COMMUNITY-BASED SOLID WASTE MANAGEMENT: THE CASE OF *BANK SAMPAH*

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Abstract

Solid waste has been a problem in Indonesia, particularly in urban areas. This encouraged the establishment of Bank Sampah, a community-based waste management in many areas of Indonesia. Bank Sampah is expected to reduce solid waste up to 50%. This study investigates the interaction of social, ecological and political aspects in the case of Bank Sampah. Using Ostrom's multi-tier framework of analysis, the study compares and contrasts several Bank Sampah in Bandung and Bantul municipalities to identify factors determining the sustainability of Bank Sampah.

Keywords: solid waste management, *Bank Sampah*, Common Property Resource, collective action.

I.Background

Economic activities generate waste. Statistical data showed that the volume of Municipal Solid Waste (MSW) in Indonesia was 176,000 tonnes per day, collected from households (48%), traditional markets (24%), commercials (9%) and others (5%) (Ministry of Environment, 2010). In some areas such as Bandung municipality, waste has become a problem. The municipality produced approximately 1,500 tonnes per day (Minister of Environment in Antara, 2013). This situation has encouraged the establishment of *Bank Sampah*[1], a community group that manages solid waste in many neighborhood areas in Indonesia. The management involves separating, collecting and recycling solid waste for the purpose of promoting cleaner and healthier environment for communities.

The aim of this research is to identify the interaction of social, ecological and political aspects proposed in the Ostrom's multi-tier framework of analysis in the case of *Bank Sampah*. This study compared and contrasted several *Bank Sampah*organizations selected based on their sustainability. It used institutional framework developed by among others Olson (1965), North (1991), and particularly Ostrom (1990;2007). Information was collected from several *Bank Sampah*in Kota Bandung and KabupatenBantul. Data were collected by using interview.

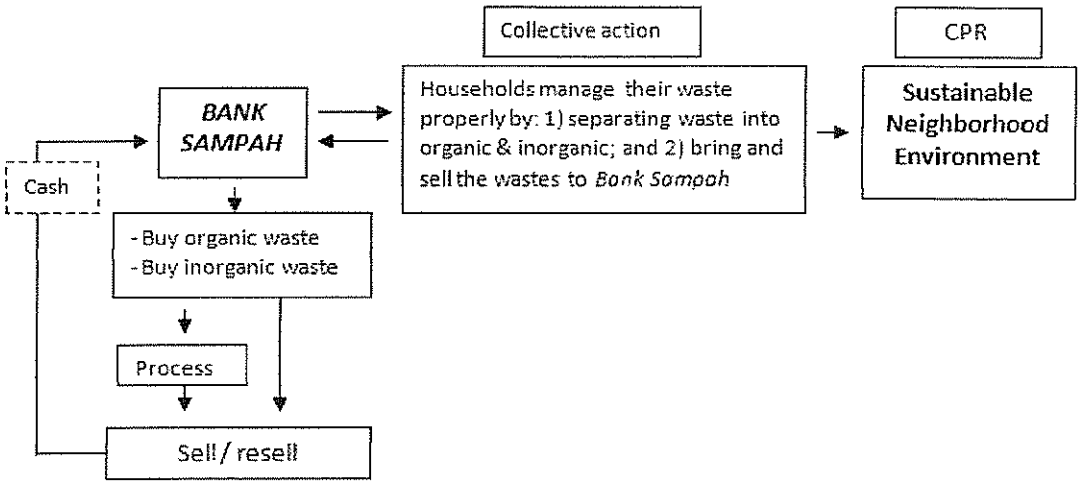
II.Framework of Analysis

The activities of *Bank Sampah*are collecting organic and inorganic solid waste from communities and sell them to recycling organizations that produce output by using the wastes as raw materials (most groups are still work around inorganic waste). The latter sells their products in the market as compost and creative products. In addition, *Bank Sampah*also provides (extra) income for solid waste collectors. However, the collectors (i.e. the households/people in the community as the members of the Bank) do not receive immediate payments since the Bank's income depends on the payments received from recycling organizations. The latter organizations will have the payments once their products are sold in the market. Since there is a time discrepancy between depositing the

[1] Literally means (solid) waste bank.

waste and receiving the payments, *Bank Sampah*promotes the payments as savings that can be used for pilgrimage or child education funds. Effective operation of *Bank Sampah*has the potential to reduce the volume of waste in Bandung municipality by 50% (Ministry of Environment in *Antara*, 2013). Thus, for the community, Bank Sampah has two benefits: creating cleaner and healthier neighborhood and generating extra income.

