PSL®2013

PROJECT SUSTAINABILITY LOGBOOK

USER'S MANUAL

The Project (or Programme) Sustainability Logbook aims to accompany a building or a facility, or a group of buildings or facilities, throughout its lifetime using regularly updated benchmarks.

The Logbook is a structured support tool comprising guidance and a series of worksheets that allows one to define and then monitor the issues and objectives of sustainable development.

The Logbook is supplemented by a document database for each of the PSL's themes that covers regulations, laws, standards, and benchmarks which are applied worldwide, in Europe and in a given country.

The PSL and the associated document database are developed and updated by

AITF — fmci Fédération Marocaine du Conseil et de l'Ingénierie — SYNTEC-INGÉNIERIE — UNSFA 75 LE SYNDICAT DES ARCHITECTES DE PARIS

in association with the following organisations

efca — FIDIC

Contents

1. How to set up a PSL workbook

1A. A PSL workbook – a built asset

The PSL comprises an Excel workbook with several worksheets.

Each Excel workbook corresponds to a single PSL that deals with works, plant, a development or ultimately a group of works, plant or developments, given that all possible coherent combinations are possible.

Thus whoever is responsible for planning can structure and gather within the PSL framework, the requirements for sustainable development that should be applied to a collection of works, plant or developments for which they are responsible, subject obviously to the compatibility of the requirements and the authority to act.

For example, for a metropolitan area, a PSL can be set up for a stock of buildings, existing now or in the future, that is taken up as the minimum PSL requirements for each urban area that is a stakeholder in the PSL initiative. Each of these urban PSL's can in its turn represent the minimum framework for a more limited area (for instance, a neighbourhood, a city centre, a specific development, a building, or a facility), for a specific type of works or for a specific scope. The PSL is therefore adjustable. A hospital can decide to have its own PSL, along with separate PSL's for some of its buildings and equipment, either specialised (e.g., for radiology) or otherwise (e.g., electric power generation plant).

To simply and to avoid confusion this manual defines works, plant, a development, and a collection of works, plant and developments as a' built asset'.

Step 1: match a PSL to a unique built asset and each built asset to a single PSL.

1B. A unique identification by built asset

Given that the asset has been identified, even though it may not yet exist, or indeed only exists as an idea for a project, it is vital to undertake a minimal characterisation (nature and the type of works, location, main function, distinctive sign or identification, full name, possible abbreviated name, etc.). This description, however succinct, can be completed as the PSL develops. It is simply that all stakeholders must be confident that they are all speaking about the same built asset - the subject of the PSL.

It should be noted that the Excel worksheets do not include the description of the built asset. It is up to the client or a representative to formalise this information in whatever format, provided the information is accessible so that it can be shared.

Step 2: succinctly characterise each built asset and assign a unique identifier.

1C. The built asset's PSL workbook

With the first two steps completed, a unique PSL workbook with an abbreviated name can be developed.

Step 3: set up a PSL workbook based on the model workbook by inserting the short name for the built asset (for instance, the workbook could be called 'PSL_Model_xxx_xxx_xxxx')

There are two steps:

- open the model PSL spreadsheet in Excel. Excel will name the workbook as, for example, 'PSL_Model_xxx_xxx_xxxx1';
- save the workbook with its proper name, for example PSL_GenevaExpo2024, which is an invented name.

From now on it will be assumed that a built asset exists so as to be able to develop its PSL.

1D. Possible issues and/or objectives

It is now necessary to identify the issues and objectives for sustainable development that are likely to be of interest to the client, the person mandated to act for the client or another representative. These issues and objectives are organised in the PSL workbook.

Two approaches are possible:

- The client has an adequate understanding of what is to be achieved so works through the 'Tab' worksheet or the PSL document database in order to check the eventual relevance of the envisaged issues and objectives;
- The client works through each of the dimensions and themes of sustainable development given under the 'Tab' worksheet or in the document database in order to make an initial choice and to start to understand the potential consequences of the choices made.

Step 4: make up an initial list of the relevant issues and objectives.

1E.Confirming the issues and/or objectives

The challenge now is to truly implement the selected issues and objectives.

The approach taken can be radically different depending upon the built asset's importance and context.

For instance, in launching an initial 'sustainability exploration' it is often recommended to set a limited number of objectives so as to facilitate understanding, the responses made and the monitoring of performance, The objectives, which are indicated in the PSL workbook's overall monitoring worksheet (the 'Overall' tab) should be designated in a decreasing order of importance. Their attainment will indicate success in terms of sustainable development; they can correspond to benchmarks so as to be incorporated in recognised undertakings involving certification, labelling and the like. Conversely, a built asset subject to a public inquiry may seek excellence and in turn state-of-the art engagements without a thorough evaluation of the consequences and the financial implications.

Completing the PSL's overall monitoring worksheet therefore represents a crucial step in the life of the built asset. The indicated issues and objectives are automatically taken up in the PSL workbook's monitoring worksheets for each of the project's phases:

- For each issue it is necessary to understand the impacts being taken into account and the way they are handled. Otherwise, what are the risks if there is a problem?
- For each objective it is necessary to understand the target. This implies being able to measure progress using verifiable outcomes.

Step 5: record in the overall monitoring worksheet the selected issues (designated 'I') and objectives (designated 'O') and their priority.

1F. Entering the performance targets, methods of evaluation and benchmarks

With the entries (issues, objectives and their priority) and a draft version of the overall monitoring worksheet that is generated one has in hand a global understanding of the immediate undertakings and can now establish a fairly accurate estimate of the effort needed to complete the overall monitoring worksheet.

Basically, for each chosen issue or objective it is now necessary to indicate three important pieces of information:

1. What is the performance target?

By this is meant: what is the indicator or action item that will allow one to verify or control the performance? In other words, what is the expected outcome, whether qualitative (for example, the power consumed) or quantitative (for example, the lack of comfort).

2. How to evaluate the performance?

How does one go about evaluating an outcome in a more-or-less generic manner since depending on the phase of the project (see the examples below), the method used will change? Thus, for instance, before being able to evaluate concretely the performance it is necessary to ensure that the performance being considered is relevant. The questions remain the same for a new or existing built asset, but the responses need to be adapted to the built asset's context and the specific features. It is necessary for example, to be able to check the following:

Planning Phase:	Are the performance requirements included in the planning documentation?
Design Phase:	How are the performance requirements integrated in the design and what performance guarantees can the designer provide with respect to meeting and maintaining the targets? Clearly, a promising response along the lines: "Please don't be too concerned; all will go well" is unacceptable. Indeed, quite the contrary.
Construction Phase:	Do the completed works meet the designer's requirements? Have there been reservations by the designer and others about keeping the issues or objectives? Does the designer agree with the contractor's implementation? Does the contractor agree with the proposed design? What performance guarantees can the contractor provide in relation to meeting and maintaining performance targets?
Operation Phase:	Does the outcome of the measures taken correspond to the expected outcome? Is any difference acceptable? What needs to be re-examined? If the outcomes are as expected, does this mean that all the operating conditions corresponded to what was planned?
End-of-life Phase:	Does the analysis of the components that led to achieving the target performance explain an eventual loss in performance (for instance the aging of materials)? What has been learnt?

3. What benchmarks are kept?

Does a selected performance indicator come from an official recommendation, either standard or specific? For example, is there an approved protocol or operating procedure? An investigation can

thereby capitalise upon other experience, which is not to say that this experience is necessarily relevant in the present case. This being the case, if the standard benchmark is relevant it will facilitate understanding, and its application and the data generated can probably be consolidated to draw some overall conclusions.

Noting that the client is free to choose a benchmark and thereby confirm its relevance, so on the other hand, if the benchmark is irrelevant, this will call for a precise description to ensure that each of the stakeholders mutually and fully understands, without any ambiguity, that an issue or objective is the same as the one which has been described.

Step 6: for each chosen issue and objective enter the performance target, its method of evaluation and the eventual benchmark.

It should be noted that it is wise to save the PSL workbook from time to time while it is being completed.

1G. Editing and controlling entries

Given the large number of entries in the overall monitoring worksheet and the implication each has for the future of the project at every phase, controlling and verifying the worksheet at this stage is recommended.

Step 7 : check the overall monitoring worksheet, verifying the completeness of the chosen issues and objectives and controlling the associated information, which may need to be corrected or completed at some stage.

1H. Estimating the impact of the choices for sustainable development

All the choices made on the overall monitoring worksheet now correspond to the aim for, and engagement towards, the sustainability of the built asset. Without necessarily questioning the choices, and before moving to an initial operational phase, its is perhaps wise to verify that the outcomes of the various choices are, in particular, compatible with the envisaged financial envelope. Adjusting or rescheduling certain priorities may be needed. In effect, sometimes it s impossible to do everything at once which implies that it is necessary to envisage keeping the chosen issues and objectives but deferring some. Certain wishes that are costly but not strictly useful may even be abandoned and one may even reconsider some strategic aspects of the project.

Differing entails keeping the initial global vision for the project, but it is likely that a given choice can only be implemented much later, at an undefined point in time. This means that one must continue to consider the choice, examining it in the context of compatibility with what has been planned and realised beforehand. Although differing will probably lead to additional cost, one must ensure that integration with what exists will be possible, implying perhaps some adjustment to allow for this evolution in the asset's features and performance. The more that is know early on in the project, either new build or brownfield, the less the additional cost will be. It is therefore useful to identify the various options before the planning documentation is drafted as this will allow a section to be added alerting a skilled reader that certain choices, which always remain possible, could be developed later.

To illustrate this concept, take the case of an asset for which mechanically controlled ventilation is envisaged with as an objective, amongst other features, the air quality. Would it be possible to change from a single conduit design to a double conduit design with energy recovery? This possible evolution would be envisaged during the planning phase, and the proposed solution elaborated at the design phase, but nothing prevents thinking about the solution when the list of issues and objectives is set up in the PSL overall monitoring worksheet.

The proposal therefore is to ask complementary questions based up on the table below.

