PUBLIC BUILDINGS – FROM DECAY TO MODEL OF EXCELLENCE

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ABSTRACT

The Norwegian municipalities' building portfolio represents a value of approximately 55 billion EUR (500 billion NOK). The buildings are important means of production for all public services. During the last few years increasing attention has been given to the decay of buildings and the considerable need for upgrading of schools, health care institutions, kinder gardens and other public buildings. In order to turn negative trends and gradually start the process towards a building portfolio with the right quality and standard, a better understanding of the existing situation is necessary. This paper presents the most extensive survey and assessment of the condition of buildings ever in Norway. Furthermore the consequences of today's situation are addressed, and perhaps most importantly, different ways to improve the current situation are described. The paper presents the technical condition and estimated costs for technical upgrading of the municipalities building portfolio on a national level. In addition a recommended budget cost level for long term planned maintenance is suggested. 130 Municipalities and County Councils participated, representing all geographic regions and municipalities and counties of all sizes. 10.000 buildings were mapped, which covers approx. 40 % of the total building portfolio. The statistical material is extensive, and gives valid and reliable data on several interesting aspects, such as statistics on building types and age, aggregated technical condition per building component, estimated upgrading costs per building component etc. Finally a set of advice is given on how to achieve better maintenance of buildings in the perspective of the municipalities and society in general. Another purpose is to discuss and evaluate the causes of insufficient maintenance and to present different models and methods for obtaining better maintenance of the public building portfolio. The work presented here was performed in the period January to September 2008.

INTRODUCTION

The total Norwegian building stock is 335 million m² of which 220 mill m² are residential, 115 million m² are non residential building and 50 million m² are public buildings. The municipalities and counties own and manage a portfolio of approximately 32 million m² gross building area which represent large values and a considerable share of the national capital assets. Through a number of studies, reports and media coverage new attention has been drawn to the deferred maintenance backlog, reduction of capital value and the need for refurbishment of buildings owned by the Norwegian municipalities and counties. Furthermore emphasis has been laid on the consequences with respect to health, safety and environment and of the physical state and technical condition of these buildings. The increased awareness of the status quo for the condition of the buildings and its implications to people, public services and capital value have contributed to putting the challenges related to maintenance of the public building stock on the agenda in Norway. The Norwegian Association of Local and Regional Authorities (KS) is a national member's association for municipalities, counties and public enterprises under municipal or county ownership. All municipalities and counties are members.
KS appointed Multiconsult (MC) and PricewaterhouseCoopers (PwC) to perform a survey and a study with two main objectives:

- survey the technical condition of the building portfolio of county councils and municipalities on a national level, and make estimates of upgrading and refurbishments needed and recommend a budget cost level for long term planned maintenance;
- evaluate the consequences of the condition of the building stock, identify the reasons leading to the present condition and examine how to improve the situation in order to optimize the performance the management and maintenance of building in the municipalities and county councils.

METHOD

The survey of the technical building condition and of building floor area

During the course of this assignment great attention has been paid to establishing a solid and representative set of data. All in all 10 000 buildings, with a total area of 12 million m², were covered by the survey. The assessment work was performed in direct cooperation with the employees responsible for the maintenance of the buildings, using their day to day knowledge of the buildings. 116 municipalities (of a total of 430) and 11 county councils (of a total of 19) participated in the survey. The survey collected data about gross area, year of construction, and involved assessment of technical condition of 16 building elements and components using the Multimap system in web version (Bjørberg % larssen, 2004).

The Multimap process consists of four steps:

1. defining reference levels and requirements;
2. mapping and gathering of data / performance;
3. matching of data /performance and requirements;
4. evaluations and calculations.

The assessment of technical condition was performed in accordance with Norwegian Standard NS 3424 "Condition Survey of Constructions" (The Norwegian Standards Association, (1995)), which involves a system of grading the condition from 0 to 3 , where 0 is excellent condition and 3 is very bad (unacceptable). 10 000 buildings have been surveyed, which means that 160 000 grades have been assessed in the survey. This gives basis data for 40 % of the building stock belonging to municipalities and county councils. In addition there are one million m² church buildings where past surveys have been used.

