Current status of the Brownfields Issue in Japan

Interim Report

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Expert Studying Group for Countermeasures against Brownfields

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1. Introduction

For the purpose of preventing adverse effects on public health caused by soils contaminated with toxic substances such as lead, arsenic, and trichloroethylene, the Soil Contamination Countermeasures Act (the Act) went into effect in February 2003. The Act provides for measures to investigate soil contamination and to prevent harm to public health.

The Act requires soil contamination investigations under certain circumstances, including when specified facilities using toxic substances are closed. In addition to those circumstances, soil contamination investigations are increasing, which are triggered by local government ordinances or voluntarily conducted in the land sale or corporate asset management settings. This situation is desirable because increased opportunities for such investigations enable us to grasp the actual state of soil contamination which may have adverse effects on public health.

However, various disruptions have been seen since soil contamination, an unfamiliar environmental issue, suddenly becomes clear close at hand. For instance, soil contamination has negative influence on land sales contracts or impedes smooth land use.

Here, we define “lands which are unused or with extremely limited use compared to their intrinsic value because of existence or potential existence of soil contamination” as “brown-fields.”

In Western countries, it is reported that many brown-fields have already come up and some countries, like the United States, has developed legal systems to redevelop such fields.

In Japan, a limited number of lands have turned into brown-fields at present because Japan’s history of soil contamination countermeasures is relatively short. However, it is estimated that there exist a lot of lands in Japan as well which have the potential to turn into brown-fields and that the changes in social environment could make this concern actual.

The increase in brown-fields could have several adverse effects. First, as a matter of environmental policy, it could interfere with the smooth implementation of soil contamination countermeasures. For example, it could impede appropriate management of contaminated lands. Second, the brown-field issue, if not addressed, could have adverse effects on local economy and then national life.

2. The intent and purpose of this examination and research

Based on the foregoing recognition, we have conducted a research for the purpose of (1) examining the actual situation of brown-fields and (2) considering solutions to the brown-field issue.

In this year, we conducted our research with emphasis on reality checks or problem recognition, such as whether or not a brown-field issue observed in other countries can be also observed in Japan, or whether or not the issue, if not actualized yet, has the potential to become actualized in Japan from now on.

More specifically, this research deals with the estimate for actual states or potential scale of brown-fields, the trend of treatment of soil contamination in the fields of real-estate appraisal, accounting processing, or evaluation of collateral in financial transactions, cause of brown-fields, and the social impacts of the manifestation of brown-fields.

3. The actual state of brownfields in Japan

Has the brownfield issue already happened in Japan? In order to grasp the actual condition, we conducted the following inquiry survey and case research. As the result, issue has already begun to be seen in some parts of Japan as well.

3.1 Inquiry survey covering the members of Geo-Environmental Protection Center

For the purpose of grasping the actual state of the brownfield issue, we conducted an inquiry survey covering the member companies of Geo-Environmental Protection Center (the Inquiry Survey) in February 2007 (For details, refer to the Appendix 1 at the end of this report.).

Geo-Environmental Protection Center consists of 179 companies which operate a business related to soil contamination research and prevention, including investigation and research, construction consultant, construction companies. Among them, 55 member companies replied to the inquiry (response rate of 31 %).

46 out of the 55 companies reported on specific cases. The number of cases reported by each company ranges from 1 to 4, but some companies reported anywhere between 10 and 20. As the result, 168 cases were reported in total. Only 2 companies clearly replied that they do not have any cases to report. The summary of the Inquiry Survey is as follows:

a) Inhibition case of effective land use

On a regional basis, 69 percent of cases were reported from metropolitan areas. On a land-scale basis, 64 percent of cases involved the areas of more than 3000 square meters.

As for the causes of these cases (multiple answers allowed), 90 percent of them were reported to occur because of “the fact or the possibility that soil contamination countermeasures are expensive”. “The fact or the possibility that the countermeasures are time-consuming” and “the fact that they can not let the contamination known publicly” respectively involve 23 percent of the cases.

b) The actual state of contract of contaminated lands

More than 70 percent of responses showed that, since the Act went in effect, in contaminated land transactions, buyers had never allowed (or exceptionally allowed) countermeasures like insolubilization or containment other than “clean up” contaminated soil.”

Additionally, when asked “From you experience, how much proportion of countermeasure’s costs to land price (the price of non-contaminated-land) is allowable to complete your land sales contract?,” 56 percent of all the responses (except the answer “not sure”) answered that contracts usually end in failure if the proportion is beyond 20 to 40 percent. The second top answer (20 percent of all the responses) considered the proportion as 0 to 20 percent. However, many replied that that depends. Besides, some replied that they would complete their contracts with the proportion of over 100%.

3.2 Case study

In Japan, how brownfield issues are happened? We gathered detailed information about 35 out of above mentioned cases and organized it in Appendix 2. Features of these cases are as follows:

・Grouped regionally, 21 cases, the largest of all, were reported from metropolitan areas, 5 were from regional hub cities, and 9 were from the other areas.

・25 cases involved old factory sites. Among them, 13 cases involved old factory sites which had been under discontinuation of the use before the Act went into effect.

・The reasons that investigations were required were land sales and redevelopment in 32 cases, and restoration of leased land in 2 cases.

・Substances which caused brownfield issues were heavy-metal compounds in 9 cases, volatile organic compounds in 8 cases, and complex contamination of both compounds 10 cases. In 6 cases, the existence of waste caused brownfield issues.

・The primary cause of brownfield issues was high cost of countermeasures, which was related to 21 cases. The second one, related to 10 cases, was that the soil and groundwater contamination existed. Most of these cases can be seen to include high cost of countermeasures as well.

The following 4 cases are typical ones.

<An old chemical factory site in a metropolitan area>

This case is related to an old chemical factory site which had been closed before the Act went into effect. There is a plan to sell the land and to reuse it as residential sections, commercial facilities, and business offices. However, as it is expensive to clean up the site, the plan has been suspended. Although having considered another plan of selling this land after in-situ containment, still they do not make an effort to find and buyer on such condition at this time.