Phase	Advantage	Budget or additional cost	Profit or added value	Delay	Risks
Planning					
Design					
Construction					
Operation					
End-of-life					

Step 8: (discretionary): estimate the impact of certain sustainability choices even before their being proposed in the planning documentation.

1I. Summary: the eight steps for setting up a PSL workbook

The steps taken to set a PSL workbook are as follows:

Step 1: match a PSL to a unique built asset and each built asset to a single PSL.

Step 2: succinctly characterise each built asset and assign a unique identifier.

Step 3: set up a PSL workbook based on the model workbook by inserting the short name for the built asset.

Step 4: make up an initial list of the relevant issues and objectives.

Step 5: record in the overall monitoring worksheet the selected issues (designated 'I') and objectives (designated 'O') and their priority.

Step 6: for each chosen issue and objective enter the performance target, its method of evaluation and the eventual benchmark.

Step 7: check the overall monitoring worksheet, verifying the completeness of the chosen issues and objectives and controlling the associated information, which may need to be corrected or completed at some stage.

Step 8 (discretionary): estimate the impact of certain sustainability choices even before their being proposed in the planning documentation.

2. How to use the PSL to monitor progress

2A. Overall monitoring worksheet

To illustrate how to proceed, four issues or objectives for each of the four dimensions of sustainable development are selected in the overall monitoring worksheet as the basis for further inquires.

2A.1. Issue or objective?

To choose between an issue or an objective in the overall monitoring worksheet, all that is needed is to enter either and 'I' , and 'O' or an 'X' in column D, E or F according the priority being assigned (the workbook cell changes colour to yellow for an 'I' and blue for an 'O' and the background to the name of the issue or objective will change to the same colour. Entering an 'X' indicates that one does not know if a choice is an issue or an objective. By default, it is assumed that an 'X' for 'no difference' corresponds to an objective. In any event, the chosen entry designation does not influence the information that a user must enter and the way the information is handled.

B	C	D	E	F
THEME	ISSUE OR OBJECTIVE *In columns D-E-F: I = Issue, O = Objective, X = no difference*	PRIORITY 1	2	3
1.1 - OVERSIGHT	1.1.1. Risk Management	I		
	1.1.2. Cross-cutting			
	1.1.3. Innovation			
	1.1.4. Strategies for choices: site, materials, multi-criteria decision analysis, etc.			

B	C	D	E	F
THEME	ISSUE OR OBJECTIVE *In columns D-E-F: I = Issue, O = Objective, X = no difference*	PRIORITY 1	2	3
1.1 - OVERSIGHT	1.1.1. Risk Management	O		
	1.1.2. Cross-cutting			
	1.1.3. Innovation			
	1.1.4. Strategies for choices: site, materials, multi-criteria decision analysis, etc.			

However, during the life of a built asset, one would consider that something is an important indicator, but for oneself alone. Not tackling an issue is in generally more prejudicial or more risky in terms of the impact than not meeting an objective. For instance, 'Job creation' as an objective defines a goal but considering as an issue gives it greater importance because the built asset then becomes a means for job creation, at least for some of its life.

The colour scheme ensures that a user can easily identify at any time which items have been selected and their priority, and the colour (yellow or blue) reminds one if it is an issue or an objective. Moreover, the choices made on the overall monitoring worksheet are inserted automatically on the five worksheets for the various phases (Planning, Design, Construction, Operation and End-of-Life). The choices ('I', 'O' or 'X') and their priority can only be altered via the overall monitoring worksheet.

2A.2. Governance dimension

Since 'Risk management', the first of the 11 possible issues or themes for the 'Governance' dimension, was an important objective for oversight, to illustrate the procedure for developing a PSL workbook an 'O' is entered in the 'Priority 1' column of the overall monitoring workbook.

A	B	C	D	E	F
DIMENSION	THEME	ISSUE OR OBJECTIVE *In columns D-E-F: I = Issue, O = Objective, X = no difference*	PRIORITY 1	2	3
1 - GOVERNANCE	1.1 - OVERSIGHT	1.1.1. Risk Management	I		
		1.1.2. Cross-cutting			
		1.1.3. Innovation			
		1.1.4. Strategies for choices: site, materials, multi-criteria decision analysis, etc.			
	1.2 - STAKEHOLDER INVOLVEMENT	1.2.1. The response to a local request			
		1.2.2. Information, consultation and coordination			
		1.2.3. Specific organisational aspects of the construction phase			
		1.2.4. Staff and user awareness			
	1.3 - TRANSPARENCY	1.3.1. Implementation of monitoring			
		1.3.2. Implementing certification			
		1.3.3. Dedicated communications			

Comments for this issue or objective given in the 'Tabs' worksheet can be read by positioning a cursor over the 'Comments' entry in Column D (or by clicking the entry).

Given below are the proposed entries for columns G ('Reference frameworks taken into consideration'), H ('Expected performance') and I ('Assessment methodology') of the overall monitoring worksheet for the example being discussed.

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000:2009, Risk management - Principles and guidelines	- A risk assessment for all project and operation (e.g., annual) reviews. - Reduction in the provision for risks.	- Ratio of the number of risk assessments to the number of project and/or operation reviews. - Cost saving before and after risk mitigation.
ISO Guide 73:2009 Risk management - Vocabulary		
ISO/IEC 31010:2009 Risk management - Risk assessment techniques		

Nevertheless, the preliminary information given in the 'Comments' entry is insufficient for completing the three entries that need to be filled in ('Reference frameworks', 'Expected performance' and 'Assessment methodology'). Instead, it is preferable to examine the document database which, while not exhaustive, gives a more detailed explanation of the issues and objectives.

Comments

For the example being considered, the chosen reference frameworks were:

- ISO 31000:2009, *Risk management - Principles and guidelines* standard
- ISO Guide 73:2009 *Risk management - Vocabulary*
- ISO/IEC 31010:2009 *Risk management - Risk assessment techniques* standard

This was because these documents are international, not easily contested and sufficiently generic so as to be able to be applied in all possible cases. Moreover, they allowed a full understanding by sharing the same language (effectively a precise vocabulary) without being subjected to a dogmatic straightjacket.

Once the reference frameworks had been identified, the proposed performance targets were:

- all project or annual operation reviews should include a risk assessment;
- reduced provisions for risk-related events.

The assessment methodologies decided upon were:

- the ratio of the number of risk assessments to the number of project or operation reviews
- cost saving following risk reduction.

The recommendation was to select wherever possible performance targets and evaluation methodologies that were relatively straightforward to implement and follow up. For the example, although one is referring to international standards, one must be pragmatic to be efficient over the long-term because those who monitor objectives until the asset's end-of-life will probably not be the same as those who made decisions at the start.

Generally speaking, a single performance target was envisaged for a given issue or objective. Two targets were suggested for the example since it did not seem to be too difficult to implement them in parallel.

The level of detail for the various entries in the workbook needed to be established.

- either the objective should be relatively explicit for all those involved and the level of detail should go beyond what was wanted for the desired consensus;
- or the aim was to maintain the consensus needed for a good overview of the issues and objectives, in which case it was necessary to allow for accompanying documentation in an annexe (which is not given for the example) to ensure a good understanding, notably for non-experts, of the information that had been retained.

The level of detail that was decided upon remained a delicate issue given that entries can be adjusted to meet various needs. Hence the importance of keeping copies of all versions of the workbook.

It should be noted that entering details of the issues and objectives in the overall monitoring worksheet does not affect the way the worksheets for the various phases are presented.

2A.3. Society/social dimension

Since 'Job creation', the sixth of the 21 possible issues or objectives for the 'Social/society' dimension, was an important objective for social cohesion and employment, for the example being considered an 'I' is entered in the 'Priority 1' column of the overall monitoring worksheet.

A	B	C	D	E	F
DIMENSION	THEME	ISSUE OR OBJECTIVE *In columns D-E-F: I = Issue, O = Objective, X = no difference*	PRIORITY 1	2	3
2 - SOCIAL / SOCIETY	2.1 - HEALTH / SAFETY	2.1.1. Hygiene and air quality			
		2.1.2. Other health risks (electromagnetic, laser light, etc.)			
		2.1.3. Safety: access and exits, operation, etc. by neighbours, users and others			
		2.1.4. Ensuring security during maintenance			
	2.2 - SOCIAL COHESION AND EMPLOYMENT	2.2.1. Professional insertion and return to work			
		2.2.2. Job creation	I		
		2.2.3. Fighting exclusion; personal mobility			
		2.2.4. Facilitating access to services (employment, education, etc.)			
		2.2.5. Facilitating accesses and exits			
		2.2.6. Forced displacement of people			
		2.2.7. Poverty alleviation			
	2.3 - LIVING ENVIRONMENT	2.3.1. Respect for the neighbours' and users'living environment			
		2.3.2. Thermal comfort; climatic comfort			
		2.3.3. Acoustic comfort			
		2.3.4. Visual comfort			
		2.3.5. Quality of the indoor and outdoor environments			
		2.3.6. Integration into the site; integration into the landscape			
	2.4 - CULTURAL DIVERSITY	2.4.1. Enhancing the cultural identity			
		2.4.2. Landscape quality			
		2.4.3. Respect for the built heritage			
		2.4.4. Respect for the natural heritage			

Comments for this issue given in the 'Tabs' worksheet can be read by positioning a cursor over the 'Comments' entry in Column D (or by clicking the entry).

Nevertheless, the preliminary information given in the 'Comments' entry is insufficient for completing the three entries that need to be filled in ('Reference frameworks', 'Expected performance' and 'Assessment methodology'). Instead, it is preferable to examine the document database which, while not exhaustive, gives a more detailed explanation of the issues and objectives.

Given below are the proposed entries for columns G ('Reference frameworks taken into consideration'), H ('Expected performance') and I ('Assessment methodology') of the overall monitoring worksheet for the example being discussed.