Estimating the need for upgrading of technical building condition

The report comprises estimates of the total need for upgrading to improve the present condition to two different levels of ambition A and B.

- Level of ambition A: upgrading the condition of the building stock to a good and acceptable condition. This includes upgrading of all components with grade 2 and 3. Level A means that all building components are well maintained and are in compliance with rules, laws and regulations.

  Need for technical upgrading = The cost of upgrading all components with grade 2 and 3

- Level of ambition B: upgrading the condition of the building stock to a condition without serious defects. That includes upgrading of all components with grade 3 and some with grade 2. Level B means that all building components are in compliance with rules, laws and regulations. Postponing the upgrading of components with grade 2 can lead to accelerated decay, environment effects etc.

  Need for technical upgrading = The cost of upgrading all components with grade 3 and some with grade 2.

The calculations have neither taken into consideration that some buildings are in such a bad condition that the most advisable would be to demolish or sell the property, nor whether a technical upgrading should be viewed in connection with the need for remodeling and extensions. These kinds of considerations have to be done as a follow up task by the authorities themselves as a part of long term total property strategy.

TECHNICAL CONDITIONS AND NEED FOR UPGRADING

Some key-figures

The municipalities owns and manages approximately a portfolio of 30 000 buildings with 32 mill m² building gross area. In addition there are approximately 1620 churches with 1 mill m² gross area. Distribution of areas, number of buildings and age on different building types are shown in Table 1.

Type of building	Municipalities [m2]	County councils [m2]	Gross area [m2]	Number of buildings	Average of age [years]
Retirement-/ Nursing home	5 120 000	50 000	5 170 000	2 900	24
Library and museum	550 000	190 000	740 000	800	70
Kindergarden, playground	1 290 000	-	1 290 000	2 900	32
House	3 360 000	90 000	3 450 000	9 400	34
Sundry buildings	1 210 000	140 000	1 350 000	2 400	57
Primary and secondary school	10 010 000	-	10 010 000	5 100	36
Sports centre	2 030 000	140 000	2 170 000	1 200	29
Office building, commercial building	2 220 000	420 000	2 640 000	1 300	46
Cultural building	1 040 000	50 000	1 090 000	900	48
Warehouse, garage, workroom	520 000	90 000	610 000	1 100	36
High school	150 000	3 530 000	3 680 000	1 700	35
Grand total	**27 500 000**	**4 700 000**	**32 200 000**	**29 700**	**35**

Table 1 *Scaled figures for areas, number of buildings and average age (area weighted)*

The building type that covers the most floor area is primary schools (31 %), geriatric institutions (16 %), and high schools (12 %).

Furthermore, Table 1 shows that the average municipal/county building is 35 years old. The geriatric institutions have the youngest buildings with an average of 24 years. The average age reflects the high activity in construction from the 60's through the 80's.

The material provides data for key figures for building area per capita in municipalities and counties. For Norway as a whole this is 6,9 m² for the municipalities. But there is a substantial variation in average area per capita. Depending on the size of the municipalities, average area per capita shows variation between 5 and 9,5 m² per capita. Small municipalities (population up to 5.000) have a considerable larger building area per capita (9,5 m²), than medium size municipalities (population between 5 000 and 20.000) which have 6,0 m² , and large municipalities (population more than 20.000) which have 5,0 m² per capita. This reflects less flexibility in use of area in the smaller municipalities and also the consequences of demographic changes. For example the size of the schools and institutions remains the same even though the population is decreasing. The average building area per capita for county council is 1 m².

Figure 1 shows key figures for area.

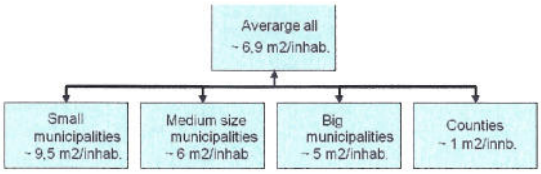

Figure 1 *Area key figures depending on municipality size*

Technical condition

The assessment of technical condition is performed in accordance with Norwegian Standard NS 3424 "Condition Survey of Constructions" which uses a system of grading the condition from 0 to 3 , where 0 is excellent condition and 3 is very bad (unacceptable). The surveyors have considered 16 elements for each building. The chosen components are in accordance with The Norwegian Standard 3451 "Table of Building Elements".