Diagram 1.
Bank Sampah in the Ostrom's self-organizing CPR framework



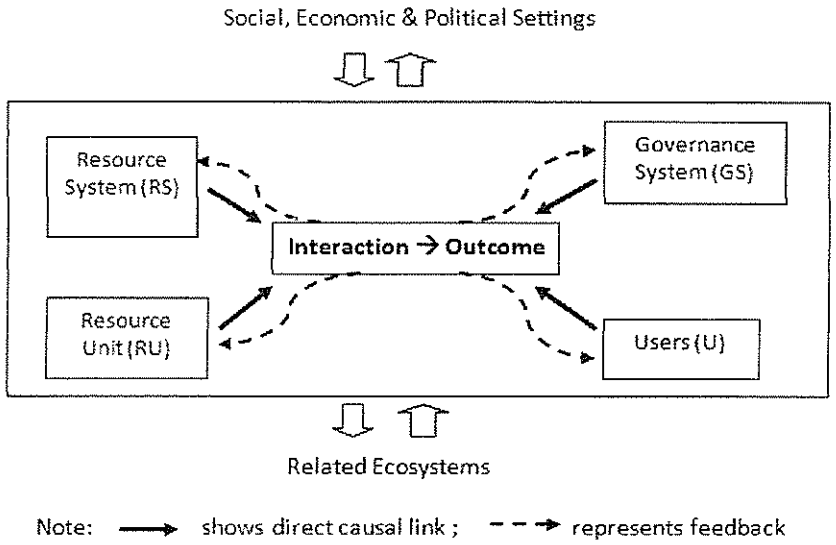
Reduced waste in the neighborhood which creates clean, healthy and sustainable environment is the resource that is managed by the community. Thus, it is the Common Property Resource (CPR). This CPR sustainability could be achieved when the community (i.e. people/households in the community) is willing to manage the waste properly by separating the waste into organic and inorganic, bringing and selling the waste to *Bank Sampah*. Ostrom's collective action (1990) in this case is the willingness of the community's member (the households) to do the activities. Bank Sampah operation is expected to foster the collective action and thus to promote sustainable of the CPR.

As a community initiative, Bank Sampah is a self-organizing entity. This governance option is proposed by Ostrom (1990) as an alternative approach to manage Common Property Resource or Common-pool Resource (CPR). In her argument, Ostrom asserted that a new framework of analysis is needed to approach the problem of overusing of CPR. Normally a popular approach is one that places active government intervention as remedy for the problem of CPR overexploitation. Ostrom (1990, 2007) argues that such approach carries substantial fallacies specifically due to the overly simple assumptions. An alternative solution is one in which the people related to the resource organized themselves as a community to manage the resource. Under the regime, CPR appears as a private goods to an outsider and as acommon goods to members of the community. The sustainability of the CPR depends on the collective action of the community. Using Ostrom's framework for self-organizing CPR (1990), *Bank Sampah* mechanism related to reducing waste is illustrated in Diagram 1.

Furthermore, Ostrom (2007) proposed a multi-tier framework of analysis to understand the relationship between socio-economic, ecological and political aspects on the one hand, and the dynamics of interaction of the resource and the users which determine the outcome, on the other hand. The first tier of the framework is dissented into six subsystems: resource system (RS), resource

unit (RU), users (U), governance system (GS), interaction (I) and outcome (O) (Ostrom 2007; 2009). The relationship of this six-first tier is illustrated by Diagram 2.

Diagram 2.
Relationship of the six-first-tier of the analytical framework for social ecological systems



Note: ⟶ shows direct causal link ; - - → represents feedback

Source: Ostrom (2007)

Sustainability of the CPR as the outcome of the CPR management is relied on the interaction between the members of the users group and the resource. Ostrom (2007) categorizes four aspects involved in the interactions namely: resource system, resource unit, users and governance system. The interaction ofthe subsystems determines the outcome. This system is influenced by socio-economic, political and ecosystems in which the system located.