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
HQE Performance Target 7 (Management of upkeep and maintenance): control, troubleshooting, repairs, and renovation with the creation of local jobs.	All new HQE-certified buildings must generate one-half of maintenance jobs in the localcommunity, and if possible in the same metropolitan area.	Ratio of the number of HQE-related jobs generated in the local community to the total number of HQR-related jobs created.

Comments

The information given in the 'Comments' entry for 'Job creation' is fairly basic. However, CEN's Technical Committee 350 (Sustainability of Construction Works) will shortly publish a standard (EN 16309) titled *Framework for the assessment of social performance.* This document was retained as a reference framework for possible future use. Performance Target 7 (*Management of upkeep and maintenance*) of the HQE building assessment system was proposed for immediate use. It underlined the need to design buildings that are easy to maintain while reducing their environmental impact. Maintenance tasks dealing with control, breakdowns, repairs and renovation can directly affect job creation according to the requirements. So the level 'High performance' was considered the most appropriate.

Once the reference framework had been identified, the proposed performance target for the example was:

- every HQE-certified building must generate one-half of its maintenance-related employment near, and if possible, within the community it is situated. This requirement must be dealt with explicitly in tenders.

The proposed assessment methodology was:

- the ratio of the number of HQE-related jobs created locally to the total number of HQE-related jobs.

2A.4. Environment dimension

Since 'Tackling light and sound pollution', the third of the 16 possible issues or objectives for the 'Environment' dimension, was an important objective for biodiversity, for the example being considered an 'I' is entered in the 'Priority 1' column of the overall monitoring worksheet.

A	B	C	D	E	F
DIMENSION	THEME	ISSUE OR OBJECTIVE *In columns D-E-F: I = Issue, O = Objective, X = no difference*	PRIORITY 1	2	3
3 - ENVIRONMENT	3.1 - BIODIVERSITY	3.1.1. Preservation of natural habitats			
		3.1.2. Maintaining ecological corridors			
		3.1.3. Tackling light and sound pollution	I		
		3.1.4. Supporting inherited plant species			
	3.2 - CLIMATE CHANGE	3.2.1. Controlling emissions from the project or programme			
		3.2.2. Controlling emissions from induced traffic			
		3.2.3. Reducing the dependence on fossil fuel derived energy			
		3.2.4. Adaptation to climate change			
	3.3 - RESOURCE MANAGEMENT	3.3.1. Controlling energy production, consumption and distribution			
		3.3.2. Renewable energy use			
		3.3.3. Controlling water resources			
		3.3.4. Controlling raw materials consumption			
		3.3.5. Consideration of the life-cycle of materials			
	3.4 - CONTROLLING EMISSIONS	3.4.1. Limiting air pollution			
		3.4.2. Waste management			
		3.4.3. Protection of water tables, watercourses and soils			
		3.4.4. Limiting hydraulic and hydrogeological impacts			

Comments for this issue given in the 'Tabs' worksheet can be read by positioning a cursor over the 'Comments' entry in Column D (or by clicking the entry).

Nevertheless, the preliminary information given in the 'Comments' entry is insufficient for completing the three entries that need to be filled in ('Reference frameworks', 'Expected performance' and 'Assessment methodology'). Instead, it is preferable to examine the document database which, while not exhaustive, gives a more detailed explanation of the issues and objectives.

Comments

In this case one was considering an urban context where impacts on fauna were perhaps difficult to measure directly. The following reference frameworks were proposed:

- The international Fatal Light Awareness Program (FLAP) which clearly explains the issues. The FLAP organisation aims to protect migratory birds in then urban environment (www.flap.org). For example, the key feature of 'Bird-Safe' buildings is to provide birds with visual landmarks needed to alert them to the presence of sheet glass and reflective building exteriors.
- The European Union LIFE+2010 HARMONICA (HARMOnised Noise Information for Citizens and Authorities) Project (www.harmonica-project.eu) has identified several examples of best practice in large European agglomerations, including Bruitparif in France's Ile-de-France region and Acoucité covering the Greater Lyon region in France.

One these reference frameworks had been identified, the proposed performance targets were:

- every building must considerably reduce bird strikes with reflective facades (windows, glass panels, facing, etc.) and in some cases eliminate collisions;
- reduce noise disturbance by one-half (a reduction of 3 dB) in one-half of the city within the next 10 years.

The proposed assessment methodologies were:

- the number of birds killed in collisions (bird strikes);
- an index based upon the best proxy for the disturbance that is also the best known and estimated according to best practice with a defined methodology.

Given below are the proposed entries for columns G ('Reference frameworks taken into consideration'), H ('Expected performance') and I ('Assessment methodology') of the overall monitoring worksheet for the example being discussed.

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
Fatal Light Awareness Program (FLAP)	Number of dead birds killed in collisions: 0	Number of dead birds resulting from collisions.
European Union LIFE+2010 HARMONICA (HARMOnised Noise Information for Citizens and Authorities) Project	50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	The best adapted and understood index for noise disturbance.

It is useful to recall that it is possible to choose a single benchmark in the first instance before considering a second issue later. The choice will depend upon the local context.

2A.5. Economic dimension

Since 'Risk limitation costs', the 14th and last of the 14 possible issues or objectives for the 'Economic dimension', is an important financial objective, for the example being considered an 'O' is entered in the 'Priority 1' column of the overall monitoring worksheet. This objective follows logically from, and compliments, the choice of 'Risk management' as an objective for the 'Governance' dimension.

A	*B*	*C*	*D*	*E*	*F*
DIMENSION	**THEME**	**ISSUE OR OBJECTIVE** *In columns D-E-F: I = Issue, O = Objective, X = no difference*	**PRIORITY** **1**	**2**	**3**
4 - ECONOMIC	**4.1 - ECONOMIC JUSTIFICATION**	4.1.1. Of the project or programme in the short term			
		4.1.2. Envisaged future of the project or programme; capability to evolve			
		4.1.3. Serviceability			
		4.1.4. Investment efficiency			
	4.2 - ECONOMIC DEVELOPMENT	4.2.1. Direct economic impacts			
		4.2.2. Induced and indirect economic impacts			
		4.2.3. Regional development			
		4.2.4. Job creation			
		4.2.5. Economic partnerships			
		4.2.6. Synergies with other developments			
		4.2.7. Poverty alleviation			
	4.3 - LIFE-CYCLE COSTING	4.3.1. Simple evaluation (investment & operation & maintenance)			
		4.3.2. Whole life-cycle costing (including external costs, dismantling and costs avoided)			
		4.3.3. Risk limitation costs	O		

Comments for this objective given in the 'Tabs' worksheet can be read by positioning a cursor over the 'Comments' entry in Column D (or by clicking the entry).

Nevertheless, the preliminary information given in the 'Comments' entry is insufficient for completing the three entries that need to be filled in ('Reference frameworks', 'Expected performance' and 'Assessment methodology'). Instead, it is preferable to examine the document database which, while not exhaustive, gives a more detailed explanation of the issues and objectives.

Comments

For the example, it was suggested to choose the same reference frameworks as those used above for 'Risk Management' in the 'Governance' dimension, namely:

- ISO 31000:2009, *Risk management - Principles and guidelines* standard
- ISO Guide 73:2009 *Risk management - Vocabulary*
- ISO/IEC 31010:2009 *Risk management - Risk assessment techniques* standard

Given below are the proposed entries for columns G ('Reference frameworks taken into consideration'), H ('Expected performance') and I ('Assessment methodology') of the overall monitoring worksheet for the example being discussed.

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000:2009, *Risk* management - Principles and guidelines	80% reduction in the provision for risks.	Ratio of the total risk-related costs before risk optimisation to the sum of the costs of risk-related action and the costs linked to residual risk after the optimisation.
ISO Guide 73:2009 Risk management - Vocabulary		
ISO/IEC 31010:2009 Risk management - Risk assessment techniques		

2B. Planning Phase worksheet

The 'Planning' worksheet for the Planning Phase (the second tab in the PSL workbook) expands upon the issues and objectives chosen in the overall monitoring worksheet for each of the four sustainability dimensions. The final results recorded in the 'Operational response' column act as a reminder.

While the examples described below are invented, they are nonetheless based upon actual situations. The type of built asset used for the example is also not defined. In effect, the issues and objectives are relevant in most contexts and, with rare exceptions, apply equally well to buildings, service infrastructure and urban developments in a sustainable city.

2B.1. Governance: Risk management

An abbreviated version of the overall monitoring worksheet entries (see above): is as follows

G	***H***	***I***
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 guidelines	- A risk assessment for all project and operation (e.g., annual) reviews. - Reduction in the provision for risks.	- Ratio of the number of risk assessments to the number of project and/or operation reviews. - Cost saving before and after risk mitigation.
ISO Guide 73 Vocabulary		
ISO/IEC 31010 standard		

The table below summarises the key worksheet entries for the Planning Phase ('Operational response', Column JP, 'Parameters and indicators', Column KP, and 'Outcomes', Column LP) for the example being considered.

JP	*KP*	*LP*
Operational response	**Parameters and indicators**	**Outcomes**
Planning Phase		
3 planning reviews undertaken together with a revue of the 20 most important risks.	- All planning reviews include a risk assessment. - Reduced provisions for risks.	- All reviews include a risk assessment. Budgeted risk costs confirmed before and after risk mitigation.
Initial budgets including risks costs before and after treatment.		

Comments

As is often the case for a significant project, there were working meetings with all identified stakeholders during the planning phase as well as two intermediate planning reviews and a final planning review. Each review gave rise to a risk assessment that allowed one to a) identify and subsequently expand upon the most important risks in terms of their need for consideration during the various project phases; and b) estimate an order of magnitude budget by phase.

Based upon this information, a section was created and completed in the planning documentation that focused on the risks and their management during subsequent phases. Risks linked directly to the planning phase were handled immediately after they have been assessed. A risk register was set up, with the timescale for reviews adapted to the phase being considered, to help manage and exhaustively follow-up on risks throughout the built asset's life-cycle.

In the case of a PSL for a metropolitan area, all built assets should follow the same process for managing risk.

