THE ALTERNATIVE WAY TO MANAGE YOUR INFRASTRUCTURAL ASSETS

B.R. MANTE & G.H.A.M. FUCHS
Business Unit Asset Management, DHV, The Netherlands
BART.MANTE@DHV.COM

ABSTRACT

Traditionally the owner of a road network is also responsible for the management of the network, mostly including the maintenance and operations. Political (call for more transparency in performance and spending of budgets), demographical (ageing of working population and knowledge drain), and economical (cut on budgets and need for more efficiency) developments place a high pressure on the sustainability of the traditional model. These developments can be seen in both the public and private domain and are even more strengthened by the tendency to focus on core activities or core business.
This paper describes a model in which ownership and management of a road network are strictly separated. Based on performance- and service level agreements the relation between owner and manager (managing agent) is arranged. The managing agent in his turn sets up contracts with third parties to take care for the maintenance and operations.
In this model the interests of the main-stakeholders (owner, manager, user, maintenance & operations suppliers) are best served. Relations between stakeholders can be defined sharp and transparent providing better input for the three levels of management: strategy and policy making, tactical planning & programming and realization (maintenance & operations).
The paper describes the experience and lessons learned with this model on basis of DHV's activities in managing the overall infrastructure (road and rail network including all structures, sewer system and landscaping) on the biggest chemical industrial site in the Netherlands (Chemelot – 850 ha.). Since 2006 DHV (an engineering and consultancy firm) acts as managing agent taking full responsibility for the management (including maintenance and operations) of the infrastructure.
Parallels will be made between the private and public domain. Experience in the private domain can be transferred to the public domain (local, regional and national level).

1. INTRODUCTION

Throughout history management of infrastructure networks is seen as one of the core activities of public governments. Reason can be found in the fact that an infrastructure network contributes largely to the accessibility (military purposes) and economic development of a region. Furthermore, investments in construction of new infrastructure are large, making the public government the most applicable to finance them. As an alternative tolling is an option, but then only infrastructure is constructed in regions of (present) economic importance.

Construction and maintenance works itself are either executed by the same government or independent contractors. Planning of (re)construction and maintenance and day-to-day road management activities (e.g. inspection) are mostly reserved to the government. More and more construction and maintenance are seen as non-core governmental activities requiring that they are contracted to the private sector (procurement / 'outsourcing').

Presently, models are tried in which the roles of ‘asset owner’, ‘asset manager’ and ‘operator / contractor’ are separated. Through Service Level Agreements, ‘contracts’ are made that enable proper control of the activities of all entities involved.

After introducing the essentials of asset management, this paper describes some of these models. Focus is put on the experience of DHV with one of these models in the Chemelot contract and how ‘proper’ asset management was implemented in this case.

2. DEVELOPMENT OF ASSET MANAGEMENT

2.1. What is asset management?

Correct functioning infrastructure networks are vital for the public case. Any infrastructure network consists of a large number of assets and asset classes such as pavements, structures, traffic lights, sewerage, embankments, etc. Accessibility and economic welfare of a region go alongside with the functioning and performance of the physical assets in delivery of services. Success of the government is significantly influenced by its stewardship of its assets.

According to PAS-55 [1] asset management is:
“*systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organizational strategic plan”*.
The strategic plan is defined as
“*overall long-term plan for the organization that is derived from, and embodies, its vision, mission, values, business policies, stakeholder requirements, objectives and the management of its risks”*.

From this definition several aspects are highlighted:

… systematic and coordinated activities and practices …
For construction and maintaining infrastructure assets vast sums of public money are invested. Therefore, correct and accountable spending of funds in new construction and maintenance is vital for the public case. This is only achievable if a systematic and coordinated process is followed in identifying investment and maintenance schemes.

… optimally and sustainably manages its assets and asset systems …
Government’s money can only be spent once. Either on public services (e.g. education, public health, …) or on maintaining road infrastructure. Therefore, it is of utmost importance that the right decisions are made in managing assets and related asset systems and that investments yield a profit on the long term (sustainability).

… performance, risks and expenditures over their life cycles …
In defining and prioritizing investment and maintenance schemes current performance and risk levels have to be balanced with the effect of the suggested investments on future performance and associated risk levels. Ideally for each investment or maintenance scheme both scope, effect on performance and related risks are made transparent.