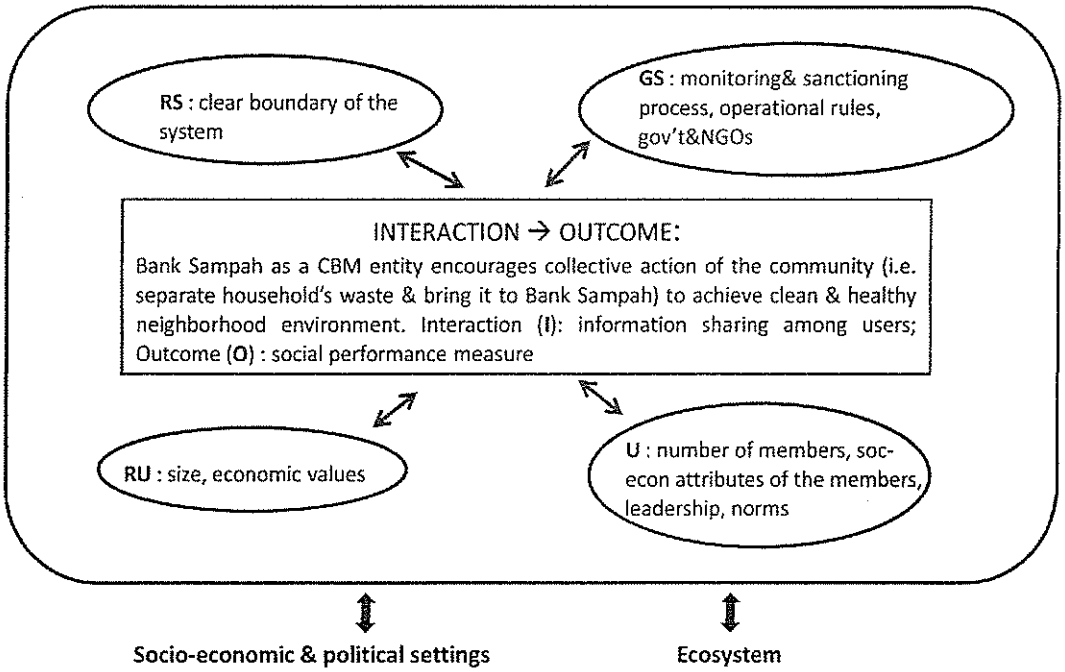
Each aspect of the first tier can be divided into tiers (Ostrom 2009). The aspects in the second tiers then could be explored into third-tier, fourth-tier, or deeper variables. Under multi-tier analytical framework, *"the whole system at one level is usually part of a system at another level"* (Ostrom 2009). At the initial stage, Ostrom proposed 41 variables at the second tier of the framework (2007; 2009)(9 variables - Resource Systems, 8 variables - Governance System, 7 variables – Resource Use, 9 variables – Users, 7 variables – Interaction, 3 variables – Outcome).

In the case of *Bank Sampah*, we believe that Ostrom's multi-tier framework above is able to represent the issue. The multi-tier nature of the approach allows for a deeper analysis that will provide better insights on governing CPRs like neighborhood environmental quality. This is done by digging into subsystems of each setting. While Ostrom proposed a wide range of factors under each setting, this research focused on factors that are relevant to the case under study (see Diagram 3). These factors are:

1. Resource systems: clear of system boundaries;
2. Resource units: size (i.e. Bank Sampah is usually operated within a *RukunWarga* -or RW-, a sub-village), economic values (i.e. benefits from cleaner and healthier neighborhood, extra income from selling waste), ;
3. Governance systems: monitoring and sanctioning processes, operational rules (i.e. these first three aspects are related to the Bank Sampah rules), government and NGO organizations (i.e. most Bank Sampah work with and get assistance from NGOs);

4. User systems: number of members, socioeconomic attributes of members, leadership/entrepreneurship, norms.
5. Interaction: information sharing among users
6. Outcome: social performance measure (especially related to equity).