<An industrial laundry site in a metropolitan area>

There was a plan to sell an industrial laundry site as a residential site. However, as soil contamination was found, the plan was relinquished and the site is used as a business office without taking countermeasures.

<A manufacturing plant site in a regional hub city>

There was a plan to sell to a governmental agency a piece of land site where there was no history of usage of specified toxic substances. Nevertheless, the plan was given up because oil and heavy-metal pollution was found there.

<A machine factory site in the other area>

This case involves an old factory site in a regional industrial city and was disused before the Act went into effect. While hoping to sell her site, the landowner has not conducted a statutory investigation on the site because it is likely that she finds soil contamination and needs to clean it up. The site has been unused because it is difficult for her to cope with the cost of soil contamination countermeasures.

4. Background of brownfield issues

4.1 Causes of brownfields

What are the main causes of brownfields? According to the foregoing Inquiry

Survey, “the fact or the possibility that soil contamination countermeasures are expensive” accounted for 90 percent of all the answers (multiple answers allowed). “The fact or the possibility that the countermeasures are time-consuming” and “the fact that they can not get contamination known publicly” respectively accounted for 23 percent. Thus, the main cause of brownfields is thought to be “the fact or the possibility that soil contamination countermeasures are expensive.”

By the way, there is no question that appropriate countermeasures must be taken against the soils contaminated with toxic substances because such soils, if not addressed, has the potential to have negative influence on human health. Consequently, the Act makes available not only a pollution elimination approach (clean up) but also a pollution management approach including insolubilization or containment (management of contamination）.

However, according to our Inquiry Survey, it is highly rare for buyers to allow measures other than the removal of contamination in contaminated land transactions. In other words, it is observable that, despite the similar effectiveness of “management of contamination” as that of “removal of contamination” to eliminate health risks caused by soil contamination, buyers prefer to require the latter than the former.

In general, “removal of contamination” is more expensive than “management of contamination.” Therefore, we could say that such buyer’s preference makes countermeasure’s cost more expensive and then causes brownfields.

4.2 Public awareness of soil contamination

As mentioned above, land buyers have a general tendency to require “clean up”, without attention to the effectiveness of each countermeasure against health risks. This indicates that soil contamination causes a great deal of “concern” for buyers (purchasers or users of land). How do the public and companies feel about soil contamination?

From January to February 2001, the Ministry of Land, Infrastructure and Transport (MLIT) conducted an inquiry survey covering 9,000 companies that were capitalized at ¥ 10 million or more and that were Japan’s 8 biggest cities-based companies (Sapporo, Sendai, Tokyo 23 wards, Nagoya, Kyoto, Osaka, Hiroshima, and Fukuoka). The purpose of the survey was “the research on business behavior related to land ownership and use” (3,694 valid responses). This survey showed the following companies’ consciousness about soil contamination:

・Thus far (as of January 2001 when this survey was conducted), 15.8 percent of

companies had considered soil contamination at the time of land purchase (consideration). However, many more companies, 58.1 percent of companies, answered that they would take soil contamination into account at the time of land purchase hereafter. Furthermore, if the scope of answers is confined to the companies which were willing to purchase lands (or consider to purchase them), 85.4 percent of them showed the intent to consider soil contamination.

・Among the companies which answered that they would consider soil contamination at the time of land purchase hereafter, most of them (65.6 percent) answered that they would "call off the purchase plan" once soil contamination was discovered. Fewer companies would "require land owners to clean up" (23.5 percent) or "require reduced contamination removal costs" (9.3 percent).

The Japan Real Estate Institute and Meikai University Graduate School of Real Estate Sciences have jointly conducted a research on psychological influences on the value of contaminated land sites. As part of this research, an inquiry survey covering 347 adults in Urayasu City, Chiba Prefecture, was conducted from August to December 2003. This survey showed the following results regarding public awareness of the purchase or lease of lands which have a history of soil contamination.

・Only 9 percent of the respondents answered that, once contaminated lands or apartment sites were cleaned up, they would be willing to purchase them. In the case of the lease of such properties, only 10 percent of the respondents answered that the lease would not raise any concern among them.

・Only 6 percent of the respondents, in purchasing apartments or lands, would not care about the fact that the real estates had been contaminated in the past but completely cleaned up by the time of purchase. Only 19 percent answered that they would be willing to purchase them if they could get proper deductions. More than half of the respondents (65 percent) answered that they "would not purchase the real estates if there was a history of soil contamination."

The results of these surveys (2001 and 2003) do not necessarily reflect the current public awareness of soil contamination because they were obtained several years ago. Nonetheless, the consciousness of the current public and companies would not be so changed, considering the present situation that negative images of soil contamination have come to the front following the cases where an apartment seller failed to inform buyers about soil contamination.

4.3 Concern that soil contamination causes for land purchasers

As previously noted, citizens and companies have a strong antipathy to soil contamination. Why are these “feelings” and concrete “concern” about soil contamination created?

This part categorizes concrete concern, which soil contamination causes for land purchasers, into respective stages such as uncertain (uninvestigated) stage, manifestation of pollution stage, and post-cleanup stage.

(1) Uninvestigated stage

Land purchasers have the potential to bear statutory liabilities for research and countermeasures when unexpected pollution comes out after land acquisition. It is impossible for them to predict demands from local community, administrative guidance, and cost sharing.

Moreover, even before land acquisition, unexpected soil or groundwater pollution countermeasures could influence the feasibility of relevant projects.

(2) Pollution Manifestation stage

There is concern that statutory liability (such as statutory obligations and damages) resulting from soil contamination can extend to land purchasers. For this reason, land purchasers usually request lands whose contamination was eliminated. Being unable to deal with administrative procedures or cleanup works, land purchasers often require the former land owners to take measures against soil contamination.

Soil contamination countermeasures are expensive and time-consuming. Furthermore, information disclosure reveals the facts of pollution to the neighborhood, which could influence the feasibility of projects.