The grades for the 16 elements are weighted depending on their value or cost for change up to one weighted grade on building level. Diagram 1 shows the county council and municipal building portfolio grouped by year (decade) of construction

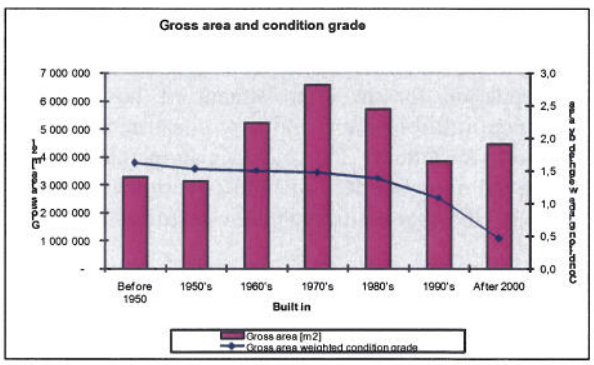

Diagram 1 *Weighted condition for the total county and municipal portfolio*

The graph in diagram 1 shows that the weighted condition grade has little variation between the different periods of construction with exception of the new buildings built after year 2000. Buildings constructed during the 90's are in better condition than older buildings. The small differences in condition from buildings that are 25 -30 years old indicate that it is the level of maintenance (lack of maintenance) rather than age that has an influence on the present technical condition.

The diagram also shows that buildings constructed from the 60's to the 80's constitute more than 50% of the total portfolio, with the 70's as the busiest period.

Table 2 gives the response rate percentage for each of the four condition grades of the building stock that has been surveyed. As mentioned above this a total of approximately 10 000 buildings and 12 mill. m². The sum of grade 0 and 1 means building elements on the "good side", whereas the sum of grade 2 and 3 gives the percentage the building elements on the bad side". The building elements which are reported on the "bad side" for more than 50 % of the buildings have been highlighted. These are: windows and entrance doors, indoor surfaces (floors, walls and ceilings), furniture, heating, ventilation and sanitary systems.

Main building component	Condition grade						Number of buildings
	0	1	0+1	2	3	2+3	
Foundations	17 %	54 %	71 %	22 %	7 %	29 %	9 936
Windows and doors	11 %	36 %	47 %	38 %	15 %	53 %	9 872
Outer walls and surface	11 %	40 %	51 %	36 %	13 %	49 %	9 909
Roofing and gutters	13 %	39 %	52 %	33 %	14 %	48 %	9 893
Internal surfaces	10 %	35 %	45 %	45 %	10 %	55 %	9 759
Fixed fittings	11 %	38 %	49 %	43 %	9 %	51 %	9 453
Sanitary	11 %	37 %	47 %	42 %	10 %	53 %	9 461
Heating system	12 %	38 %	49 %	40 %	11 %	51 %	7 919
Fire fighting	18 %	54 %	71 %	23 %	6 %	29 %	8 994
AC/Ventilation	14 %	33 %	48 %	32 %	21 %	52 %	7 921
Electrical , distribution	13 %	42 %	54 %	37 %	9 %	46 %	9 752
Electrical system	13 %	45 %	57 %	35 %	8 %	43 %	9 787
Tele and automation	15 %	47 %	62 %	30 %	8 %	38 %	7 888
Lifts	24 %	46 %	70 %	21 %	10 %	30 %	2 532
Landscaping	12 %	46 %	59 %	31 %	10 %	41 %	9 860
Outdoor technical	11 %	44 %	56 %	36 %	8 %	44 %	9 106

Table 2 *Spread of responses on condition grading for all buildings*

As mentioned, the condition grades have been weighted within each building and weighted by area in buildings to achieve the total distribution of condition grades for the total national portfolio.

The condition survey has shown that the building portfolio, roughly speaking, may be divided into three categories, where:

- one third of the buildings is in good or satisfactory condition
- on third is partly satisfactory and need corrective maintenance efforts
- the last third is in bad condition and is in need of heavy technical upgrading.

The overall condition, however, is better than expected in comparison with past surveys. This indicates that the sector has invested in maintenance, refurbishments and new buildings in the recent years.