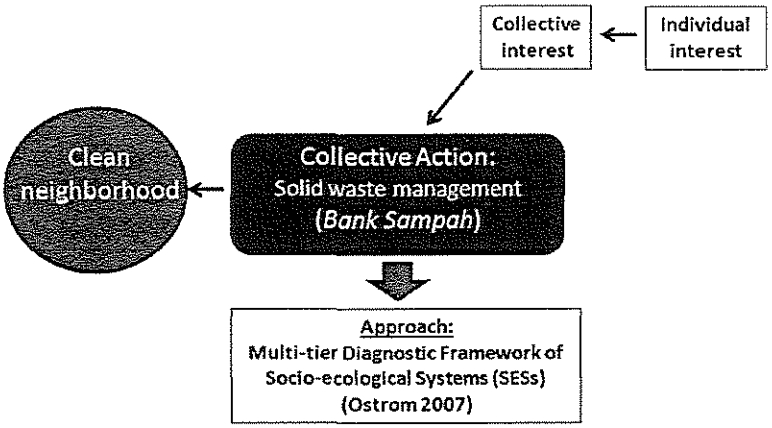
Diagram 3.
Ostrom's Multi-tier Diagnostic Framework for *Bank Sampah*



Bank Sampah operation is substantially influenced by an array of variables. As a whole, the system is influenced by the social surroundings, as well as political and economic settings (where the neighborhood lies). The diagram shows variables at the second-tier framework which are relevant to the operation of the *Bank Sampah.*

Ostrom's multi-tier analytical framework is used to examine collective action of the CPR management. Diagram 4.illustrates the role of *Bank Sampah* in the context of collective action and the multi-tier approach that we choose to represent the issue. The collective action, namely proper waste management by households of the Bank Sampah's members, is present when there is a community's collective interest. Since the community consists of individuals, the interests of these individuals would shape the collective interest of the community. The link between individual interest and collective interest is discussed in the following section.

Diagram 4.
Bank Sampah as a Community-Based Management Entity



Clean, healthy and "waste free" neighborhood is perceived as the common property resource (CPR). To achieve that outcome, all households have to manage their waste properly. *Bank Sampah* initiative is established as a collective action, which is also shaped by the interests of its stakeholders, whether they come as individuals or in a collective. Since the *Bank* is managed and operated by the community members (i.e. residents) in that particular neighborhood, it can serve as a type of community-based management (CBM) organization. This organization (or initiative) is subject to a range of variables, which are further depicted in Ostrom's Multi-tier Framework of socio-ecological systems (SES's).

III.From Individual Interest to Collective Action

Individual interest are often interdependent, in that when the individual carries out actions based on his or her interest, those actions are also influenced by the interest(s) of others. For instance, voting is a clear example of such interdependence. Despite the vote itself is an independent action (taken exclusively by the individual), assessment of personal choice is influenced by the interest of other individuals. Another example is the prisoners depicted in the prisoner's dilemma game: their choice to "confess" are independent choices that are interdependent, in that each prisoner takes into account the rational strategies that they believe are going to be taken by the other prisoner.

Several factors influence individual in carrying out her or his action. Ostrom pointed out four factors, namely: expected benefits and costs, internal norms, and discount rates (1990). His or her personal (internal) norms will affect the expected costs and benefits of a particular strategy, which in turn determines whether or not that action is being carried out. When transcended onto other individual's interests, internal norms and discount rates are major factors. For instance, our own "judgment" regarding whether or not to join a community co-op is heavily influenced by our internal norms as well as norms of other individuals in our surroundings.

Hardin further asserted on the rationality of individuals and collective entities, in which he argued that despite individuals are rational, a group (of rational individuals) are not necessarily rational (1982). Individual interest can lead to collective interest, and when an action is carried out collectively, it is then when collective interest is truly implemented. In other words, when moving from individual interest to collective interest, there are some very substantial assumptions to be made.

Collective action is based on the presence of collective interests, which itself is shaped by individual interests. In other words, individual interest is the necessary condition for collective

action. Individual interest can come in the form of "revealed" preferences (decentralized approach), or in the form of public representation, usually by the government (centralized approach) - assuming that the government itself is benevolent.

Principles of collective action can be implemented upon a situation, provided that the situation itself can be represented as a common property resource behaving in a prisoner's dilemma game. This is to say that there exists a Nash Equilibrium that is suboptimal, in which the players' dominant strategy is to free ride or "defect" rather than to cooperate (the latter will bring superior payoffs). Thus, individual strategies taken are rational but produce irrational outcomes (Dawes, 1973). Hardin (1982) argues that collective action emerges as individual interest becomes collective interest. However, he further states that the logic of collective action which is prisoner's dilemma prevents any collective action to emerge. This is the reason Hardin (1982) proposes the role of political entrepreneur who persuades individuals as collective agents to produce rational outcome.