… achieving its organizational strategic plan …
Basic assumption is that all activities are directly related to the larger organizational plan. For a government this means that first of all choices have to be made on the total development of the country or region. In these choices education, health care and infrastructure (amongst others) are competing with each other for the available funds. As soon as targets are formulated such as 'acceptable yearly number of casualties on the road network' these have to be translated to Key Performance Indicators (KPI), Service Levels (SLA) and measurable data (PI). Investment and maintenance schemes in infrastructure can then be related to the organizational strategic plan.

2.2. Elements in development

Up till recently, asset management was seen as a 'technical and self sustaining activity' meaning that given a budget required maintenance works were executed. Effects in terms of 'outcome' (how do these activities support government's policy) were not really measured. Trust was put to the (technical) leadership to identify the correct and most effective spending of supplied funds and to the (technical) workforce to supply value for money in terms of quality control.

Presently pressure is experienced both from within the asset management organization and outside for more transparency in performance and spending of budgets. Also demographical aspects (e.g. knowledge drain either through ageing or epidemic diseases as HIV or '*googlenization*' of youngsters) and economical (cut on budgets and need for more efficiency) developments can place a high pressure on the sustainability of the traditional model. These developments can be seen in both the public and private domain and are even more strengthened by the tendency to focus on core activities or core business processes.

To ensure more transparency, processes and results have to be made more explicit. As depicted in figure 1 this means that instead of only input/output (traditional) also the effect of the projects on demanded outcome (explicit) is defined. Furthermore, evaluation of effects is not a one way route but goes both ways to input and output / outcome.

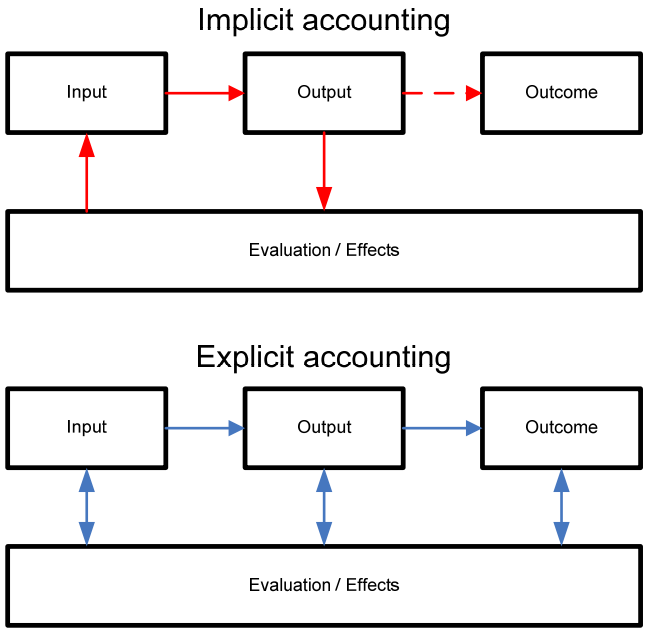

Figure 1 – Implicit vs. explicit accounting of performance

2.3. Requisites for proper asset management

In our experience some requisites can be defined that define whether proper asset management is implemented or whether it fails. These requisites have a direct link to most of the elements described in §2.2.

Risk based decision making
Budgets tend to be never enough. In practice, it can be found that given the right choices agencies are able to cope with these budgets in delivering an adequate level of service. An important factor to achieve this level of service is making the right decisions related to usage of the network, risks associated to investment and repair schemes and costs of the maintenance actions themselves.

Good information management
For proper decision making correct and reliable data and information is needed. Current as well as historic data and information. If not managed correctly, any investment in data and information acquisition will turn obsolete. Therefore, good information management is more important than the data and information storage itself. An asset management organization should plan for and define (and enforce) requirements on data and information acquisition.

Quality control in delivering works and services
Money can only be spent once. Therefore, part of asset management is deriving the most value from the works and services executed. Efficiency and effectiveness should therefore be measured and constantly evaluated.

Leadership in implementation and enforcement
Good asset management requires clear direction from top level management. Direction means setting priorities, development of competencies in the work force and implementing a cooperative attitude in the organization instead of each delivering its own work. Without enforcement an organization runs the risk that employees will fall back into old patterns.

