular remediation technologies varies according to the type of contamination, as well as the available time and budget. For example, a cost-time comparison among the various remediation technologies often shows that those using natural processes require more time but cost less money, while the reverse is true for those based on physical-chemical processes (Guo *et al.*, 2006). Based on the collaboration indicators described earlier, the main goal here is mutual learning and understanding through exchanging ideas about the important criteria for choosing the best remediation option. The expected outcome is for the group to achieve a consensus on the best remediation options to be used for their particular site.

During this stage, the relatively high profile of the remediation techniques can mean that other aspects such as the site's cultural and historical assets, spatial quality and social impact become secondary considerations. For example, few researchers have studied remediation alternatives by focusing on their broad ecological benefits or visual quality rather than their contamination types and economic feasibility (Laforteza *et al.*, 2008). To accomplish an inclusionary decision making, a balanced dialogue that includes professionals with political, social, and cultural expertise is critical if the group is to consider the full range of remediation alternatives, taking into account their broad social and cultural benefits. To adequately evaluate each option, experts and stakeholders, including local people, need to discuss the set of criteria. Decision support systems that engage both experts and local residents need to combine objective- and subjective-based data, if necessary with the aid of appropriate education and communication materials based on accessible language and visual resources.

4. Site Redevelopment Stage

Lastly, the site redevelopment stage is not critically different from most other planning processes. The site ownership

is important at this stage; there will be more community engagement opportunities if the site is owned by local government, but far fewer if the site is owned by the private sector. The main collaboration goal in this stage is to meet the diverse interests of all the stakeholder groups, including local residents with an interest in the site, and build a consensus. It is important to keep the meeting moving by engaging in open conversations and avoiding one-way conversations if the principle agent is a private sector entity. The expected outcome is a site reuse plan that is specific to that site.

IV. Conclusion

In recent years, brownfield sites in urban areas have begun to be regarded as valuable opportunities for revitalizing cities and neighborhoods and as potential green areas for urban green infrastructure. The process of emerging, abandoning and reusing brownfield sites is not just a matter of what happens to an individual plot but is closely related to the economic infrastructure of a city and its associated urban environmental and social issues. Thus, each brownfield site has an inherent complexity and dynamic in which the interests of various stakeholders are interlinked. Without a thorough understanding of the interactions between these interests, brownfield redevelopment plans will only result in unproductive conflicts among stakeholders. The case of the High Line in New York shows how a lack of understanding led to a judicial dispute that had a major impact on the initial stages of the project. The greatest benefit of communicative planning is that it can prevent unnecessary disputes in advance and reflect diverse perspectives and adapt to the ever-changing dynamics of different interest groups.

However, the communicative approach requires a considerable amount of time and resources. Therefore, it is important to find or build a feasible collaborative planning model for brownfield redevelopment to guide urban planners' efforts. As an early attempt, this study identified a preliminary collaboration framework consisting of thirteen indicators based on current communicative planning approaches and went on to apply this to the brownfield planning process and explore the critical moments at different stages. This research revealed that the critical moments are largely concentrated in the site assessment and remediation phases and are generally associated with imbalances between the participant groups. For an effective adaptive

collaboration strategy for brownfield planning, these results suggest a critical need for a new adaptive model that facilitates a balanced dialogue among experts including scientists and designers, as well as lay people, particularly regarding the risk communication and remediation options discussion.

This study has limitation since it mainly considered brownfield planning process in U.S. context and focused on area-wide planning projects implemented recently (typically dealing with a series of small abandoned industrial or commercial sites in local area). For example, the four planning stages in the U.S. where site risk assessment is a requirement to initiate the process, cannot be same in other contexts where comprehensive brownfield planning is not active or the redevelopment decisions are often made first. There is a research need regarding variables according to brownfield project types, regional scope, and environmental policy conditions.

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