2B.2. Social/society: Job creation

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
HQE Performance Target 7 (Management of upkeep and maintenance): control, troubleshooting, repairs, and renovation with the creation of local jobs.	All new HQE-certified buildings must generate one-half of maintenance jobs in the local community, and if possible in the same metropolitan area.	Ratio of the number of HQE-related jobs generated in the local community to the total number of HQR-related jobs created.

The table below summarises the key worksheet entries for the Planning Phase.

JP	*KP*	*LP*
Operational response	**Parameters and indicators**	**Outcomes**
Planning Phase		
Define criteria for the recruitment of local staff (work-home distance; stand-by intervention time, etc.)	- Aim for on-half of maintenance posts being supplied locally. - Proximity indicators	- Planning with the introduction of criteria for local employment. - Research into solutions leading to service functionality.
Service functionality		

Comments

The project documentation was not limited to a functional description of the built asset. It also described how the asset should be operated until its end-of-life by encouraging the employment of locally-based operators and maintenance personnel. Recruitment criteria, for example, included proximity indicators which, for the same level of skill, encouraged local employment (the distance between living and work; a calculation of the green-house gas costs for travelling this distance; the time for intervention by those on standby duty reduced as much as possible, etc). In fact, depending upon the skills being sought, a recruitment criterion applied not only to a given built asset but also to all existing and future assets in a metropolitan area in such a way that

instead of temporary positions, positions would be permanently established as full-time positions in a global approach for all assets.

To conclude, when optimising resources and means, most functions needed to be examined from the perspective of the economics of functionality, which meant replacing an approach based on the ownership of equipment or built assets by one based on their use. In other words, equipment suppliers or the asset's contractor remain the owner until the end-of-life and make available the equipment or assets according to predefined rules and with a service quality guaranteed contractually. One thereby replaced a" sell at any price" approach by an optimum and realistic level of service, thereby obliging the supplier to upkeep and maintain equipment and assets under the optimum conditions. Take the case of industrial buildings, both individual and collective: suppliers of installations for heating, air conditioning, electric power supply, the supply and removal of water, lifts, etc. remain the owner of the equipment they install and are accordingly obliged to ensure regular upkeep and optimal maintenance in exchange for a users' fee for a guaranteed service quality. Given the situation, employing well trained local technicians was essential, and corresponded among other things to an economic requirement. It was also a way to take up the widely known slogan invented by René Dubois: "think globally; act locally". This amounted to integrating the global and local context into the strategy for a 'durable city'.

2B.3. Environment: tackling light and sound pollution

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
Canadian Fatal Light Awareness Program (FLAP Canada)	Number of dead birds in collisions: 0	Number of dead birds resulting from collisions.
European Union LIFE+2010 HARMONICA (HARMOnised Noise Information for Citizens and Authorities) Project	50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	The best adapted and understood index for noise disturbance.

The table below summarises the key worksheet entries for the Planning Phase.

JP	*KP*	*LP*
Operational response	**Parameters and indicators**	**Outcomes**
Planning Phase		
Input from an ornithologue and architects and specialists (lighting engineer; facade designer).	Number of dead birds through collisions: 0	List of requirements relating to noise and light, together with explanatory diagrams.
Input from an ornithologue and architects and specialists (animal acoustician; acoustic engineer; manufacturers of air moving equipment)	50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	Compatibility with item 2.2.3 (Acoustic comfort).

Comments

The planning documentation described the built asset's various functions for not only internal use but also to learn how to manage interfaces with the exterior such as access, the management of supplies and waste, human resources management, etc. To address light pollution, the asset's owner in addition to a project

management specialist called in four specialists: a behavioural ornithologue familiar with fauna in an urban environment, a electricity and lighting engineer, a specialist in facades, and an architect to sketch out the requirements for protecting birds and for visual landmarks. The sketches did not pre-empt solutions because it was during the design phase and perhaps even during the construction phase when the solutions envisaged were confirmed by the stakeholders. The sketches illustrated that the consolidated requirements, spelt out in clear terms in the planning documentation, were mutually compatible and technically feasible, eventually perhaps in a modified form that would have to be justified.

In the same way, to tackle noise pollution (including both background noise and variable sources of noise), the asset's owner called in five specialists, namely the same behavioural ornithologue , a specialist in animal noise (where the noise is both received and emitted by animals), an acoustics engineer, a manufacturer of air conditioning equipment, and the same architect as for light pollution to sketch out the acoustic requirements. It should be noted however that working meetings allowed for the treatment in parallel of disturbances to both animals and humans by taking account of the reaction to noise. Clearly for humans this aspect was covered under 'Acoustic comfort' in the 'Quality of life' theme, but this was not examined in the example under consideration. It was for this reason that a psychologist also participated in the meetings. The fauna examined went beyond birds (migratory, nesting, etc) by also considering both domestic and wild mammifers, both flying and sedentary (bats, squirrels, foxes, dogs, cats, etc.) knowing that noise which was inaudible to humans could disturb urban fauna since it is a vibration. It was noted that the requirements that had been articulated were taken up as recommendation to be respected throughout the durable city from now on, except when exceptions were justified.

2B.4. Economic dimension: Risk limitation costs

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 standard	80% reduction in risk provisions.	Ratio of the total costs linked to risk before risk optimastion to the sum of the cost of actions plus the costs linked to residual risks after optimisation.
ISO Guide 73 vocabulary		
ISO/ICE 31010 standard		

The table below summarises the key worksheet entries for the Planning Phase.

JP	*KP*	*LP*
Operational response	**Parameters and indicators**	**Outcomes**
Planning Phase		
Risk management assistance	80% reduction in risk provisions.	Total costs linked to risk before risk optimastion greater than the sum of the cost of actions plus the costs linked to the remaining residual risks that need to be optimised.
Risk identification and joint evaluation		
Establish a risk committee		

Comments

As mentioned under 'Risk management', several meetings were organised at the Planning Phase to identify risks and to share the understanding. A risk register was established to allow each risk to be followed up, especially phase by phase. Each risk was evaluated, sometimes in a fairly cursory manner since pertinent

information was missing. However, the method of estimating the risk was recorded following each evaluation in order to improve estimates and to capitalise upon and record how estimates were obtained. The evaluation of some risks led to several very different and maybe even contradictory methods of estimation but this did not necessarily mean that the estimates were incompatible. As it was, owing to the fairly ad hoc nature of the reference frameworks it was necessary to find ways to evaluate risks and to verify, at least to a certain extent, the relevance to any results.

Given these difficulties a risk management professional was called in to calibrate findings and to save time given that only a preliminary analysis had been made. The aim was to evaluate the risks before the first mitigation actions were taken. There also remainsed the evaluation of the costs of risk mitigation and estimating the residual costs after risk mitigation.

The second question was to know if anything of importance had been overlooked. Even though risk management is the client's responsibility, risk assessment would show that every stakeholder carried a risk by not engaging a risk management expert. In a similar way, some clients hesitate before starting a subsurface geotechnical examination of a site solely because there was a cost attached, thereby ignoring the benefits that could be drawn and leveraged if a predictable catastrophe could be avoided. Subject to professional secrecy and with the agreement of all parties, it was agreed that assessments remained confidential within stakeholders, at least in the first instance, in order not to jeopardise the future results of evaluations before and after risk mitigation. In addition, to refine estimates one needed to consider both joint risks and the risks borne by each stakeholder. Subsequently, each stakeholder agreed to share evaluations. The difficulty at the beginning was to remind everyone that a risk identified by a party can cause damage to others, and vice versa. Several successive risk assessment focussing on the Planning, Design and Construction phases were needed

2C. Design Phase worksheet

The 'Planning' worksheet for the Planning Phase (the second tab in the PSL workbook) expands upon the issues or objectives chosen in the overall monitoring worksheet for each of the four sustainability dimensions. The final results recorded in the column 'Operational response' act as a reminder.

2C.1. Governance: Risk management

The abbreviated version of the overall monitoring worksheet entries (see above) is as follows:

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 *guidelines*	- A risk assessment for all project and operation (e.g., annual) reviews. - Reduction in the provision for risks.	- Ratio of the number of risk assessments to the number of project and/or operation reviews. - Cost saving before and after risk mitigation.
ISO Guide 73 Vocabulary		
ISO/IEC 31010 standard		

The table below summarises the key worksheet entries for the Design Phase ('Operational response', Column JD, 'Parameters and indicators', Column KD, and 'Outcomes', Column LD).

JP	*JD*	*KD*	*LD*
Operational response		**Parameters and indicators**	**Outcomes**
Planning Phase (reminder)	**Design Phase**		
3 planning reviews undertaken together with a revue of the 20 most important risks.	2 design reviews undertaken together with a revue of the 20 most important risks.	- All project and operation reviews included risk costs. - Reduced provisions for risk.	- All project and operation reviews. - Substantial savings in risk costs before and after risk mitigation.
Initial budgets including risks costs before and after risk mitigation.	Budgets include risk costs before and after risk mitigation.		

In the case of a metropolitan area, all built assets adopt the same risk management procedures, with experience being accumulated during each successive phase.

Comments

The Planning Phase gives rise to working meetings with all stakeholders with as the main aim the sharing of the same understanding of the planning documentation. The meetings led to an immediate and final design review. Each review gave rise to a risk assessment which allowed the identification of a) new risks linked to the way the asset was built, operated and brought to its end-of-life; and b) ways to take the risks into consideration, either as a design constraint or as a maintenance item. Discussions also allowed responsibilities to be identified, an understanding of the interactions between the various actors, and even the bringing forward of unexpected solutions for optimising implementation. Moreover, the consideration of operation and maintenance risks allowed the security and comfort of staff in the future to be improved. Finally, consideration of the asset's end-of-life, while difficult to take on since the asset was not yet built, led to innovative solutions being proposed: ground pollution could be avoided, even during the Operation Phase, and the recycling of some materials become feasible with time. The most important risks were once again confirmed in terms of their occurrence in the four remaining phases and recosted so as to be able to adjust the budget at each phase. Following the final design review, a dedicated presentation explained all the measures put in place, some of which would probably not have seen the light of day had it not been for the risk assessments (staff awareness and training, site visits, paths for visitors, security arrangements for on-site activities, etc.). Quantifying these measures and the residual risks (in terms of cost, time, quality, client and neighbours' satisfaction, etc) usually highlighted the interest in this type of risk management. It remained to be seen if the same applied to the other phases.