Continuous improvement
Asset management has a large organizational aspect. As with any organizational model, continuous improvement is essential for continuity of road user and public's satisfaction. The asset management organization should learn from both success and failures and identify proper action to ensure in future a more effective and efficient delivery of services can be guaranteed.

3. ROLE MODEL

3.1. Basic activities in asset management

Before introducing the role models discerned by DHV attention is paid to the basic activities that are important to ensure that the right investment and repair schemes are defined in asset management. On a high level these are:

- Definition of asset management policy describing the framework against which the asset management strategy, objectives and plans can be developed.
- Definition of asset management strategy describing the requirements of stakeholders and taking into account the lifecycle of the assets, risks and criticalities detailing both here and now as well as future developments.

- Definition of asset management objectives for each asset (performance levels for specified indicators) by which these assets ensure that the asset management strategy is implemented in practice.
- Definition of asset management plans in which the requirements stated in the strategy and objectives are operationalized in investment and repair schemes.
- Contracting of works based on the defined plans to realize objectives.
- Risk management on asset management process to ensure that problems are immediately observed and appropriate action is taken.
- Information management to ensure that data / information is available to support business processes
- Condition monitoring including quality assessment to identify problems and new works
- Evaluation of total business process and effect of works on service level.

3.2. Diversification of responsibilities

As stated before, a tendency can be observed in which organizations focus on core activities and core business processes. It is thought that this provides the best value for money as generally an organization tends to be more efficient in doing activities that it knows by heart and is good in. On an overall scheme this realizes the most efficient and effective setup of asset management activities.

Related to core business processes DHV discerns three role models in asset management. These models each contain a specific distribution of tasks and responsibilities and are:

- Traditional model
- Managing Agent / Managing Contractor model
- Quality Assurance model

Traditional model
In the traditional model the asset owner is also the asset manager and performance auditor. Definition of policy, strategy, objectives and the related work plans are all in one hand. Works are contracted to the contractors and the asset owner's organization enforces quality control and auditing whether is delivered what was promised. Also, the asset information is managed by the asset owner's organization.

The traditional organization tends to lead to a lot of internal procedures, less effectiveness in operations and a contractor that is only delivering what was specified. Improvements in quality and services are slow because not the total supply chain experiences the same incentives to improve.

Quality Assurance
In the Quality Assurance model the Asset Owner is supported by an independent party (mostly a Consultant) in assuring that value for money is delivered. Although there are different models possible in the amount of responsibility transferred to the quality assurer mostly responsibility for risk management, information management, condition monitoring and evaluation of performance is given.

An important aspect of the quality assurance model is that it should act as an independent entity from Asset Owner, Asset Manager and Contractor reviewing activities and results of all. Through independency, the quality assurer can challenge both asset owner / manager as well as contractor to review their performance, identify improvements and implement

these. Through the contractual setup, roles and responsibilities of all involved are more explicit, helping in achieving more efficiency in all organizations.

Managing Agent / Managing Contractor
In the Managing Agent / Managing Contractor model in essence the Asset Owner only defines its own business plan and the related asset management policy and specific requirements for the asset strategy. It is up to the Managing Agent or Managing Contractor to define the strategy, objectives and corresponding plans supporting the policy. Between Asset Owner and Managing Agent or Managing Contractor a specific contract exists that defines their relation.

Contracting of works is done by the Managing Agent (either internally – in that case one can speak of a Managing Contractor – or to outside contractors). Quality control is one of the internal activities of the Managing Agent although the Asset Owner can still require specific information in relation to monitoring and evaluating the contract with the asset manager / contractor.

Table 1 depicts the distribution of high level activities over the different roles in the three models. As can be seen from table 1 the amount of responsibility moves from Asset Owner to the Asset Manager through each of these models. It should be noted that some activities can be shared along the different roles.

	Models:		
Roles:	**Traditional**	**QA**	**MA/MC**
Owner	Policy Strategy Objectives Plans Contracting Risk management Information management Condition monitoring Evaluation	Policy Strategy Objectives Contracting Evaluation	Policy Strategy Evaluation
Performance auditor		Plans Risk management Information management Condition monitoring Evaluation	
Manager			Strategy Objectives Plans Contracting Risk management Information management Condition monitoring Evaluation
Contractor	Works	Plans Information management Condition monitoring Works	Works

Table 1 – Asset Management Models

4. APPLICATION IN CHEMELOT PROJECT

4.1. Managing Agent model

Since 2006 DHV (from origin an engineering and consultancy firm) acts as managing agent (MA) taking full responsibility for the management (including maintenance and operations) of the civil infrastructure on the industrial site Chemelot in the Netherlands. Chemelot (owned by the Dutch multinational DSM) is one of Europe's biggest chemical sites.