Sustainability of Common Property Resource (CPR) depends on collective action. Since many aspects influence the success of collective action; such aspects shape the sustainability of CPR, as Ostrom asserted that *"...when multiple appropriators are dependent on a given CPR as source of economic activity, they are jointly affected by almost everything they do" (1990:38).*

Ostrom (1990) suggested that, unfortunately, CPR organizations or institutions often do not have prisoner's dilemma characteristics in their operations, but rather more of an "assignment game" in which their actions are initiated by external or third party.Marwell& Oliver (1993) also pinpointed that free riding is the main problem in collective action; the engaged agents usually want to enjoy the benefits without doing or contributing to the work.

CPR problems, dominated most often by the free-riding issue, suggest an array of policy prescriptions. Ostrom (1990) suggested three possible types of policies, namely central government control, privatization, and the establishment of a binding contract between the involved agents. All three types are argued to be the necessary condition for generating economic efficiency from the development of CPR – of course stemming from different circumstances. In centralized control, the external (or central) authority decides the specific CPR usage strategies for each user[2]. In privatization scheme, the key issue is the proper assignment of property rights to the CPR. In the contracting scheme, negotiation that leads to the formulation of the contract (and the enforcement thereof) is the key; external authorities have no interference, and the agents or players themselves exercise greater control over the usage strategies.

Another factor influencing collective action is rules of the game, either in the forms of formal and informal rules (norms). In reality, these two forms of rules are complementary in nature, in the sense that informal rules will fill in any discrepancy that formal rules are absent. As a result, the effectiveness of rules of the game could be improved if individuals within an institution have flexibility to account for local values and conditions in implementing the rules (Wade 1988; Ostrom 1990; Baland&Platteau 1996).

IV. Case Study Analysis: *Bank Sampah*

When we construct *Bank Sampah*as an institution that follows the principles of Community Based Management (CBM), we see the following characteristics:

1. *Bank Sampah* originally stems from community initiatives, constructed from the recognition for neighborhood cleanliness while earning some extra cash;
2. Indonesia's central government, namely the Ministry of Environment has brought the *Bank Sampah* initiative to national level, promoting it to be implemented at other areas as well.[3]

[2]As an initial promotion effort, the ministry has issued a publication that exposes the profiles of several *Bank Sampah*.

[3]It is notable that in many cases nationalization of CPR often implies expropriation of that particular resource, as stated by Ostrom (1990)

3. The ministry appears to allow *Bank Sampah* to develop locally as a means to foster economic growth, and at the moment the government is not performing the task of a central arbitrator of *Bank Sampah*.
4. In their operation, most Bank Sampah buy and sell (or re-sell) inorganic waste. On the other hand, statistical data shows that in Indonesia in general, organic waste comprises more than 50% of the total waste.

This research uses qualitative approach since the purpose of the research is to explore factors that are believed to determine the sustainability of *Bank Sampah* operation. To achieve this purpose, data were collected by interviewing the *Bank Sampah* officials as well as users (resident members). The interview was based on a set of open-ended questions developed by using Ostrom's framework depicted in Diagram 2 (see above). The responses were clustered by using thematic data analysis where sustainability factors developed in the framework were used to cluster these responses. Based on thesemethod, we clustered the responses into four themes, similar to the six first-tier of the Ostrom's analytical framework: resource system, resource unit, governance systems and users.

The research, in particular data collection, is still in progress. At this stage, we have managed to interview the officials of Bank Sampah. So far, data from two *Bank Sampah*(i.e. SMAN 2 and GemahRipah in Bandung and Bantul municipalities, respectively) has been collected. Unfortunately, the one in Bantul has only been recently established. As a result, testing for sustainability at this time is irrelevant.