2C.2. Social/society: Job creation

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
HQE Performance Target 7 (Management of maintenance and upkeep): control, troubleshooting, repair, and renovation with the creation of local jobs.	All new HQE-rated buildings to generate one-half of maintenance-related jobs close by and if possible within the immediate community.	Ratio of the number of HQE-related jobs created locally to the total number of HQE-related jobs.

The table below summarises the key worksheet entries for the Design Phase.

JP	*JD*	*KD*	*LD*
Operational response		**Parameters and indicators**	**Outcomes**
Planning Phase (reminder)	**Design Phase**		
Define criteria for the recruitment of local staff (work-home distance; stand-by intervention time, etc.)	For various types of jobs, create training programmes and contracts for apprentices and professionals with experts as trainers	- Aim for on-half of maintenance posts being supplied locally. - Proximity indicators	5 training programmes (high school diploma plus two years) and contracts for apprentices/professionals in 5 areas (heating, air-conditioning, lifts, plumbing, electricity).
Service functionality			

Comments

With the need for the asset having been expressed in terms of its service functionality, the requirements had to be translated into a design. To guarantee a contractual level of service in accordance with a predefined level of use implied that the future owners and thus the operators and maintenance firms must become involved, maybe even before the design phase. This effectively gave rise to a new situation because these firms became stakeholders in the systems for heating, air-conditioning, electric power supply, supply and removal of water, lifts, etc. to ensure the optimum conditions for upkeep and maintenance. Given these conditions of use it was necessary that the requirement reflected accurately the situation in the future so that equipment lasted as long as possible and upkeep and maintenance, which was at the supplier's charge, was optimised both financially and economically.

The responsibility assumed by suppliers made them rethink the way they did business. It was necessary for them to prove that they had control over a certain level of risk. From this stemmed their requirements for the design of their equipment and for their installations, which they continued to own, by monitoring closely interfaces with other stakeholders during construction. "Constructing to last" called for a new approach, not only for financing the total cost of an investment and to eventually prepare a submission to a bank, but also in terms of employment because those who undertook the design also monitored the implementation and needed to have the same knowledge as an experienced operator (and also not forget the end-of-life). All this called for staff trained to handle a new global approach, thereby creating local employment to meet the need for staff working under new types of operation contracts. Moreover, new staff were accompanied by a tutor who not only explained how to design equipment that lasted but also gave professional insights that limited future problems and delays and helped maintenance operations. What was more, these jobs were long-lasting and necessarily local in view of the constraints on maintenance. One was far removed from the concept of he who makes something not needing to worry about what follows: one was dealing with another way to think through the durable city. Another important outcome was a reduced investment cost for a building because those depending on the various systems were a direct charge on the service providers in exchange for which the service providers received a users' fee. This concept works now and is destined to develop.

2C.3. Environment: Tackling light and noise pollution

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
Canadian Fatal Light Awareness Program (FLAP Canada)	Number of dead birds in collisions: 0	Number of dead birds resulting from collisions.
European Union LIFE+2010 HARMONICA (HARMOnised Noise Information for Citizens and Authorities) Project	50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	The best adapted and understood index for noise disturbance.

The table below summarises the key worksheet entries for the Design Phase.

<table>
<tr><th>JP</th><th>JD</th><th>KD</th><th>LD</th></tr>
<tr><th colspan="2">Operational response</th><th rowspan="2">Parameters and indicators</th><th rowspan="2">Outcomes</th></tr>
<tr><th>Planning Phase (reminder)</th><th>Design Phase</th></tr>
<tr><td>Input from an ornithologue and architects and specialists (lighting engineer; facade designer).</td><td rowspan="2">Choose technically evolving architectural and technical solutions with direct mitigation of both static and dynamic noise sources.</td><td>Number of dead birds through collisions: 0</td><td rowspan="2">- Treat in parallel noise and light pollution to avoid bird strikes.
- Design a visual and acoustic setting, with the latter for both direct and indirect noise.</td></tr>
<tr><td>Input from an ornithologue and architects and specialists (animal acoustician; acoustic engineer; manufacturers of air moving equipment).</td><td>50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.</td></tr>
</table>

Comments

Tackling light pollution was somewhat of an adventure for the project designers because this aspect is rarely considered from an environmental point of view. The approach taken was above all economic because not to turn off lights represented an important cost stemming from an arbitrary decision, namely turn lights on or off without asking other questions. Part of a thought process that one could say was enlightening was the possibility to bring value to the asset by creating harmony through the interplay of light and shadow while ensuring security and meeting the requirements for migratory birds. Given that the design was not very sophisticated compared to say an historic building, there were several simple rules for avoiding light pollution. New technologies also led to significant improvements (pathways with coloured semiconductor lighting; programmable variable intensity spotlights that were remotely adjustable; double faced glass panelling; fibre optic captors and skylights that were invisible from outside, etc.). In fact, the response to designing an object that from the start that must respond to ecological issues was wide ranging and addressed objectives that were not necessarily chosen at the start. Moreover, this process made economic sense, proving that tackling certain issues upstream, while undoubtedly taking time especially when the approach was innovative and the outcome uncertain, allowed solutions to be found that were adapted to the circumstances and provided significant leverage effects. Design engineering was fundamental and cost little compared with the investment and the recurring costs of a built asset with a life of 50 to 80 years.

There included the design of systems and solutions to limit direct noise (from the start-up of fans, for example) or indirect noise (from wind striking walls, for example), inaudible to humans but audible to animals, both static and dynamic (the Doppler effect). Conversely, the difficulty was not to completely suppress noise because its total absence was a source of anxiety. Among the solutions envisaged and depending upon the objective, bird cries or noise such as those emitted by crickets could quieten or alter

certain species of migratory birds. A good understanding of urban wildlife and choosing solutions that evolved with time (both repeatedly year-by-year and over the long term) were sometimes indispensible.

2C.4. Economic: Risk limitation costs

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 standard	80% reduction in risk provisions.	Ratio of the total costs linked to risk before risk optimisation to the sum of the cost of actions plus the costs linked to residual risks after optimisation.
ISO Guide 73 vocabulary		
ISO/ICE 31010 standard		

The table below summarises the key worksheet entries for the Design Phase.

JP	*JD*	*KD*	*LD*
Operational response		**Parameters and indicators**	**Outcomes**
Planning Phase (reminder)	**Design Phase**		
Risk management assistance	- Investment budget examined thoroughly. - Risk mitigation by iteration. - Sharing risks and mitigation. - Choice of the assurer.	80% reduction in risk provisions.	Decrease in costs linked to risks, including mitigation, of 60% for design and 85% for construction, equivalent to 83% for these two phases.
Risk identification and joint evaluation			
Establish a risk committee			

Comments

Following on from what was achieved in the Planning Phase, estimating the cost to limit risks came to the fore. It no longer covered simply the approach or the budget envelope but comprised a much more detailed and mature analysis. On the one hand, the risk assessment had to be complete for all the project phases, together with assessments before and after risk mitigation. The party responsible for operation, given the length of the engagement, was a key component, - hence the upstream engagement with operators and maintenance firms. On the other hand, the crux of the matter was the financial component, both investment and running costs, where every decision had to be justified in terms of cost, delay and performance/quality. Anything that reduced extra costs was of course appreciated, but it was recognised that identifying an extra cost was often seen as bad news in the same way as a risk manager was seen as a bad omen when in fact both reveal what was often hidden.

Ways to economise were important: for a project costing 100 units, initial extra costs of up to 50 units are perhaps not so important since everything depends on the initial budget. A project budget that is arrived at by a technical department and then submitted to a vote by a municipal authority is often nothing more than a simple working budget. When the final balance sheet is established, the budget overrun often varies by 50 to 80% since certain costs are overlooked such as upstream studies, value added taxes, project management, insurance, supervision costs, changes in prices, etc. Conversely, an ‘Other provisions’ budget item of 5% is often added with no justification other than this is the normal practice. Since at the same time the working budget has been reduced by 5 to 10% or more, there is a financial problem quite apart from the cultural aspect.

First of all, one must argue on the basis of the correct budget envelope that covers the investment and the running costs –that is to say the global cost. Everyone knows that an economy having little investment can become a financial black hole when it comes to running costs. This is why efforts to limit the cost of risks did not stop at the phase underway or during the next phase, but continued throughout the asset's lifetime even though the eventual owner was not the same as whoever developed the project. It was not uncommon for the extra costs after risk mitigation and estimates of residual risks to be reduced by a factor 10. Thus for a project budget of 100 units with extra costs of 50 units, can the global value be reduced to 100 + 5 units? Reducing extra costs by a factor of only five, giving a budget of 100 + 10 units showed clearly that the exercise, while not totally satisfactory, remained attractive.

2D. Construction Phase worksheet

The 'Construction' worksheet for the Construction Phase (the third tab in the PSL workbook) expands upon the issues or objectives chosen in the overall monitoring worksheet for each of the four sustainability dimensions. The final results recorded in the column 'Operational response' act as a reminder.

2D.1. Governance: Risk management

The abbreviated version of the overall monitoring worksheet entries (see above) is as follows:

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 *guidelines* ISO Guide 73 Vocabulary ISO/IEC 31010 standard	- A risk assessment for all project and operation (e.g., annual) reviews. - Reduction in the provision for risks.	- Ratio of the number of risk assessments to the number of project and/or operation reviews. - Cost saving before and after risk mitigation.

The table below summarises the key worksheet entries for the Construction Phase ('Operational response', Column JC, 'Parameters and indicators', Column KC, and 'Outcomes', Column LC).