Figure 2 – Chemelot site (Netherlands)

Amongst others the following civil assets are managed by DHV:

- 200 km sewerage system, including 6 pre-water treatment plants
- 80 km paved roads
- 1 harbor
- 80 km railway track including safety system
- 40 km pipe support structures (column-racks)
- 16 Structures (tunnels, bridges, fly-over,….)

Besides managing the aforementioned assets DHV, as managing agent, is also responsible for *(i)* the management of the soil, *(ii)* the issuing of working licenses, *(iii)* the SHE (Safety Health Environment) enforcement as well as *(iv)* the Mapping and Registry of subsurface piping and cables.

The position of the managing agent is further clarified in figure 3. He manages the assets on behalf of the owner and takes full responsibility for the tactical (planning & programming), operational and realization (maintenance) related activities. This doesn't mean that the MA take's care of all the maintenance activities himself, but it does mean that the responsibility, the procurement for these activities with (sub)suppliers and the performance reporting is in one hand and responsibility.

Figure 3 – Responsibility Managing Agent

4.2. Asset Management methodology

The assets are managed making use of the following basic principles:

- Management based on functional sustainability (output geared)
- Minimize the Total Cost of Ownership (long term analyses)
- Assets are no debit but generate added value
- Interest of the owner is leading

These basic principles fully comply with the definition of asset management according to the PAS 55 [1] *"systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organizational strategic plan".*

In the case of Chemelot the following interests of the owner were identified:

- 100 % undisturbed course of primary process plants
- Avoidance of claims
- Guarantee the License to Operate
  - informal (commitment stakeholders)
  - formal (compliant to legislation)
- Minimize TCO
  - lower costs with same performance
  - lower cost with lower performance, but interests owner still guaranteed

By defining the basic principles and the interests of the owner, the first part of the Deming "plan-do-check-act" circle according to the PAS55 [1] has been completed (see figure 4).

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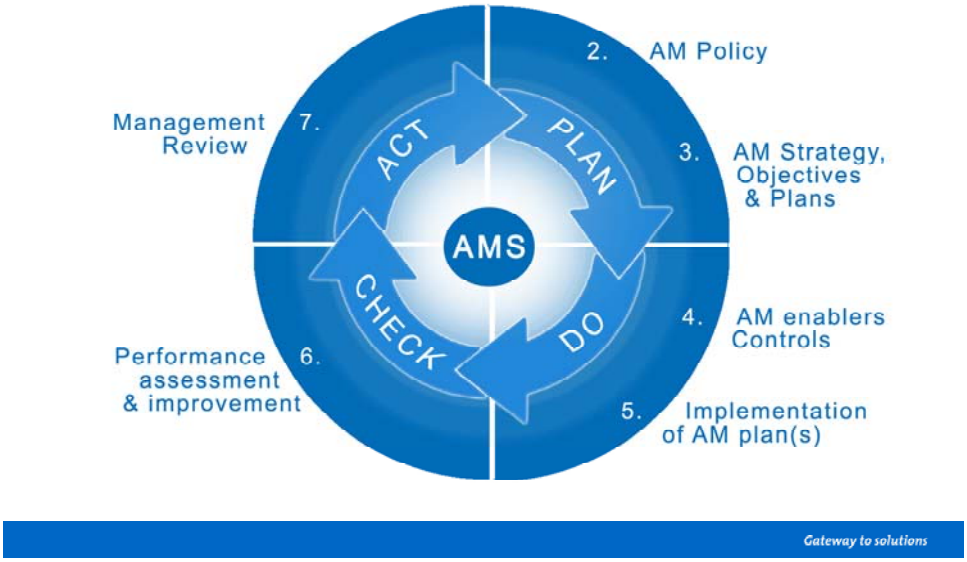

Figure 4 – Deming circle Asset Management

4.3. Performance reporting

The next step at Chemelot was developing a reporting methodology to show and guarantee that the interests of the owner were taken care of. This was done making use of KPI's (Key Performance Indicators), Service levels and Performance Indicators(PI's). The KPI's and Service Levels are defined on a high level of abstraction based on RAMSHE-criteria (Reliability, Availability, Maintainability, Safety-Health-Environment). The performance indicators are primarily technical standards and norms who are regularly monitored. The PI's are the basis on which maintenance activities are subcontracted to suppliers. If the performance indicators are met, the service levels are safeguarded. If the service levels are OK, than the KPI's are met and as such also the interests of the owner are secured (see figure 5).