Even if countermeasures eliminate soil contamination of lands, it is impossible to foresee its impact on sale to end-users.

(3) Post-countermeasure stage

① “Management of contamination” including containment

Containment restricts land use because it needs continuing maintenance of shutoff. Moreover, there is concern that changes in the forms of land use might need additional costs of contaminated soil treatment or disposal of containment parts. For these reasons, presently containments are usually avoided in land sale settings, which depend on the way of land use.

② “Removal of contamination,” cleanup of contaminated soil

When excavation and removal or in-situ cleanup are executed and a prescribed verification is carried out, that land can be said to be restored to a sound condition. Nonetheless, land sellers are sometimes requested to offer discounted land prices because of a stigma of the past contamination. Furthermore, land buyers are sometimes afraid of residual contamination, questioning the effectiveness of the cleanup.

4.4 Causes of the unpopularity of contamination management (including containment)

Generally speaking, “the contamination management” approach including containment is cheaper than “the cleanup approach.” Properly performed, the contamination management approach can prevent adverse effects of soil contamination on public health and also minimize its negative influences on land use. However, this approach is rarely adopted in land sale settings. The reasons are followings, which show various concerns of land purchasers.

Most of these concerns are expected to be relieved by disseminating information and promoting public understanding of soil contamination.

① Lower assessed value (sale price)

・It is difficult to find a buyer who allows containment because most buyers call for no soil contamination.

・Even if parties reach agreements on land sales, buyers request sellers to offer discounted prices. Such lands are sometimes sold at less than half of their usual value. The deduction amount may be the costs of complete cleanup.

・This kind of lands are generally regarded as lemons, or damaged goods.

② Restrictions on land use

・The necessity of keeping containment restricts land use.

・It is necessary to continuingly maintain shutoff functions including impermeable wall.

・Changes in ways of land use, which result in excavation or off-site disposal of containment parts, involve additional costs of contaminated soil treatment or disposal.

③ Concerns about residual contamination

・Developers who deal in condominiums or residential site are generally unwilling to acquire and subdivide sites with residual contamination because potential buyers are

highly likely to have an aversion to such contamination.

・One of the reasons that developers do not adopt containment techniques is because they are unwilling to sell to buyers, or general consumers, lands with uncertainty in the future (including pollution outflow and potential non-attainment of statutory standards revised in the future).

④ Request from neighborhood for complete cleanup

・Even if soil contaminations are managed, neighborhood tend to demand complete cleanup because of anxiety about nearby residual contamination.

⑤ Never delisting from designated areas

・Even though the contamination management approach like containment is properly taken, that land is not delisted from designated areas. Such lands generally receive avoidance responses from land purchasers, although that depends on ways of land use.

⑥ Need for maintenance

・For the purpose of proper maintenance, lasting maintenance such as monitoring and repair is required.

4.5 Cleanup techniques

"The contamination cleanup" approach is to eliminate soil contamination of lands. This approach is divided into two categories. One is "excavation and removal," which excavates all the contaminated soil and disposes of it at off-site facilities. The other is "in-situ cleanup," which eliminates soil contamination by extracting or decomposing toxic substances under the soil without excavating contaminated soil.

Contamination removal techniques are determined in accordance with the characteristics of pollutants. Thus, the techniques used for heavy-metal contamination are different from those for volatile organic compound contamination. "The results of the survey on Enforcement Status of the Soil Contamination Countermeasures Act & Numbers and trends of soil contamination investigations and countermeasures in the fiscal year 2004 (The Ministry of the Environment, Environmental Management Bureau)" shows countermeasures adopted in the statutory standard exceeding cases in 2004. Among 362 cases about which countermeasures adopted were reported, "removal of contamination" was adopted 382 times, out of which "excavations" were adopted 296 times (Multiple answers allowed. In addition, sometimes multiple

countermeasures are applied at a single site. Hence, there is a difference between the reported number of cases and the sum of individual countermeasures).

Furthermore, classified by the type of pollutants, in heavy-metal contamination cases about which 232 cases were reported, “removal of contamination” was adopted 211 times, among which “excavations” accounted for 205 times. In volatile organic compound contamination cases concerning which 66 cases were reported, “removal of contamination” was adopted 81 times, among which “in-situ cleanup” accounted for more than half, 49 times, but “excavations” accounted for 32 times.

In this way, “removal of contamination” through “excavations” constituted the majority of the total countermeasures, although “in-situ cleanup” was popular in volatile organic compound contamination cases. The reasons of this, as referred to hereinafter, are that there is no good alternative to excavations in the case of “removal of contamination” with heavy-metals, excavations are widely applicable irrespective of types of pollutants and ways of land use, and “removal of contamination” has advantages of certainty and short-term engineering works.

The characteristics of pollutants, applicable technologies, their constraint conditions, and the trend of countermeasure costs are as follows (Refer to Appendix 3 for comparative table for the characteristics of the major techniques included in “removal of contamination.”).

(1) The characteristics of heavy-metal contamination and contamination removal technologies

Heavy-metal contamination has the following characteristics.

① It is observed at the relatively surface layer of soil.

② Heavy metals are unable to be decomposed and rendered harmless by its very nature. Hence, there is no effective technology of in-situ cleanup (do without excavations).

In this manner, excavations are generally taken against heavy-metal contamination because of relatively shallow contamination and difficulty of in-situ cleanup.

Another technique is soil washing, which needs excavations but is on-site cleanup technique. However, when grounds consist of fine silt or clay, soil washing discharges lots of sludge as a byproduct, resulting in reduced cost-effectiveness. Thus, the applicability of soil washing can be limited according to the types of grounds.

(2) The characteristics of volatile organic compound contamination and contamination

removal technologies

Volatile organic compound contamination has the following characteristics.

① Volatile organic compounds often reach the impermeable layer at the bottom of the aquifer because they are with a higher specific gravity than water and highly osmotic. Hence, groundwater contamination often accompanies soil contamination.

② In-situ cleanup without excavations is applicable in principle because organic compounds can be discomposed and rendered harmless.