JP	*JD*	*JC*	*KC*	*LC*
Operational response			**Parameters and indicators**	**Outcomes**
Planning Phase (reminder)	**Design Phase** (reminder)	**Construction Phase**		
3 planning reviews undertaken together with a revue of the 20 most important risks.	2 design reviews undertaken together with a revue of the 20 most important risks.	All meetings include a risk assessment.	- All project and operation reviews included risk costs. - Reduced provisions for risk.	- All meetings include a risk assessment. - Final extra costs for the phase, including risk costs, are less than provisions.
Initial budgets including risks costs before and after risk mitigation.	Budgets include risk costs before and after risk mitigation.	Final balance sheet for the phase focuses on risk.		

Comments

The Construction Phase gave rise to daily site meetings involving all staff and participants involved in construction activities. Minutes of every site meeting included a section on risks and warnings indicating the 10 to 20 most important risks for the week of for the next fortnight and covering items such as the weather,

the arrival of a large crane, etc. Understandably, each new arrival on the site was alerted to the risks of direct concern as well as those relating to quality, delays, etc. This gave rise to a collective awareness of the need to identify risky situations and to anticipate corrective action linked directly to routine operations and the future of the built asset. Aside from this, all formal progress reviews with the client and on occasion with the eventual operators gave rise to risk assessments that indicated certain difficulties which helped explain inherent delays. New risks and their accompanying mitigation measures were indentified; everyone took part in spite of a certain reticence at the onset (this was followed by normal working when natural reflexes took over). Moreover, even though responsibilities had been identified, a more cohesive work force emerged able to tackle certain difficulties where the collective interest corresponded to the individual interest. As a result, the works encountered few delays and the operation and maintenance risks were managed. The important risks were once again quantified according to their appearance in the three key phases of the asset's lifetime (Construction, Operation and End-of-Life) and re-estimated to limit the budget envelope for the nest phase. Pre-commissioning operations were dealt with more rapidly than was foreseen, the quality was as expected and only a few minor and rapidly treated anomalies were detected. At taking-over a detailed risk management assessment demonstrated in concrete terms the importance of risk management. The financial outcome of risk measures, in spite of residual risk (relating to cost, delay, quality, client and neighbours' satisfaction, etc.) and the emergence of several risks gave a final amount that was less than the amount foreseen for the Construction Phase. T he relevance of the risk management initiative was thus proved and the initiative itself was approved by everyone.

2D.2. Social/society: Job creation

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
HQE Performance Target 7 (Management of maintenance and upkeep): control, troubleshooting, repair, and renovation with the creation of local jobs.	All new HQE-rated buildings to generate one-half of maintenance-related jobs close by and if possible within the immediate community.	Ratio of the number of HQE-related jobs created locally to the total number of HQE-related jobs.

The table below summarises the key worksheet entries for the Construction Phase.

JP	*JD*	*JC*	*KC*	*LC*
Operational response			**Parameters and indicators**	**Outcomes**
Planning Phase (reminder)	**Design Phase** (reminder)	**Construction Phase**		
Define criteria for the recruitment of local staff (work-home distance; stand-by intervention time, etc.)	For various types of jobs, create training programmes and contracts for apprentices and professionals with experts as trainers	- A suite of courses and contracts for apprenticeships and professional training. - Bring forward this mode of recruitment in schools and firms.	- Aim for on-half of maintenance posts being supplied locally. - Proximity indicators	5 training programmes (high school diploma plus two years) and contracts for apprentices/professionals in 5 areas (heating, air-conditioning, lifts, plumbing, electricity).
Service functionality				

Comments

It is recalled that the Construction Phase gave rise to daily site meetings involving all staff and participants involved in construction activities, mainly with risk management in mind, as discussed above, The sharing of responsibilities throughout the various equipment systems as has been described and taken into consideration during the Design Phase, led to specialists and their trainee apprentices not only ensuring the proper implementation of their future installation but also their understanding the constraints imposed on other staff. This lead to a degree of solidarity between the five trainee apprentices because they found that over and above the technical competence needed for their future employment, working to certain extent also called for some knowledge of how to explain to others what they were doing or should do. There was a dual effect: on the one hand everyone expected to understand better how others worked. On the other hand, the fact of having to explain professional skills or a trade (which they on occasion had only recently learnt) forced the apprentices to understand new concepts, to work out simple explanations for non-specialists, notwithstanding that their colleagues were apprentices like themselves. The value of the training increased because the apprentices were now able to explain what they were doing. Their employment was also seen as useful because it included how to design, implement or operate with a view to maintenance and operation. In essence, the requirements were significantly more stringent that those which are often encountered because each knew that mediocre or poor quality called for more work or the obligation to correct throughout the asset's lifetime errors that could have been avoided.

The five professional training or apprenticeship contracts developed during the Construction Phase were sometimes seen by firms as a source of concern from the risk point of view because they represented a new approach. However, the contracts, if not revolutionary, at least added value for training institutions and the firms themselves. It was often agreed to prolong and develop arrangements even though the Operation Phase had not yet started.

It should be noted that pre-commissioning progressed more rapidly than planned and that the taking-over of the various parts of the built asset gave rise to only a few minor and easily corrected defects. According to technical inspectors, this represented a major breakthrough achieved in spite of the ever increasing number of regulations. Thus the emphasis on local employment through service functionality constituted a successful approach in spite of having to overcome numerous reservations arising from the administrative and financial perspectives: it should be reproduced elsewhere.

2D.3. Environment: Tackling light and noise pollution

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
Canadian Fatal Light Awareness Program (FLAP Canada)	Number of dead birds through collisions: 0	Number of dead birds resulting from collisions.
European Union LIFE+2010 HARMONICA (HARMOnised Noise Information for Citizens and Authorities) Project	50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitain area within 10 years.	The best adapted and understood index for noise disturbance.

The table below summarises the key worksheet entries for the Construction Phase.

JP	*JD*	*JC*	*KC*	*LC*
Operational response			**Parameters and indicators**	**Outcomes**
Planning Phase (reminder)	**Design Phase** (reminder)	**Construction Phase**		
Input from an ornithologue and architects and specialists (lighting engineer; facade designer).	Choose technically evolving architectural and technical solutions with direct mitigation of both static and dynamic noise sources.	Implementation of installations to identify and prevent disturbance by light and noise, both static and dynamic.	Number of dead birds through collisions: 0	- Implementation of designed, tested and taken over installations - Add sensors and cameras to prevent the causes of bird strikes.
Input from an ornithologue and architects and specialists (animal acoustician; acoustic engineer; manufacturers of air moving equipment)			50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	

Comments

Suppliers of equipment designed to tackle light and sound pollution participated in some site meetings to allow them to explain, with their designers, the reasons for the interest in this type of equipment and the requirements for its installation. For an astonished audience which had never had to address this unusual issue, those working on the site discovered that that the built asset could have damaging consequences for wild birds, both migratory and nesting, and for certain mammals, both domestic and undomesticated. As a result, it was agreed that light levels on the site itself, something that had been overlooked in the planning documentation and at the Design Phase, should be examined. In effect, the main concern was to link to the way the asset 'lived' during operation. Site equipment as well as the construction that was underway could be dangerous for fauna (crane signals, the temporary storage of glass panels, night working during the migration season, etc.).

Similarly, noise disturbance was examined in more detail in order to significantly decrease site-wide the level of noise generated by traffic and plant of all types without decreasing site safety (crane pulleys, vehicles reversing, the choice of less noisy equipment in the case of compressors, rock drills, grinders, etc.)

It was obvious that special attention had to be paid to many aspects to tackle light and noise pollution, the latter both direct and indirect. In general, this involved installing equipment to identify and prevent the pollution, interfacing with other aspects, choosing appropriate points to intervene in the work programme, factory and on-site testing before and after installation, etc. Moreover, additional sensors and cameras were needed in order to improve, technically speaking, the measures to prevent the two types of pollution arising and to limit their impact.

2D.4. Economic: Risk limitation costs

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 standard	80% reduction in risk provisions.	Ratio of the total costs linked to risk before risk optimisation to the sum of the cost of actions plus the costs linked to residual risks after optimisation.
ISO Guide 73 vocabulary		
ISO/ICE 31010 standard		

The table below summarises the key worksheet entries for the Construction Phase.

JP	*JD*	*JC*	*KC*	*LC*
Operational response			**Parameters and indicators**	**Outcomes**
Planning Phase (reminder)	**Design Phase** (reminder)	**Construction Phase**		
Risk management assistance Risk identification and joint evaluation Establish a risk committee	- Investment budget examined thoroughly. - Risk mitigation by iteration. - Sharing risks and mitigation. - Choice of the assurer.	- Daily risk meeting. - Share risks and their mitigation. - Solutions integrating safety and operation and maintenance.	80% reduction in risk provisions.	- Decrease in costs linked to risks, including mitigation, of more than 85% for construction. - Increased quality; reduced delay and global operation costs.

Comments

The two risk assessments made during the Construction Phase, accompanied by site meetings, progressed the identification, evaluation and treatment of risks and reduced significantly in a well thought out manner the budget items linked to risk. Importantly, this allowed not only an improvement in how the asset was constructed (methods, programme, interfaces, technologies, etc.) but also reduced risks linked to site working. All involved understood the need for risk management so financial and social aspects linked to risk were raised at every site meeting. The aim was to at least highlight each risk experienced by a sub-contractor, to quantify the risk and to propose a mitigation measure together with an estimate of its cost, and in some cases the cost of residual risks. Following on from the Planning Phase risk committee, a daily meeting of a risk committee of no longer than 30 minutes was set up to handle, on behalf of the owner, urgent issues that had important consequences in terms delays, quality, impact on staff, and obviously on the financial outcome.