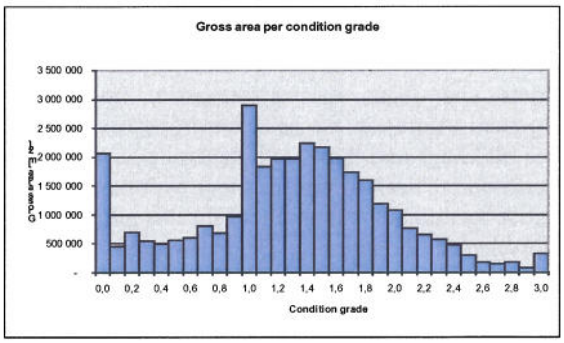

Diagram 2 *Spread of area and weighted condition grade (0=as new, 3=unacceptable)*

Upgrading Costs

The need for upgrading buildings belonging to Norwegian municipalities and county councils is large. The backlog will of course vary with the individual levels of ambition with respect to required standard and quality levels. As described above we have defined two different levels of ambition, A and B. Level A means upgrading the condition of the building stock to a good or acceptable condition. While level B is somewhat lower ambitions which mean upgrading the

the building stock to a condition without serious defects, by rectifying the most serious defects due to deferred maintenance backlog. Maintaining a level B ambition may not eliminate all the negative impacts the reduced technical condition has on the properties and the core activities of its users. Further, the estimated need for upgrading measures has been divided into periods of execution depending on how poor the condition is. Table 3 summarizes the costs of remedying the deferred maintenance backlog for both levels of ambition.

Table 3 *Upgrading costs distributed by ambition levels and periods*

Period	Ambition level A Billion NOK	Ambition level B Billion NOK
Short (0 - 5 yr)	60	60
Long (6 – 10 yr)	82	34
Total	142	94

The total cost of improving the condition of the buildings by clearing the deferred maintenance backlog up to level A is estimated to 142 billion NOK (15 billion EUR) equals 4000 NOK/m² (420 EUR/m²) for the whole portfolio. The amount is approximately 15 % of the cost new construction of this portfolio.
For level B the estimated maintenance backlog amounts to 94 billion NOK. (10 billion EUR) or 2 900 NOK/m² (305 EUR) i.e. 10 % of the cost of new construction.
In addition there are 1620 churches which with their service buildings cover approximately 1 million m², and have an estimated cost of clearing the backlog of 13 billion NOK. (1,4 billion EUR)
The challenges facing this part of the public sector in Norway requires special effort to optimize investment funds and operating costs to maximize the benefit. The challenges also include the need for expensive upgrading and changes in the way properties and property portfolios are managed.
The recommended strategy is to identify the most suitable properties and focus the maintenance, investment and development efforts on the selected properties. For the less suitable buildings and those with general poor condition it is recommended to seek to replace them with new buildings or alternative locations. A model/tool for this purpose is shown as a flowchart in the report to The Norwegian Association of Local and Regional Authorities (KS 2008, Bjørberg et. al), see figure 2.

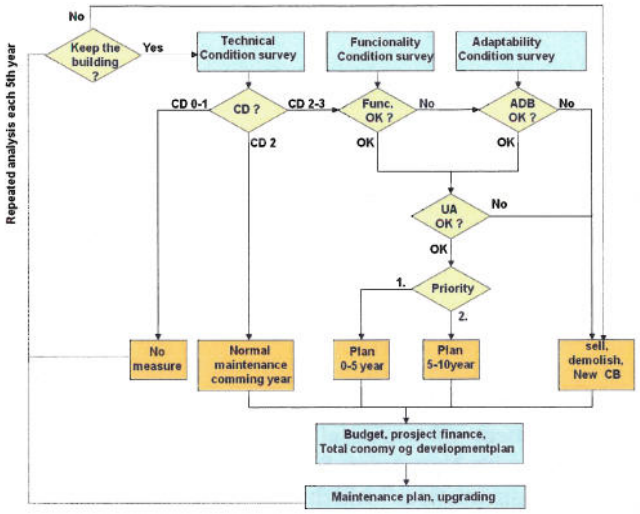

Figure 2 *Flowchart total mapping of building performance*

It will be important to manage the planning of maintenance as an integrated part of the general financial and development budget and planning in municipalities and county councils.