Excavations are applicable to relatively shallow volatile organic compound contamination, but hardly to deep one because it is expensive to extend bracing walls (slurry wall, steel sheet pile, mine timbering and so on) to the impermeable layer.

In-situ decomposition technique without excavations is applicable to volatile organic compound contamination. This technique includes oxidative decomposition, reductive decomposition, and bioremediation, which are used according to the state of contamination such as pollutants and contamination concentration.

However, excavations are often taken against highly-concentrated contamination parts because reductive decomposition and bioremediation are hardly applicable to them.

(3) The trend of contamination removal costs

Excavations consist of two processes. One is the process of excavating contaminated soil under the ground and the other is the process of disposing of excavated soil. Generally speaking, the cost of the latter process accounts for large portion of the total cost. Disposal of contaminated soil is classified into on-site cleanup and off-site disposal. According to above-mentioned survey conducted by the Ministry of the Environment, off-site disposal accounted for 93 percent of the total.

Off-site disposal are divided into three types, disposal at final disposal sites, cleanup at soil remediation facilities, and use in cement plants. The prospect for epoch-making technological development may be scant because these facilities use existing technologies. Moreover, further environmental-friendliness, including monitoring in the contaminated soil transfer process, will be necessary. Thus, it is unlikely that excavations much decline in cost.

In-situ cleanup technologies have been much developed including chemical decomposition and bioremediation. A traditional problem, swiftness, has been overcome by new technologies. However, enhancing certainty and swiftness of in-situ cleanup is likely to accompany higher costs. Therefore, it is also unlikely that in-situ

cleanup much decreases in cost. As the survey conducted by the Ministry of the Environment shows, about two third of soil contamination is heavy-metal contamination. Hence, even if in-situ cleanup much declined in cost, it would not lead to much decline in contamination removal costs because in-situ cleanup is hardly applicable to heavy-metal contamination.

4.6 Relationship between brownfields and countermeasure work costs and land prices

(1) Relations with land sales price

Soil contamination countermeasures, “removal of contamination,” are usually taken if certain gain on sale of lands can be reaped despite such countermeasures.

The more countermeasure work costs account for sales price, the more land sale plans end in a failure because benefits resulting from land sales decline significantly. According to the foregoing Inquiry Survey, most respondents answered that many contracts end in failure if the proportion is beyond 20 to 40 percent.

In local areas whose land prices are lower, more land sellers would give up their land sales because countermeasure costs are the same between metropolitan areas and local areas if the state of pollution is identical and because local areas have a higher countermeasure costs - to - land prices ratio (Refer to Appendix 4 for estimation of the relationship between countermeasures and land sale prices).

(2) Site area and rate of countermeasure work costs

Regarding small sites, the scope of contamination tends to account for large part of the land area. As the result, the higher countermeasure costs - to - land prices ratio becomes, the more contracts hardly end in a success. That is the case primarily for small companies.

Concerning large sites, the scope of contamination tends to become relatively small and the lower countermeasure costs - to - land prices ratio enables more countermeasures to be adopted. Moreover, the firm sizes of large site owners are usually large and it is relatively easy for them to bear the countermeasure costs.

For that reason, lands which small companies have in local areas where land prices are lower tend to become brownfields.

5. Potential scale of brownfields

How large is the potential scale of brownfield issues in Japan? In order to

understand this problem, this study team estimated the potential scale of brownfields, based on information on land assets and results of survey researched showed in the Land basic survey report (the Ministry of Land, Infrastructure and Transport, Land and Water Bureau Land Information Division).

This estimate regards the potential scale of brownfields as the scale of lands which were hard to sell because of high soil contamination countermeasure cost (For details, refer to the Appendix 5 at the end of this report).

As showed in 4.1, high soil contamination countermeasure cost was not necessarily the only cause for brownfields because the fact that it is impossible to reveal contamination can be another cause. Moreover, even if lands are hard to sell, the effective use of lands through ground leases is possible. Hence, the potential scale of brownfields depends on how to define the meaning of them. The reason why this report adopts the above-noted definition of the potential scale of brownfields is that, as the foregoing Inquiry Survey indicated, most of the cases where soil contamination prevented effective use of lands resulted from high countermeasure costs.

In Japan, land assets which legal persons and family units (individual) own are estimated to be about ¥1,150 trillion and about 13.48 million ha in area. About ¥43.1 trillion and about 113,000 ha of them are expected be land assets with soil contamination, which is estimated based on event probabilities computed by use of lands.

Assuming that land sales are difficult once countermeasure costs exceed 30 percent of land prices, one fourth of lands with soil contamination are expected to be the potential brownfields. The scale is estimated to be about ¥10.8 trillion on asset value and about 28,000 ha in area. This is a comparable size to slightly less than half of Tokyo 23 wards (about 62,000 ha in area). Furthermore, the countermeasure costs of the potential brownfields are estimated to be about ¥4.2 trillion.

5.1 Estimated scale of lands with contaminated soils

As of 1 January 2003, of the lands which legal persons owned (area: 2.24 million ha, assets amount: ¥406 trillion), business properties accounted for about 2.14 million ha in area and their assets amount was about ¥385 trillion. Moreover, of the business properties, lands used for housing sites (except farm land, forest land, land for railroad & rail track, and land for energy transmission & distribution facilities) accounted for about 714,000 ha in area and their assets amount was about ¥334 trillion. Assuming that, of these housing sites which legal persons owned, 35 percent of all the industrial

sites and warehouse sites and 5 percent of the other areas (except reservoirs and channels) were contaminated, the area of contaminated land was estimated to be about 98,900 ha and its assets amount was estimated to be about ¥37 trillion. These ratios were set by this study team, considering the actual state of soil contamination investigations under the Tokyo Metropolitan Government Ordinance.