This sharing of experience gave rise to individual awareness that limited many risks and changed the relationship between suppliers. Involuntarily, some suppliers had often not recognised the risks that they made others assume. The result was reinforcement of site security and of operational and maintenance aspects that were now handled systematically. Generally speaking, staff responsible for specific types of work often took part in all the meetings so as to ensure the measures which were put in place did not give rise to constraints or problems for the operator or for those responsible for maintenance, both on a daily basis as well as during major repairs. Security during operation was a permanent concern because except for rare occasions, a built asset must usually remain open to the public night and day. Using the same methodology as before, mitigation costs and the residual risk cost were established for the Operating Phase, knowing that a repeat or a reoccurrence of a given risk was possible owing to the simple fact that maintenance and operation activities carry on for a long time during the life of an asset. Risk management during the End-of-Life Phase was also not overlooked, even though it was less important in relation to other issues.

2E. Operation Phase worksheet

The 'Operation' worksheet for the Operation Phase (the fourth tab in the PSL workbook) expands upon the issues or objectives chosen in the overall monitoring worksheet for each of the four sustainability dimensions. The final results recorded in the column 'Operational response' act as a reminder. To improve readability, entries for the Planning Phase are not repeated as reminders in tables that follow.

2E.1. Governance: Risk management

The abbreviated version of the overall monitoring worksheet entries (see above) is as follows:

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 *guidelines* ISO Guide 73 Vocabulary ISO/IEC 31010 standard	- A risk assessment for all project and operation (e.g., annual) reviews. - Reduction in the provision for risks.	- Ratio of the number of risk assessments to the number of project and/or operation reviews. - Cost saving before and after risk mitigation.

The table below summarises the key worksheet entries for the Construction Phase ('Operational response', Column JC, 'Parameters and indicators', Column KC, and 'Outcomes', Column LC).

JD	*JC*	*JO*	*KO*	*LO*
Operational response			**Parameters and indicators**	**Outcomes**
Design Phase (reminder)	**Construction Phase** (reminder)	**Operation Phase**		
2 design reviews undertaken together with an assessment of the 20 most important risks.	All meetings include a risk assessment.	- Each annual meeting to include a risk assessment. - A technical inspection to check the the built asset and its risk potential.	- All project and operation reviews included risk costs. - Reduced provisions for risk.	- All annual meetings include a risk assessment. - Keep the asset financially viable with an operating surplus.
Budgets include risk costs before and after risk mitigation.	Final balance sheet for the phase focuses on risk.			

Comments

The Operation Phase was the occasion for an annual meeting between the built asset's owner and the operators. A systematic risk assessment was organised for both maintenance and operation. All sub-trades participated in producing an annual report that presented not only results for the sustainable development indicators for which each was responsible but also the risks identified for the upcoming period and for major works over the longer term. The report took over from the situation presented the year before and included a list of decisions and actions undertaken since then, together with an updated risk register with accompanying financial estimates before and after risk mitigation. This allowed for thoughtful decision-making with regard to current issues and proprieties. The most important risks and warnings were obviously examined during the meeting, and assessed rapidly if necessary for a decision to be taken within a month. Moreover, the follow-up of the risk register allowed updating at given times, and even the addition of new risks without a formal meeting being held. If necessary, a risk situation could be the subject of a meeting leading to a rapid decision. Past experience and proven personal experience with risk management often resulted in pragmatic solutions in the best interest for the safety and security of staff, equipment and the built asset. Operation and

maintenance risks were handled as they arose. The most important risks were flagged on each occurrence for both the Operation and End-of-Life phases. They also led to a recalculation of the eventual final budget. Moreover, in agreement with the specifications for operation, a formal taking-over of a part of the built asset could be organised for the same day as a technical control so as to ensure the correct functioning of the asset in spite of its ageing. This permitted new arrivals to understand better not only how the asset functioned but also the issues and objectives of sustainable development. The continuous development of know-how was thereby assured, along with a less frightening risk culture.

2E.2. Social/society: Job creation

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
HQE Performance Target 7 (*Management of maintenance and upkeep*): control, troubleshooting, repair, and renovation with the creation of local jobs.	All new HQE-rated buildings to generate one-half of maintenance-related jobs close by and if possible within the immediate community.	Ratio of the number of HQE-related jobs created locally to the total number of HQE-related jobs.

The table below summarises the key worksheet entries for the Operation Phase.

JP	*JD*	*JO*	*KO*	*LO*
Operational response			**Parameters and indicators**	**Outcomes**
Design Phase (reminder)	**Construction Phase** (reminder)	**Operation Phase**		
For various types of jobs, create training programmes and contracts for apprentices and professionals with experts as trainers	- A suite of courses and contracts for apprenticeships and professional training. - Bring forward this mode of recruitment in schools and firms.	- Maintain these jobs over the long term, bringing improvements and well paid. - Reduced costs for users; an assured viability for suppliers.	- Aim for on-half of maintenance posts being supplied locally. - Proximity indicators	- Permanent jobs for qualified staff. - Other contracts for local employment created. - 98% user satisfaction rate. - Staff turn-over close to zero.

Comments

The contract between the owner, a representative of users of the service functionality system and the system's owners was organised each year during the Operation Phase. The undertakings of the system owners with respect to jobs created and maintained was easily checked because service quality could only be met via local employment. Given the short times for intervention, firms set up lightweight and appropriate forms of organisation throughout the local community so as to be able to meet not only the contractual obligations but also the expectations of users who increasingly sought complementary services for activities such as moving or adding equipment. The latter were paid for according to a price lest established annually. Those engaged owing to their good understanding of the installations effectively enjoyed a captive market even if this market only represented a small fraction of their turnover. On the other hand, keeping equipment operational by means of a repeat fee with continued operation ensured by the firms that took the initial risk

of supplying service functionality gave rise to customer loyalty with customers seeking further similar services. This 'clustering' of service providers worked well since other built assets have been created or rehabilitated using the same principles to develop responsibility. The experience accumulated by firms gives them a competitive advantage and profitability over the long term that leads to further job creation in a durable city. In pooling resources, firms improve their quality of service since, for example, during holiday periods it would have been necessary to assume their contractual obligations using staff located a long way off. Moreover, the creation of local jobs has positive benefits such as less travel fatigue , fewer accidents at work, reduced absenteeism, and the availability of qualified staff who are smiling and relaxed. An analysis of user satisfaction translated into a 98% satisfaction rate.

From the staff's point of view, employees acquired excellent experience and their contracts with their firms guaranteed interesting, valued and permanent work. Since these employees were well paid, staff turnover was low. This stability was beneficial, ensuring a guaranteed service for users, a more-or-less guaranteed remuneration for the firms (essentially a fixed income), with local employment that was well paid and appreciated by employees who often favoured environmentally friendly modes of transport (walking, cycling, etc.)

2E.3. Environment: Tackling light and noise pollution

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
Canadian Fatal Light Awareness Program (FLAP Canada)	Number of dead birds through collisions: 0	Number of dead birds resulting from collisions.
European Union LIFE+2010 HARMONICA (HARMOnised Noise Information for Citizens and Authorities) Project	50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	The best adapted and understood index for noise disturbance.

The table below summarises the key worksheet entries for the Operation Phase.

JD	*JC*	*JO*	*KO*	*LO*
Operational response			**Parameters and indicators**	**Outcomes**
Design Phase (reminder)	**Construction Phase** (reminder)			
Choose technically evolving architectural and technical solutions with direct mitigation of both static and dynamic noise sources.	Implementation of installations to identify and prevent disturbance by light and noise, both static and dynamic.	- Follow-up on the installations preventing nuisance. - Add noise detectors and infra-red cameras.	Number of dead birds through collisions: 0 50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	- No deaths from bird strikes. - No acoustic disturbance.

Comments

An informal meeting between the owner, the operator and users took place each year during the Operation Phase to review the situation regarding light and noise pollution. As concerns bird strikes, no accidents were

noted. This being so, some users were questioned to find out if this excellent result was due to the measures taken or because nobody could find a dead bird close to the built asset. The question was particular pertinent because the owner and the operator were asking the same question since generally speaking bird strikes seemed to be extremely rare. A recognised official survey had never been organised dealing with the issue. This is why several years after the start of operation it was decided to add impact detectors and high resolution infra-red cameras capable of detecting movement and being steered. Tests worked well in spite of the impact detectors being difficult to adjust. It proved to be important to avoid recording, wherever possible, parasitic noise such as noise linked to meteorological events (gusts of air, hail, torrential rain, etc.)

Regarding noise, the systems and equipment that was installed and replaced over time coped with all noise disturbance. Furthermore, arrangements designed at the beginning to trap sound meant that the noise experienced by those nearby was further reduced such that the target level of background noise was always respected. The noise intensity was often reduced by a factor of three to four throughout the Operation Phase. A few sporadic investigations limited in time were carried out. They involved injecting noise and scents from the countryside into the built asset's urban surroundings.

It should be noted that the experience gained was capitalised upon and reproduced successfully elsewhere on several occasions throughout the durable city as the experience allowed the subject of pollution to be raised in a different way with inhabitants. The solutions that were adopted for biodiversity and environmental issues in an urban environment allowed problems related to the residents' lifestyles and even their behaviour to be overcome.

2E.4. Economic: Risk limitation costs

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 standard	80% reduction in risk provisions.	Ratio of the total costs linked to risk before risk optimisation to the sum of the cost of actions plus the costs linked to residual risks after optimisation.
ISO Guide 73 vocabulary		
ISO/ICE 31010 standard		

The table below summarises the key worksheet entries for the Operation Phase.

JD	*JC*	*JO*	*KO*	*LO*
Operational response			**Parameters and indicators**	**Outcomes**
Design Phase (reminder)	**Construction Phase** (reminder)	**Operation Phase**		
- Investment budget examined thoroughly. - Risk mitigation by iteration. - Sharing risks and mitigation. - Choice of the assurer.	- Daily risk meeting. - Share risks and their mitigation. - Solutions integrating safety and operation and maintenance.	- Training of one-half of new arrivals by an experienced staff member. - Examine the role played by all suppliers (half a day every three months).	80% reduction in risk provisions.	- Decrease in costs linked to risks, including mitigation, of more than 85% for construction. - Increased quality; reduced delay and global operation costs.