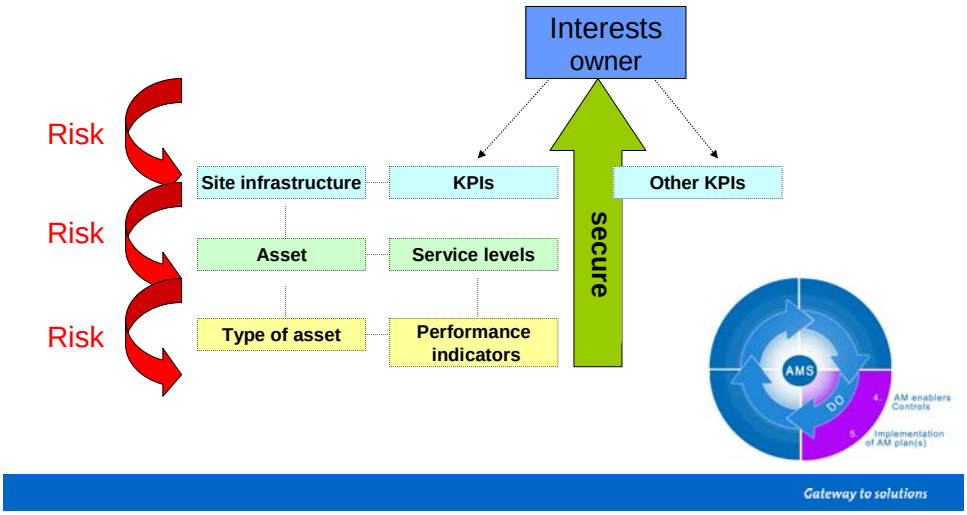

Figure 5 – Performance reporting

Based on the service levels and KPI's each quarter the performance is reported to the owner. An example of KPI's, service levels and PI's is mentioned below:

KPI	**Service level**	**PI**
- reliability	< X days per year unforeseen Not available	Corrosion steel Deformation defects Resistance
- availability	< X days per year out of order Because of maintenance	Max. response time with incidents Technical standards (NEN, ISO, …)
- neatness	maximum of X complaints per year	Registrated complaints

By consequently reporting the performance each quarter based on KPI's and service levels the impact of budgetary decisions can be made clearly visible and transparent. Discussions with key stake holders have proven to be more effective and constructive. Instead of loosing one-selves in technical issues, discussion is more focused on the functionality of the assets (e.g. roads) and its contribution to the primary process.

4.4. Evolution

Since the start in 2006 both DHV in his role as Managing Agent as well as DSM as owner of the assets have evolved. Important is the willingness to learn and have an open mind for innovation. The asset management contract between the owner (DSM) and the managing agent (DHV) had an initial period of 4 years and was again extended for another 4 years. Through the years extensive discussions were held regarding the desired performance of the assets in the search for the most optimal balance in costs and performance. This resulted in adaptation of some of the service levels (see figure 6).