As of 2003, the land which family units (individual) owned was about 11.20 million ha in area and their assets amount was about ¥748 trillion. Of them, the lands used for housing sites were about 1.01 ha in area (current living place: 661,000 ha, the other residential area: 350,000 ha), their assets amount was about ¥610 trillion. Moreover, assuming that, of housing sites which family units owned, except current living places and the other residential area which were obviously without contamination, 35 percent of all the industrial sites and warehouse sites and 5 percent of the other areas were contaminated, the area of contaminated land was estimated to be about 13,700 ha and its assets amount was estimated to be about ¥6.13 trillion.

In sum, the lands with soil contamination was estimated to be about 113,000 ha in area (legal person-owned land: 98,900 ha, family unit-owned land: 13,700 ha), about twice the size of Tokyo 23 wards (62,000 ha). Their assets amount was estimated to be about ¥43.1 trillion (legal person-owned land: ¥37 trillion, family unit-owned land: ¥6.13 trillion).

These estimates included legal person-owned and family unit-owned lands, but not public use land. Accordingly, the scale of lands with contaminated soil in Japan is expected to exceed these estimates.

5.2 Estimated potential scale of brownfields

As noted above, this estimate viewed the potential scale of brownfields as the scale of lands which were hard to sell because of high soil contamination countermeasure cost.

In determining whether soil contamination countermeasure cost are high or not, various factors are relevant, such as prices of target lands, relevant parties' economic load bearing capacities, and business judgments. However, it is extremely difficult to take these factors into consideration. Therefore, this estimate used as a measuring factor the ratio between prices of target lands and soil contamination countermeasure costs.

This estimate assumes that brownfields will occur when soil contamination countermeasure cost exceeds 30 percent of land price, considering that the top answer

(56 percent except “not sure”) of the Inquiry Survey was that “contracts usually end in failure if the proportion of countermeasure cost to land price is beyond 20 to 40 percent.”

Yasutaka et al. 2007, Proceedings 2nd International Conference on Managing Urban Land, which covers past and present manufacturing business, laundries, and gas stations, found the event probability and the potential scale of brownfields. Their study also concluded that brownfields will occur if soil contamination countermeasure cost exceeds 30 percent of land price. Additionally, their study showed that about 24 percent of lands with contaminated soil are potential brownfields.

Accordingly, this estimate assumes that one fourth (25 percent) of lands with contaminated soil are potential brownfields, in light of Yasutaka’s study. According to this assumption, the scale of lands hard to sell because of high cost of countermeasures is estimated to be about ¥10.8 trillion on asset value and about 28,000 ha in area. This is a comparable size to slightly less than half of Tokyo 23 wards (about 62,000 ha in area). This scale is variable depending on land price movements because it relies on current land prices, based on the premise of use of excavations.

5.3 Estimated countermeasure costs

This estimate regarded an average unit soil contamination volume (the volume of contaminated soil per 1 ㎡ of target lands) on soil contamination sites as 0.3 ㎥ / ㎡.

Soil contamination countermeasures are divided into two categories. One is “the soil contamination management approach” such as pavements, seepage control work, insolubilization and containment. The other is “the soil contamination removal approach” including excavations and in-situ cleanup. Either approach, if properly employed, can prevent health damage caused by soil contamination. However, this estimate assumed “the soil contamination removal approach,” considering that, as the Inquiry Survey indicated, the approach were usually required in land sale settings. Additionally, soil contamination countermeasure unit cost was expected to be ¥50,000 / ㎥, assuming that “excavations” were adopted because they were commonly used as the soil contamination removal approach and because they were applicable to any kinds of pollutants.

Based on these conditions, countermeasures against lands with contaminated soils are estimated to need about ¥16.9 trillion, and countermeasures against lands which are hard to sell because of their high costs are estimated to require about ¥4.2 trillion.

6. The trend of brownfield issues

The top answer of the foregoing Inquiry Survey was that land sale contracts usually end in failure if the proportion of countermeasure cost to land price is beyond 20 to 40 percent. According to the results of the Survey, brownfields are more likely to occur in the area where land prices are lower such as local cities because difference between regions does not influence countermeasure costs in principle.

However, the result of the Survey shows that the cases where soil contamination prevented the effective use of lands were mostly observed in metropolitan areas. At present, this result is thought to show that most soil contamination investigations are conducted in metropolitan areas. Moreover, land prices in metropolitan areas shows signs of having bottomed out or the upward trend for several years, which reduces occurrence of brownfields.

The Act requires soil contamination investigations under certain circumstances. Furthermore, local governments' ordinances which require soil contamination investigations are increasing in number. In addition to these environmental regulations, in the field of real-estate appraisal, soil contamination is viewed as a factor that has much influence on price formation. Also, in the area of mortgage collateral appraisal, efforts to quantify soil contamination have been advanced. Additionally, companies will be more likely to conduct more cautious investigations on soil contamination in acquiring lands, considering the movement to include soil contamination as a debt in accounting standards.

Therefore, it is likely that soil contamination investigations in land transactions will become more common in the future and that such investigations will extend to local cities, not only metropolitan areas. Land prices in local cities are lower than those in metropolitan areas. Moreover, the decline in land prices continues in most local cities. Therefore, not only in metropolitan areas but also in local cities, the speed at which brownfields become actualized could increase from now on.

Additionally, the interim report of little-used and unused land countermeasures committee (July 2006) pointed out that there is a possibility of increase in little-used and unused lands in light of the balance between demand and supply. Soil contamination issues are expected to accelerate this trend.

The following sections discuss several economic and social aspects of soil contamination respectively.

6.1 Treatment of soil contamination in the field of real-estate appraisal

Soil contamination is taken into account in the real-estate appraisal settings. The value of contaminated land in real-estate appraisal is the price calculated according to the following formula.

"The value of contaminated land = A-B-C"
A: The intrinsic value of land with no contamination
B: Countermeasure costs (concerning future cost, its present discounted value applies.)
C: Stigma (if necessary)
(As few objective data are available to appraise the percentage of depreciation applied to stigma, the percentage is comprehensively evaluated, consulting the numerical value which real-estate appraisers empirically employ in light of some factors such as the proximity to unpopular facilities. The percentage of depreciation depends on ways of land use or regional characteristics. The depreciation resulting from stigma hardly matters to lands used for commerce or business in metropolitan area.)