Comments

The solutions planned, designed and installed in earlier phases held up since the risks identified, even those with a small probability, were more likely to appear year after year given the continued operation and maintenance. Generally speaking, risk mitigation led to substantial cost savings and a positive financial result during operation. As an example, described below are two plans for systematic action that were agreed upon and implemented, with additional cost, during the Operation Phase.

Action 1

Every new arrival, both part-time or permanent, was taken in hand during the first half-day by an experienced staff member who described all the operations that the new arrival was likely to face as well as the public areas with and without security. Moreover, the experienced staff member made the new arrival aware that his or her actions could impact upon other staff, and even the public. Conversely, from experience, actions by other operators and maintenance staff led to risks for the new arrival. The new arrival was given a short, printed guide describing the built asset, the types of staff involved and the high-risk zones. A login and a password was handed over so that the new arrival could access the asset's history as well as descriptions of the risks envisaged and the incidents and accidents that had been identified. All this had a cost.

Action 2

Every three or four months, a half-day case study, either actual or simulated, was organised dealing with an event that resembled an accident, invented yet probable, that could arise. This brought all operating staff together for a joint appraisal. The aim was to remind everyone that risks often arise, both on a daily basis and exceptionally, from an improbable chain of events and that accidents result from such a scenario.

In the final analysis, throughout the Operation Phase, even though the total cost of preventing risks was higher that what had been envisaged initially, the global cost including the cost for residual risks was significantly less than the provisions which had been made.

2F. End-of-Life Phase worksheet

The 'End-of-Life' worksheet for the End-of-Life Phase (the fifth tab in the PSL workbook) expands upon the issues or objectives chosen in the overall monitoring worksheet for each of the four sustainability dimensions. The final results recorded in the column 'Operational response' act as a reminder. To improve readability, entries for the Planning and Design Phases are not repeated as reminders in tables that follow.

2F.1. Governance: Risk management

The abbreviated version of the overall monitoring worksheet entries (see above) is as follows:

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 *guidelines* ISO Guide 73 Vocabulary ISO/IEC 31010 standard	- A risk assessment for all project and operation (e.g., annual) reviews. - Reduction in the provision for risks.	- Ratio of the number of risk assessments to the number of project and/or operation reviews. - Cost saving before and after risk mitigation.

The table below summarises the key worksheet entries for the Construction Phase ('Operational response', Column JC, 'Parameters and indicators', Column KC, and 'Outcomes', Column LC).

JC	*JO*	*JE*	*KE*	*LE*
Operational response			**Parameters and indicators**	**Outcomes**
Construction Phase (reminder)	**Construction Phase** (reminder)	**End-of-Life Phase**		
All meetings include a risk assessment. Final balance sheet for the phase focuses on risk.	- Each annual meeting to include a risk assessment. - A technical inspection to check the built asset and its risk potential.	- Final risk assessment together with charts giving cost savings as a function of the lifetime. - Demolition and restoration of the site.	- All project and operation reviews included risk costs. - Reduced provisions for risk.	- 2100% risk assessment together with a balance sheet for the risk assessments. Hand-over (after demolition) of the site in its original state.

Comments

Following tens of years of good and loyal service and in spite of developments since its birth, one had to recognise that the asset was no longer adapted to the needs of the times.

The End-of-Life Phase gave rise to preparatory meetings between the owner and the operator. A risk assessment was organised to re-examine the asset's past history, the way the asset had evolved and to check identified risks and the risk register which was brought up to date for the occasion and accompanied by quantitative cost estimates. Measurements of indicators for sustainable development were recorded just before the end-of-life to ensure the continuity of past and present requirements. Accounts for all the risk assessments consolidated the cost of risks, and over and above the global cost, visualisation as curves and histograms allowed one to understand better what had been taken into account over the course of time, and even economised thanks to risk management. The last most important risks and warnings were taken into account in order to return to a situation similar to the one before construction through conformance with archived descriptions. A formal handing-over after demolition confirmed the site's return to its initial state.

2F.2. Social/society: Job creation

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
HQE Performance Target 7 (Management of maintenance and upkeep): control, troubleshooting, repair, and renovation with the creation of local jobs.	All new HQE-rated buildings to generate one-half of maintenance-related jobs close by and if possible within the immediate community.	Ratio of the number of HQE-related jobs created locally to the total number of HQE-related jobs.

The table below summarises the key worksheet entries for the End-of-Life Phase.

JC	*JO*	*JE*	*KE*	*LE*
Operational response			**Parameters and indicators**	**Outcomes**
Construction Phase (reminder)	**Operation Phase** (reminder)	**End-of-Life Phase**		
- A suite of courses and contracts for apprenticeships and professional training. - Bring forward this mode of recruitment in schools and firms.	- Maintain these jobs over the long term, bringing improvements and well paid. - Reduced costs for users; an assured viability for suppliers.	All staff find work for which they are qualified, for which they are well paid, either by their local firm or by moving.	- Aim for on-half of maintenance posts being supplied locally. - Proximity indicators	All jobs that had been created were immediately re-established.

Comments

As has been noted for the 'Risk management' objective above, the End-of-Life Phase gave rise to preparatory meetings between the owner and the operator. The jobs generated by the creation, construction, operation, and maintenance of the asset existed no longer. Nevertheless, the staff concerned, in view of their qualifications, could be transferred to other nearby assets or profited from an opportunity to move to another region, with retirement envisaged for some. Maintaining qualifications at a high level ensured that staff could find immediate employment, ideally nearby. If in accounting terms jobs must disappear, the reality is that an asset guided by the PSL ensured the perennity of jobs even after the asset's disappearance, as was confirmed at the start. The results expected by the PSL had thus been achieved throughout the asset's lifetime.

2F.3. Environment: Tackling light and noise pollution

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
Canadian Fatal Light Awareness Program (FLAP Canada)	Number of dead birds through collisions: 0	Number of dead birds resulting from collisions.
European Union LIFE+2010 HARMONICA (HARMOnised Noise Information for Citizens and Authorities) Project	50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	The best adapted and understood index for noise disturbance.

The table below summarises the key worksheet entries for the End-of-Life Phase.

JC	*JO*	*JE*	*KE*	*LE*
Operational response			**Parameters and indicators**	**Outcomes**
Construction Phase (reminder)	**Operation Phase** (reminder)	**End-of-Life Phase**		
Implementation of installations to identify and prevent disturbance by light and noise, both static and dynamic.	- Follow-up on the installations preventing nuisance. - Add noise detectors and infra-red cameras.	- Analyse results and performance. - Develop a best practice guide. - Recycle and reuse equipment.	Number of dead birds through collisions: 0 50% less noise disturbance (a reduction of 3 dB) within 50% of the metropolitan area within 10 years.	- No dead birds from collisions. - No acoustic disturbance. - Capitalise upon best practice.

Comments

The documents that had been used throughout the life of the asset had been archived. It was decided that an historical account of the fight against noise and light pollution should be produced in order to determine the essentials and the key features. The cumulative follow-up of the results obtained that had been reported upon in a global fashion were extracted and complemented by a short analysis (of no more than two pages) to capitalise upon the experience. A best-practice guide would be drafted and made available on the durable city's website so as to share the experience and deepen understanding. Functional and technical specifications would be re-examined in the light of technical advances and the evolution of needs.

At the same time, the equipment used in the fight against light and sound pollution would be recovered, recycled and re-used wherever it was envisaged to use such equipment from the start or through add-on at a later stage. The aging of certain types of insulation materials would also be examined in order to determine the change in performance and the optimum lifetime.

2F.4. Economic: Risk limitation costs

The overall monitoring worksheet entries are as follows (see above):

G	*H*	*I*
Reference frameworks taken into consideration	**Expected performance**	**Assessment methodology**
ISO 31000 standard	80% reduction in risk provisions.	Ratio of the total costs linked to risk before risk optimisation to the sum of the cost of actions plus the costs linked to residual risks after optimisation.
ISO Guide 73 vocabulary		
ISO/ICE 31010 standard		

The table below summarises the key worksheet entries for the End-of-Life Phase.

JC	*JO*	*JE*	*KE*	*LE*
Operational response			**Parameters and indicators**	**Outcomes**
Construction Phase (reminder)	**Operation Phase** (reminder)	**End-of-Life Phase**		
- Daily risk meeting. - Share risks and their mitigation. - Solutions integrating safety and operation and maintenance.	- Training of one-half of new arrivals by an experienced staff member. - Examine the role played by all suppliers (half a day every three months).	- Risk treatment have been anticipated (zero cost at this phase). - Costs limited to risk management expert teams.	80% reduction in risk provisions.	- Reduction in risk-related costs of more than 85% during the asset's lifetime. - An operating cost that allows risks to be eliminated also allows an efficient and profitable operation.

Comments

Deconstruction corresponding to the End-of-Life Phase was also the subject of an assessment of anticipated risks that started at the Planning Phase and of an assessment during the End-of-Life Phase itself. All risks linked to the asset were recorded in the risk register to facilitate follow-up (causes, consequences, criticality, etc.) and re-evaluated over time, notably during the Operation Phase. Amongst other aspects, this has the advantage of integrating the End-of-Life Phase and in making the corresponding preparations. The outcome was generally positive since the cost of minimising risks was less than the amount usually encountered, where the End-of-Life Phase is often ignored. In effect, risk assessment at this point in the life of an asset without any provision gives rise to a much larger budget envelope concentrated over a few months since one is dealing with risks over which one has little control.

Including the financial perspective, envisaging the worst case does not imply that the worst will arise, and preparing for the worst case is often less traumatic than doing nothing,. The anticipated risks sometimes also give rise to opportunities such as those associated with the asset's end-of-life (for instance, the birth of another asset, better adapted and with a better capacity to evolve).

For the example at hand, the cost to limit risks was simply expressed since one only needed to check what had been anticipated in the earlier phases, without adding further items. The only cost came down to the services provided by a risk management expert, as had been foreseen since the Planning Phase. The entire project was therefore efficient in quality/cost terms, and also profitable.