Based on the data, we perceive *Bank Sampah* as engaging in a common property resource (CPR) problem: as *Bank Sampah* is established, we first assume that the underlying individual as well as collective interests are being facilitated into this initiative. As such collective action, a binding contract between the stakeholders is formed, which regulates how the waste collection and income-creation is conducted. From evaluating field observations we argue that issues in efficient appropriation of *Bank Sampah* essentially lies within 12 areas of the second-tier aspects mention in section II, which linked each other. The aspects are the following:

1. *Bank Sampah* activities are considered beneficial by the users in terms of generating (extra) income, not as a means to prevent their neighborhood environment from waste problem. The CPR for this case namely the cleanliness of the surrounding environment as the result from proper waste management through *Bank Sampah*mechanism, is overlooked by the users. This situation is vis-à-vis the cost-side, in which the waste collectors (*Bank*'s members) still perceive the activities to bear high cost, especially in terms of trade-offs that need to be sacrificed (i.e. not per se monetary costs).This situation is the main reason for households not to manage their organic waste and as a result the Bank merely buy and sell inorganic waste. In this case, unclear boundary of the resource system (RS) resulting in underestimated of the economic values of the resource unit (RU).
2. The lack of sufficient enforcement to fulfill their obligations is partly due to the voluntary nature of membership itself. The lack of sufficiently strict rules and regulation pertaining to the *BankSampah* activities. Institutional boundaries taking form in rules and regulation will shape how economic activities are carried out. Inefficient outcome prevails when the institutional setting is imperfect. This is not the case found in SMAN 2. Since the activities of Bank Sampah is part of the curriculum, the school decides how the economic activities are carried out. The revenues from selling the products have been collected for funding the school or students activities. Most of the products are sold to parents at affordable prices.The problems are related to second-tier aspects of monitoring and sanctioning process and operational rules of the governance system (GS). Again, this condition was not found in SMAN 2. The school system enforces and monitors the program since it has been integrated into the curriculum of the school. As such, the students do not necessarily perceive the activities as income generating instruments.

3. Incomplete information, i.e. educational values, that communities possess in order to effectively carry out *Bank Sampah* activities. By this we mean that the involved communities often accept *Bank Sampah* purely as a quick way to earn extra cash, without realizing that sustaining the activities can bring welfare improvements for themselves in the longer run (i.e. reduced waste in the surrounding neighborhoods). The lack of such complete information, in our view, is one substantial factor contributing to how sustainable *Bank Sampah* activities are maintained in a respective locality. Again, this is not found in SMAN 2. The values of neighborhood cleanliness and healthy environment are thought by the teachers during class meetings. Class assignments, examinations and participations in running the program are instruments to test how far these students understand the values of environmental issues such as neighborhood and environmental cleanliness. The aspects are related to the second-tier aspect of interaction (I), namely information sharing among users.
4. Other second-tier aspects which are expected to be relevant for Bank Sampah are: the role of government and NGOs (under the first tier's GS), size of the resource (under the first tier's RU), number of members, socio-economic attributes of the members, leadership and norms (under the first tier's U), and social performance measure (under the first tier's O). Those subsystems should be tested by further field data.

V. Conclusive Summary

Bank Sampah is a community-driven activity that has great potential to foster standards of living and local economic growth, hence it is necessary to develop an environment that can sustain the initiative. Institutional establishments in the form of pertaining rules and regulations are one of the "pillars" that can support such sustaining environment.

Nevertheless, *Bank Sampah* initiative is not free from issues and constraints. We developed a conceptual diagnostic framework to place *Bank Sampah* as a CBM entity in a realm of collective action. Here, issues and problems arise from multiple angle namely the "precondition" as well as the "sequel". In the former, we find that *Bank Sampah* faces hindering factor stemming mainly from the lack of collective interest and even more, individual interest to sustain the initiative. In the latter, it appears that major problems come from the efforts to sustain, which comprise of, but not limited to, the difficulties in enforcing the binding contract (between the respective stakeholders in the *Bank Sampah* itself). In the case of Bank Sampah operating within a school (e.g. SMAN 2), rule enforcement is workable because Bank Sampah activities of Bank Sampah is part of the school curriculum.

Another problem with *Bank Sampah* is unclear resource unit and resource system perceived by the users (i.e. the members of Bank Sampah) in the form of overlooking the environmental benefits from *Bank Sampah* activities. As the members see the Bank merely as the source for (extra) income from selling households' waste, the cost (effort) of conducting waste management activities was perceived as "too expensive", particularly in handling organic waste. Failure to manage organic waste has omitted the potential of the Bank to reduce the waste volume, asmore than 50%of household waste is organic. Institutional approach in coping with these issues need to focus in a great deal on (re)promoting the incentive system; reaching that stage will potentially boost interests (be it individual or collective) as well as enforcing the binding contract.

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