"Soil contamination" in the real-estate appraisal settings is defined by "Operational guidelines for real-estate appraisal of soil contamination" (Japanese Association of Real Estate Appraisal) as follows.

""Soil contamination" in the real-estate appraisal is that toxic substances, which have a large impact on price formation as one of individual factors, exist on the surface or in the ground. In practice, when specific toxic substances which §2 (1) of the Soil Contaminate Countermeasure Act (2007, No.53) provides for and toxic substances regulated under each local governments' ordinances and the Dioxin Special Countermeasure Act exceed statutory standards, such substances are assumed to have a large impact on price formation." Namely, the guidelines point out that what should be focused on in real-estate appraisal is the existence of soil contamination which has a large impact on price formation. They also focus on naturally-occurring excess of standards, to which the Act is inapplicable.

Moreover, soil contamination is cautiously (out of consideration to safety) appraised in general. "About real-estate appraisal of soil contamination (booklet for use to train)" (Japanese Association of Real Estate Appraisal) reads as follows;

"However, the actual state of sales of contaminated land is as follows. Land sales

end in a success only when buyers complete “so-called cleanup” (note: countermeasures which meet the requirements of delisting from designated areas under the Act) or when buyers give sellers a deduction of at least “so-called cleanup” cost on intrinsic land price with no contamination. Hence, the price under these conditions is thought to be the normal price set under the actual socioeconomic circumstances.

Namely, even if the Act provides for various countermeasures to be applied depending on ways of land use, it should be noted that the price based on countermeasures other than “so-called cleanup” is hardly viewed as the market price. In discussing normal prices, such countermeasures as ones considered to be “permanent measures” in “Guidelines and criteria for investigations and countermeasures against soil and groundwater contamination” (Ministry of the Environment), including “containment,” should not be relied on. (Note, see below)

Therefore, “the value of contaminated land” is lower than “intrinsic land value” because at least both “cleanup cost” and “discount resulting from public aversion to the fact of contamination” are taken into account. In calculating the price based on countermeasures such as “containment,” at least “discount resulting from land use restriction caused by such measures” should be taken into consideration.

(Note) In discussing the most effective use of a target real-estate, not only its economic value, but also whether the way to use can lead to land sales should be considered. Therefore, for instance, even if parking lots founded on “pavements” which sufficiently prevent health damage can be assessed as economically effective use, it will lack marketability under the actual state of land sales.”

6.2 Treatment of soil contamination in the field of evaluation of collateral in financial transactions

Soil contamination has effects on financial transactions.

The effect that soil contamination has on financial institutions become actualized when it becomes clear that the lands received as securities on loan business are with soil contamination. Of course, security, like surety, is the last refuge on loan business. However, even if financial institutes, as secured parties, try to collect funds by selling loan customers’ lands, soil contamination can prevent bidders from buying them or make their selling prices much lower. In order to avoid these problems, it is necessary to previously assess the potential soil contamination of real-estate securities which are acquired or are going to be acquired.

In adopting the new BIS regulation (Basel Ⅱ) which had been scheduled to be adopted

at the end of 2006, the Finance Services Agency revised "Financial Inspections Manual" (February 2007) in 8 years. In the newly revised manual, "evaluation of collateral" is treated as follows:

"It is necessary to examine whether assessed value of collateral is calculated by an objective and reasonable evaluating method. Assessed value of collateral should be examined from multiple standpoints, when necessary, including comparative analyses and its consistency with extinguishment and reserve. Also, disposal price should be examined from several viewpoints, such as types of real-estate collateral, borrower categorization, ways of disposal, and trends of actual selling price. Furthermore, evaluation of collateral needs evaluation based on existing conditions in principle. The evaluation should be properly implemented based on on-the-spot inspections and researches on relation of right and statutory regulation (including Building Standards Act and Agricultural Land Act), paying attention to environmental conditions such as soil contamination and asbestos."

However, not all the financial institutions are required to immediately take actions because the Financial Services Agency states in "Summary of public comments and responses to them" that "the Manual does not mean that reevaluation is required by immediately applying evaluation in accordance with certain assessment criteria and evaluating methods, or impact assessment based on sales cases to all the collateral." Nonetheless, as some financial institutions including mega-banks is said to have already reevaluated almost all collateral, institutions whose efforts are insufficient could be required to take some actions in the future.

A problem facing financial institutions is how precisely they can quantify the costs of soil contamination and reflect them in evaluation of collateral. In securing real-estate collateral as a condition of loan to companies, financial institutions generally check whether or not soil contamination exists and deduct the estimated costs from assessed value of collateral, if necessary. Financial institutions desire to evaluate cleanup costs of soil contamination as soon and cheaply as possibly. They entrust expert investigation firms with the evaluation because they do not have relevant knowledge and skills. However, evaluating methods are not standardized and the methods vary from investigation firm to firm. As the result, evaluation of collateral also varies by financial institute.

After a process of trial and error, soil contamination evaluating methods in evaluation of collateral may be developed and standardized sometime in the future. The previously explained efforts of financial institutes will have a large impact on companies which have collect funds on security of their real-estate. The reason is that

financial institutes will require such companies to accept reduced loan or to cope with cleanup costs, if their real-estate collateral are with soil contamination. For the companies which get loans from financial institutes, it will be increasingly important to voluntarily conduct investigations and, if soil contamination is discovered, to take countermeasures against it in advance.

6.3 Treatment of soil contamination in the field of accounting processing

The actual state of treatment of soil contamination in the area of accounting processing is as follows.

(1) Japan's accounting standards and the actual state of accounting treatment of soil contamination costs

Most large companies are thought to know whether or not their own properties are with soil contamination, to have started cleanup, or to continue cleanup in a phased manner. The accounting processing of the soil contamination investigation cost and cleanup cost are thought to be implemented as follows.