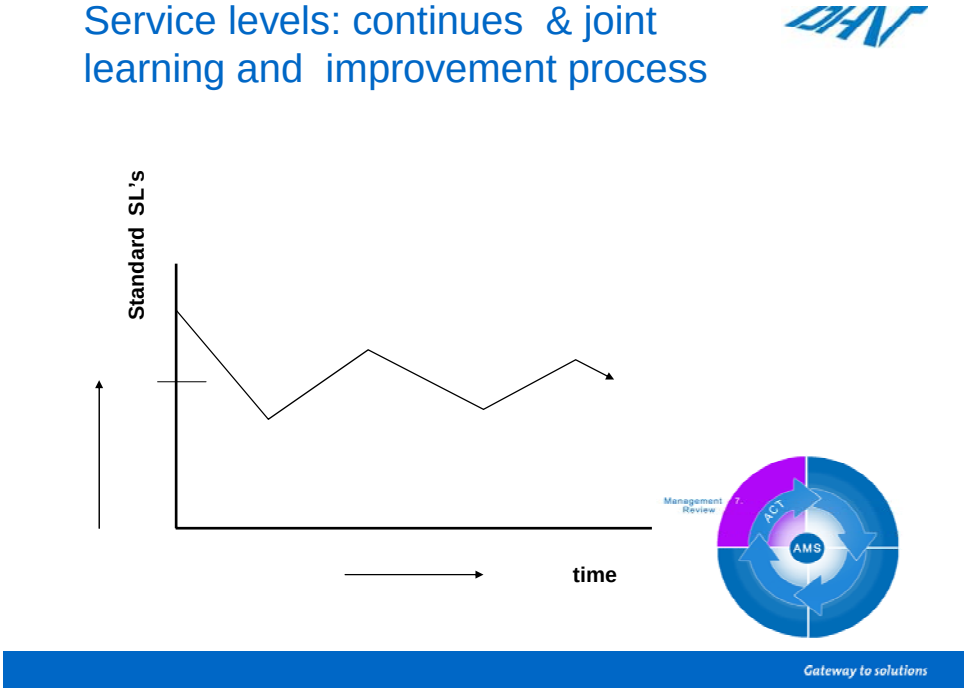

Figure 6 – Development of service levels

The results after 5 years of experience are very evident. The owner of the assets has had far less worries and could place better focus on his core activities. The managing agent model resulted in more transparency and lower costs (on an average some 20 % less on a yearly basis). In the Netherlands more and more in the private market these models come up.

5. APPLICABILITY OF EXPERIENCES IN PUBLIC ENVIRONMENT

5.1. Translation private – public

The experience with the managing agent model as described in the case Chemelot (chapter 4) is also applicable in a public environment. To do so first an analysis must be made which circumstances are comparable and which differ. In general the outcome of this analysis is as follows :

- Comparable
  - technique & process
  - need for transparency
  - knowledge drain (ageing of working population)
  - justification of choice's
  - necessity for cutback in expenditure
- Different
  - public; relation to strategy organization is longer
  - public; stakeholders are more divers & subject to change
  - public; in general more "service"-oriented, private more "€ / $"-oriented;
  - private; scope of services more unambiguous
  - private; procurement more efficient

Looking at the analyses the biggest challenge in translating the described model into a public environment is defining steady and constant interests of the owner (government, provinces or municipalities) that will not change dramatically after a political change.

In essence this means a thorough stake-holder analysis, in which a wide variety of the society is involved. However, when using the model, even in case of different interests because of a political change the influence and consequences of made choices can be made more transparent. One must realize that the alignment within the organization from owner (public entity) to the end-user (citizen) is longer and as such gives more reason for interference. Still the authors are of the opinion that in a public market the achieved results can be very substantial in terms of costs, performance and transparency.

In the Netherlands DHV has also experience with the managing agent model in a public environment. For the municipality of Nijmegen DHV manages the full real estate portfolio. Results are comparable as with the Chemelot (private) contract.

6. LESSONS LEARNED

6.1. Responsibilities and process

Through the years many evaluation- and risk sessions have occurred between owner and managing agent. Jointly the following conclusions were drawn:

- Make use of and define/develop the same language (communication)
- Act both as professional principal
- Have continuity in key-staff
- Keep steady in the context of your role
- Management must be transparent & aligned throughout both organizations
- Always think and act in terms of output
- Make use of state of the art (ICT) tools
- Perform frequently risk-sessions in all levels of the organization (risk management must be part of the yearly business cycle)

6.2. Contract

In terms of the evolution in time of the legal contract between the owner and the managing agent the following conclusions were drawn:

- Take time for assessing the starting situation (quantity & quality of assets, …)
- Short escalation line’s
- Build on trust (giving transparency vs. give way)
- Clear the way for development of contract & relation (no use in putting a lot of effort upfront into long term contracts in which everything is fixed)

7. CONCLUSIONS

7.1. Alternative way

Based on the experience so far, the authors are of the opinion that by means of the managing agent model an attractive alternative in managing infrastructure assets is available, leading to the following results:

- Less worries for the owner
- Lower costs
- More transparency
- Improved focus on respective core activities

REFERENCES

1. PAS 55-1: 2008 Asset Management. IAM (The Institute of Asset Management), September 2008