Another challenge is the communication of the need for maintenance measures between the different levels of management (from the operative to the strategic levels). During the survey it has been uncovered that there is a need to establish agreed strategies, goals and plans that can serve as a foundation for an improvement of how and when maintenance, refurbishment and new construction are to be performed in the future. This includes an increased focus on analyzing the consequences of both governmental and local decisions of the changes in the public sector core activities.

MAINTENANCE STRATEGIES AND COSTS

Maintenance strategy

A strategy for maintenance comprises and defines the goals related to maintenance and gives a description of how to reach these goals. The elaboration of the strategy is an owner responsibility, and as a minimum it has to satisfy the requirements of the Planning and Building Act. Furthermore, the strategy has to take into account the owners vision for the building portfolio and the general visions and strategies of the municipality/county.
A maintenance strategy may be related to the condition grades and measurable requirements related to the levels of ambition e.g.:

- "A" : No building element or component shall have condition grade 3 or 2;
- "B": No building element or component shall have condition grade 3, some may have or 2;
- No building shall have weighted grade lower than 1,2.

Failing to have a maintenance strategy often leads to a subconscious "acute strategy" where emergency repairs are dominant. This results in higher total costs because a lack of strategy often is accompanied by the absence of a plan for

preventive maintenance which in turn contributes to accumulated backlog of deferred maintenance and poor asset management.

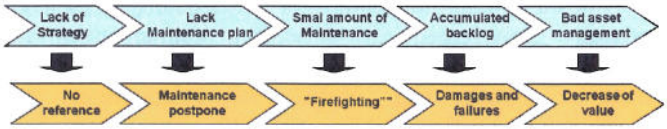

Figure 3 *Road to decreased value*

Maintenance costs – key figure

Based on the estimated need for maintenance for the different types of buildings, and the distribution of areas between the buildings, an average estimated budget requirement is expressed in terms of an annual cost (annuity) as NOK/m² in accordance with NS 3454 "Life Cycle Costs for buildings". Thus all maintenance and replacement needs are included. No adjustments for the different principles of accounting of operating costs and capital investments have been made.

The estimate of average budget requirement expressed in terms of an annual cost (annuity) is 170 NOK/m² (18 EUR) based on 60 years service life and 6 % calculation interest rate.

The annual cost is sensitive to the length of expected service life, intervals for preventive maintenance and replacements and interest rate. Halving the expected service life gives a reduction of the estimated key figure to100 NOK/m² (11 EUR/ m²).

For a norm figure to be representative for the purpose of annual budgeting, a portfolio consisting of at least 40 to 50 buildings is needed to allow for that the large maintenance projects on individual buildings can be covered by the total budget. With an average size of 1100 m² for each building, a total area of 40- 55 000 m² area is required for a portfolio in order to fit in the larger maintenance works, which in turn means municipalities with a size of population of at least 7 500 – 10 000. Between 110 and 140 municipalities are of sufficient size to use norm figures in budgeting, the remaining 310-340 municipalities have too small portfolios to use norm figures in the budgeting of yearly maintenance. Their budgets will vary from year to year, and will have to be derived from the more specific plans for each individual building.

As emphasized earlier, large maintenance activities have to be viewed in connection with the present and future requirements of the owner and user, and the possibility to satisfy these requirements by adaptations of the existing buildings. This means that one cannot regard the management of the building portfolio solely from a maintenance perspective. Adding up these considerations will lead to a necessary level of investment that exceeds the 170 NOK/m² (18 EUR/m²) when the costs of adaptations and refurbishments are included. These additional costs are according to the standard NS 3454 defined as "development costs".

EXPLANATIONS FOR THE DEFERRED MAINETENANCE BACKLOG

Municipal property management is complex, and has different and greater challenges than that of private companies. The main objectives of private real estate companies are, in most cases, to manage and develop the properties in such a way that return on investments and the asset value are maximized. The municipalities, however, have to balance their maintenance costs with the other expenses needed in order to produce the other obligatory services to the public.