Costs incurred in current fiscal year are reported as extraordinary loss in income statements and the status of corresponding cash-out is recorded in cash flow statements.

Under the existing accounting standards in Japan, future cleanup costs which result from existing contamination are not recorded as debt or reserve accounts in most cases. Hence, the future costs are rarely reported debt or reserve accounts in financial statements, even if highly likely in the future.

(Asset-impairment accounting)

Since 1 April 2005, asset-impairment accounting standards apply to capital assets. As the result, the real book value of physical fixed assets (such as land and building) becomes extremely lower or is expected to become so, companies must report it as depletion. Companies divide their own properties into groups (grouping). When recoverable value becomes extremely lower than book value, companies are supposed to deduct depletion loss from book value and record the loss as extraordinary loss in income statements.

However, recoverable value of capital assets is referred to the higher of the two, net sale value (about real estate: the value based on real-estate appraisal standards) and use value (the value based on cash flow resulting from asset utilization). For this reason, with regard to land used as factory site, if its use value is higher and its net sale

value is likely to be discounted due to soil contamination, the company need not reflect the discount.

Additionally, in the case of depletion, the amount of depletion exceeding acquisition cost of capital asset is unable to be reported.

(Report as reserve account)

Regarding an idea that abatement costs of capital assets are reported as reserve amount, under the Japan's accounting standards, when future costs whose causal facts existed before the current year are likely to be incurred and their money value can be estimated in a reasonable manner, those costs or losses are supposed to be reported as the current costs or losses in income statements and the reserve amounts are supposed to be recorded in the debt section of balance sheets.

In the electricity industry, costs of reactor dismantling are reported as dismantling reserve amount depending on electric generation performance and as long-term repair reserve amount. Although some companies report soil contamination costs as reserve amount, it is an uncommon practice to record abatement costs of capital assets as reserve amount.

(2) The trend of accounting standards on soil contamination costs and future debt

In Japan, as a part of international convergence of accounting standards to ensure the comparability of Japan's standards and International Financial Reporting Standards, the Asset Abatement Expert Panel was established within the Corporate Accounting Standards Committee of the Financial Accounting Standards Foundation and has discussed the practice guidelines (accounting standard) for asset abatement debt since the end of 2006. The accounting standards for asset abatement debt discussed by this panel require that the present value of the future abatement costs of physical fixed assets such as contamination cleanup costs is regarded as increase in assets and debt, and that the present value and the relevant assets is reported as depletion by the time of future abatement. Target debt is expected to include not only legal debt (cleanup liability placed under statutes like the Act) but also constructive debt (de facto cleanup liability expected from administrative guidance or high probability of selling). This idea is similar to that of American standards. The practice guidelines are now under consideration. However, this is a short-term project and the guidelines are expected to be released within 2007 (the bill is expected to be released by 2007 fall).

In the United States, accounting standards for asset abatement debt were established as FAS143 (accounting standards for asset abatement debt) in 2001 and have

been strictly enforced in accordance with a new interpretive guideline FIN47 (accounting procedure of conditional asset abatement debt: Interpretation of FAS143) since December 2005. Under the American standards, asset abatement costs which are expected to be incurred in abating long-lived assets are regarded as assets. Besides, the amount is reported as debt and the costs are allocated by durable years in a regular and reasonable way.

Under the European International Financial Reporting Standards (IFRS), a draft about asset abatement debt was released and the accounting standards are expected to be published in 2008.

In the United States, the ways to record legally required cleanup in accounting standards were established in 1997. This was the accounting of contamination cleanup in accounting of contingency in Financial Accounting Standards Board Statements (FAS5), which was specified by AICPA's statement of position on environmental cleanup debt (SOP96-1) published in 1997. Specifically, if statutory cleanups are required under the CERCLA, the RCRA and so on, companies are required to estimate costs including cleanup and relevant cost, debt and depletion, and to report them in financial statements. In that case, companies are supposed to report cleanups as explanatory notes to financial statements.

(3) Effects and problems of developed accounting standards

Through the enforcement of practice guidelines for asset abatement debt, corporate managers assume liability to estimate at each account end how much cleanup costs such as soil contamination cleanup costs in the future. As the result, debt and costs related to cleanups are reported and become clear in financial statements. Thus, companies could have incentives to examine a wide variety of countermeasures against existing contamination disposal and then to immediately take actions. In the United States, as some companies accelerate their contamination debt disposal, it is argued that such accounting standardization has effects to promote cleanups.

It is estimated that companies which intend to acquire new assets will try to avoid the risk of acquiring assets with contamination debt and will more carefully behave so as to acquire assets without any debt. At present, as the number of little-used and unused lands is increasing in industrial area, the demand for assets with soil contamination is likely to become less in the area where demand for lands is small.

6.4 The actual state of little used and unused lands

In considering brownfield issues related to soil contamination, it is necessary to understand the actual state of little-used and unused lands in Japan.

According to the Land basic survey report 2003 (the Ministry of Land, Infrastructure and Transport, Land and Water Bureau Land Information Division), of legal person-owned housing sites in 2003, "parking lots," "yard for building materials," and "blank space" (hereinafter collectively called "little-used and unused land") accounted for about 905 ㎡ in area, which is about 181 ㎡ larger than in 1998. Also, according to an appendix of the interim report of little-used and unused land countermeasures committee) (July 2006), in an inquiry survey covering metropolitan area (such as Tokyo 23 wards) -based business corporations, the top answer to a question why they made their lands little-used or unused was that they "tried to sell the land, but have not." The proportion of this answer increased from 30.0 percent in 2000 to 40.7 in 2005.

The increase in little-used and unused land is thought to result from the relaxation of supply and demand of land caused by acceleration of demographic aging and change in industrial structures. It is estimated that little-used and unused land will increase in area because of clear trend of decline in population and families.

Although such little-used and unused land occurs irrespective of soil contamination, concern over and manifestation of soil contamination are thought to be factors which increase such land. Moreover, in carrying out a policy to activate little-used and unused land, the existence of soil contamination could be an obstacle.

7. The effects of brownfields

In Japan, it has only recently been considered that soil contamination is an environmental and social issue. Japan's history in this field is shorter than that of the West. Japanese does not strongly recognize the effects of brownfields. Moreover, the actual state of brownfields in Japan has not been understood in detail and it is difficult to qualitatively and quantitatively determine the existence of their effects. Nevertheless, parties of land transactions increasingly negotiate for who pays soil contamination cleanup costs. It is expected that brownfields occur as the result of unsuccessful negotiations. Therefore, it would be beneficial to examine the future social impacts of brownfields.

(1) Effects on environment

First of all, there is fear that soil contamination of brownfields has impact on

environment. For instance,

・When brownfields with soil contamination have the potential to cause health damage and if the Act is applicable, certain countermeasures are taken under the Act in order to prevent health damage. However, under the other circumstances, if land owners have no fund and do not sufficiently maintain the land, there are fears that someone who enters the land may directly ingest contaminated soil and that someone drinks groundwater contaminated through soil contamination.

・Moreover, it is likely that, about the lands of which land sales end in a failure because of the fear of soil contamination, land owners do not conduct soil contamination investigation in the first place. In this case, even the fact that soil contamination exists may be unknown.

(2) Effects on local communities

If soil contamination investigations are insufficiently conducted and toxic substances extend to adjacent land, brownfields may have effects on real-estate values and on the image of neighboring communities due to concern over so-called “passive contamination”, in addition to the above-mentioned health damage. Also, the occurrence of brownfields can degrade living environment or cause deterioration in the security situation.

The costs caused by these effects not only extend to land owners of brownfields but also can have influence on neighboring communities in several manners. Furthermore, if brownfields, combined with factors other than soil contamination, broadly generate lots of little-used and unused land, vitality and attraction of communities will be lost, which leads to less tax avenue.

(3) Effects on town development

If left unaddressed, soil contamination will prevent redevelopment, effective use of lands, and realization of land use established in city plan. Even if soil contamination countermeasure costs are high, market mechanisms solve the problem as long as economic benefits brought by planned development exceed the costs. However, if this is not the case, the land will be left behind and green fields (farm and green space) of city fringes will be developed instead because they need cheaper costs of development than brownfields do. As the result, the cost burden of new infrastructures will be needed. Furthermore, along with brownfield issues, new urban problems are expected to occur, such as traffic jam, loss of green space, and urban decay. Social impacts of the expansion of urban area will be serious in terms of town

development.

(4) American way of understanding the effects of brownfields

Some of the problems discussed above have become actualized in Japan and been taken actions against without mentioning soil contamination. This is because brownfield issues are far-reaching, not limited to soil contamination. Brownfield issues will be effectively solved if relevant parties take actions against environmental and social issues multilaterally and in close coordination.

For example, looking back on the American history of brownfields (Note), “redevelopment of contaminated land will have beneficial effects, such as removal of the adverse effects of contamination on public health, (1) revitalization of the rural economy, employment creation, and increase in tax revenue, (2) protection of unused land and prevention of urban decay, (3) use of social capital, and (4) improved city landscape.” (Development Bank of Japan “support system for brownfields in the United States” March 2003) Moreover, as the Secretary of the Environment states at the brownfield conference, “by federal or state brownfield policies, the private investment of $850 million ($1 = ¥120: ¥1 trillion) was attracted, more than 8,600 real-estate was appraised, and more than 39,000 people were hired.” In this way, the results of actions taken against brownfield issues were expressed in figure (For details about advantages brought by brownfield redevelopment and about the mechanism of soil contamination, refer to Appendix 6).

*Note: The definition of brownfields differs among countries. The definition used in the United States includes the presence or potential presence of soil contamination. “Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.”

8. The need for countermeasures against brownfield issues

As described above, brownfield issues have partially become actualized in Japan as well. Furthermore, even if not actualized yet, contaminated lands which have the potential to become brownfields exist in large numbers. It is estimated that there are hundreds of thousands of sites which are potentially contaminated. Moreover, it is common that soil contamination is discovered on sites other than industrial sites. Such lands have substantial value in asset size.

The increase in brownfields may cause multiple problems, including adverse effects on land use, industrial promotion, regional development, not only the environmental issue of abandoned land which contains contaminated soil. Hence, brownfields problem needs a balanced approach from a comprehensive perspective, considering several aspects including socioeconomic policies, not only an environmental policy.

By the way, in Japan, brownfield issues concerning soil contamination have not been seriously recognized as social problem. However, there is concern that the number of brownfields might rapidly grow (1) because it is expected that soil contamination will receive greater recognition from now on, (2) because soil contamination investigation will be widen to local areas where land value is lower than in metropolitan sphere, and (3) because it is indicated that the number of lower-used or unused land may keep growing due to continued relaxation of supply and demand of land.

Therefore, some actions should be taken not only against the emerging brownfield issues, but also against the potential ones. If left unaddressed, brownfield issues could have serious effects on socioeconomic issues as well as environmental issues in Japan. It is crucial to emphasize preventing brownfilelds from developing in order to avoid the brownfield issues from getting worse.

The main cause of brownfields is that land transaction and reuse are hampered because of (potentially) high cost of countermeasures against soil contamination. Moreover, the reason why soil contamination countermeasure cost is high is that parties of land transactions are excessively concerned about soil contamination and require relatively expensive “removal of contamination,” paying no attention to effective “management of contamination” such as containment.

The trend that the public select “removal of contamination” under any circumstance is undesirable not only in terms of brownfield issues but also in terms of economic rationality. Along with appreciating the actual state and effects of soil contamination scattered across Japan and taking proper actions against soil contamination, it is necessary to have views and ways to manage and effectively use limited land resources.

Now that 4 years have passed since the Act went into effect and soil contamination is generally viewed as an environmental issue, joint effort of the public and private sectors is required to deal with brownfield issues concerning soil contamination. This study team long for broad-based approach in every relevant area, regarding brownfield issues as socioeconomic as well as environmental issues.