Another explanation of the deferred maintenance backlog is that in fact it may be rational to postpone the heavier maintenance activities. Based on economic theories, it has been argued that technological development and changing requirement of the population make it in some cases reasonable to defer the heavier maintenance. The reason for this is to establish flexibility to adapt to new technologies and/or changing priorities of the users. Political reforms in the health- and school sectors are examples which illustrate such considerations.

Experience from the last 10-15 years indicates that when the building condition has reached a critical level and the political pressure is intensified, special governmental measures will be taken to financially stimulate the economy of the municipalities. An example of this is the compensation for mortgage costs. Such mechanisms may result in that municipalities deliberately defer the maintenance of their buildings.

In our opinion the municipalities are not as passive as the image conveyed by media and the political discourse. They rather take advantage of such opportunities when they arise, by adjusting their policies accordingly. In addition the following points should be noted:

- the municipalities lack a tradition of developing real estate strategies;
- there is a shortage of good routines and systems for collection and application of data about the condition of buildings;
- from the survey it has been noted that there is a shortage of capacity among key staff at all levels in the maintenance value chain.

In sum this contributed to that municipal building maintenance often is random and ad hoc. Unforeseen events and breakdowns are given great attention, and these are events that could have been avoided by a practice of planned and preventive maintenance.

There is a need for better technical and management information for maintenance. Employees at the operative level often experience that their voices are not heard. On the other hand the top management and the political level often say they do not receive enough and adequate information about the state of the building portfolio.

POSSIBLE SOLUTIONS TO OBTAIN BETTER MAINTENANCE

Increasing the awareness among the politicians

To meet the challenges it is important to develop a property management strategy where maintenance is a vital element. This strategy has to be linked to the superior governing documents in the municipality/county.
It is recommended to establish a political property management committee in the municipalities. The purpose should be to upgrade the political recognition of property management, as well as to increase the awareness of taking care of one of the most important resources in the municipality, both financial and as a foundation for the production of welfare services to the population.
Good quality of data is the core of municipal planned maintenance. The data need to be accompanied by operational goals and standards for the maintenance. Thus, it is important to have systems and routines for monitoring and control of maintenance. A central issue is collecting information about property values, condition, suitability and usability in connection with the making of the municipal annual budgets and activity plans. Doing so would contribute to equal and balanced treatment maintenance and the municipal service in the budget processes.

Introduction of internal rent

Those who have introduced internal rent in the municipality have achieved a better balance between the role of owner and the role of user of the municipal property portfolio. To be efficient the internal rent must reflect the actual costs. If the gap between rent and owner cost becomes too wide there is a risk of loss of legitimacy of the model. The Directorate of Public Construction and Property introduced the principle of internal rent called "cost-covering-rent" in the early 90's. The condition of these buildings is higher (better) than the municipality buildings where internal rent is absent. As it is today, the maintenance budget often becomes balancing item.

Using PPP-agreements

In spite of challenges like the risks involved with the choice of contractor and more expensive financing, it is our opinion that using Public-Private Partnership Agreements (PPP-agreements) could be worth exploring for municipalities and county councils. In the long run the PPP –agreement may prove to be of strategic value when it comes to committing the municipality to long term preventive maintenance, provided that the agreement also covers maintenance and both parties see the benefits. PPP agreements often cover financing, planning/construction and operation of the building. The agreement therefore has to satisfy the contractor's ambition for the level of maintenance and the maintenance and operating costs. In doing so the PPP-agreement may increase the contractor's interest in choosing materials and technical solutions which give low life cycle costs which in turn will benefit both parties.

CONCLUSIONS

In addition to giving condition grades and estimates of costs of upgrading a large building portfolio, the survey has provided a tool and foundation for better quality of strategic property management in Norwegian municipalities and county councils. This new knowledge is expected to ensure more economic and professional maintenance and development of this building portfolio. The results have already increased the awareness among politicians, which in turn may lead to strengthening the status and financial position of real estate values in this sector. If the building condition is systematically followed up, further build up of deferred maintenance backlog can be avoided, hence boosting the spirit of staff responsible for operation and maintenance of public buildings. However, for the majority of Norwegian municipalities and county councils it remains to develop strategies for property management, and maintenance in particular.

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